2014

The Role of the School Psychologist in K-12 Online and Blended Learning Environments

P. Dawn Tysinger
Georgia Southern University, dtysinger@georgiasouthern.edu

Jeffrey A. Tysinger
Georgia Southern University, jtysinger@georgiasouthern.edu

Terry D. Diamanduros
Georgia Southern University, tdiamanduros@georgiasouthern.edu

Handbook of Research on K-12 Online and Blended Learning

EDITED BY RICHARD E. FERDIG AND KATHRYN KENNEDY

Handbook of Research on K-12 Online and Blended Learning

Handbook of Research on K-12 Online and Blended Learning

Design Direction by Shirley Yee

ISBN: 978-1-312-58708-3
Library of Congress Control Number: 2014953854

For those who "learn to devote themselves to doing what is good,
in order that they may provide for daily necessities and not live unproductive lives"

(Titus 3:14, NIV)

PREFACE

Introduction

We were sitting in a hotel lobby in New Orleans at a technology and education conference. We both had been working in the field of K-12 online and blended learning for some years. Our coffee conversation focused mainly on the progress of research that had been published in the area since the inception of K-12 online education in the mid 1990's. We shared both our optimism for the continued research in the field as well as our relative frustration at a lack of awareness of that research. Although most of the people doing work in the area knew each other (and even occasionally worked together), many new to the field thought that they were discovering K-12 online and blended instruction for the first time.

This wasn't an egotistical exercise; this wasn't another occasion where one academic was calling out peers for not including their citation or reference in a paper. Rather, this was a problem as researchers—particularly those new to the field—seemed to be lacking the opportunity to proverbially 'stand on the shoulders of giants.'

There is no clear reason why this happens. Perhaps it has to do with the fact that people in the field publish in a wide variety of journals. Articles in K-12 online and blended instruction might appear in anything from the *Journal of Technology and Teacher Education* to *The International Review of Research in Open and Distance Learning* and from the *Journal of Medical Internet Research* to *The Internet and Higher Education.*

To be honest, we were less concerned about why this happened and more interested in how to fix it. We recognized we needed one location to catalog—and more importantly to synthesize—the existing research in the field. And so in that hotel lobby in New Orleans, the idea for this handbook was born. We decided we wanted to create a handbook that would act as a key resource for existing and new researchers, practitioners, and policymakers in the field. We later shared the idea with fellow researchers who reciprocated their interest. We then had the blessing of beginning a conversation with Drew Davidson from Carnegie Mellon.

Drew is a professor at CMU as well as the founding editor of ETC Press. ETC Press is interested in the participatory nature of publishing. As such, they publish texts that are available electronically and openly with Creative Commons licenses. Readers can choose to download the materials, thus making them more widely available. Or, they can also pay to have a print version sent to them from Lulu.com.

What we enjoyed about working with Drew, Shirley Yee, and the rest of the ETC Press team is that they pushed us to think more deeply about the book. For instance, was this handbook going to be full of op-ed articles? Was this going to be a catalog of existing research for that year? How would we ensure that it was representative of research in the field? The fact that we were asked these questions early in the process—as well as the fact that we were publishing a book about electronic technologies in an electronic format—helped us strengthen the quality and accessibility of this book.

What this book is…and what it is not

This handbook is meant to be a resource for anyone interested in research, practice, or policy in the field of K-12 online and blended learning. This book is not intended to be a collection of opinions on the field. Nor is it meant to be a compendium of the top research articles for this past year. It is not a list of what is currently trending in K-12 online and blended schools. And, it is not a list of 'best pieces' from leading researchers in the field. Rather, this handbook is a collection of what we currently know about research in the field.

There are at least three main goals for completing this work:

1. To continue to strengthen our field by providing clear evidence of what is known and what is yet to be known;
2. To provide an empirical resource for researchers (new and experienced) as well as parents, media, administrators, and policy officials; and
3. To set in motion a yearly close examination of our field.

The Book's Outline

Our first step in creating the layout for this handbook was to discern the major topics in the field. There were three key ways we addressed this task. First, we examined the existing research in the field. We used that research to create categories. If we found an article that did not fit within a category or one that challenged our existing structure, we revised our framework. We continued with that process until we felt like we could comfortably fit existing research articles into the broad headings.

The second step was to compare that framework with existing handbooks of research. Obviously K-12 online and blended learning is a unique research area. However, other handbooks—particularly those in education—contain frameworks that are useful in helping to frame our work. We used those handbooks to determine areas of overlap as well as components that were missing from our framework.

The final step was to talk to experts in the field. We shared our framework with researchers and practitioners in the field. We asked them to evaluate the framework to see what we had gotten right and what we were missing. The outcome of the entire process was a six-section framework that included the following broad headings:

I. **A Background and Historical Perspective** – *What are the important background and historical markers that help contextualize research in K-12 online and blended environments?*

II. **Research on Learning and Learners** – *What does the research say about learning in K-12 online and blended environments?*

III. **K-12 Learning in the Content Domains** – *What does the research say about similarities and differences within content areas?*

IV. **Research on Teaching** – *What does the research say about preparing and mentoring current and future teachers?*

V. **Research on the Role of the Other** – *What does the research say about the role of the preparing and mentoring others who support K-12 online and blended environments?*

VI. **Research on Technological Innovations** – *What does the research suggest might be new and innovative technologies that will transform how we conduct and think about teaching and learning in K-12 online and blended learning?*

The General Outline of Chapters

After creating the framework, we contacted researchers in the field to ask them to consider writing under each of the broad topics. We made suggestions as to when and where the authors' work might fit; however, we left it up to the authors to choose topics they felt most comfortable with. We asked authors in the "Background and Historical Perspective" to help set the stage for a deeper understanding of the research by providing a background and contextual information about K-12 online and blended instruction. We suggested to the authors that after consuming the chapters in this first section, the reader should have a context by which to understand the specific areas of research in the other sections in the book. This would include an introduction, a discussion, and then a conclusion that set the stage for both where we are now and understanding what might come next.

Authors for the remaining five sections received more explicit instructions as we wanted consistency between chapters. We asked authors to ensure that each chapter would include:

- **Introduction** – explain purpose and objectives of chapter. Include a layperson's description of the topic in a short overview including relevant definitions.

- **Research Synthesis** – categorize and present the research, preferably in themes, such that the chapter does not become a laundry list of everything published in that area but rather a synthesis of what we understand.

- **Implications for Policy and Practice** – given the research synthesis, what are the direct implications for policy, instruction, and preparation of teachers, students, and administrators?

- **Implications for Research** – given the research synthesis, this section sets the stage for what we have yet to learn that is a research gap in this specific context.

- **Conclusion** – What are the top highlights in terms of what we know about research, policy, and practice, and where we need to go next?

- **References** – this should be a section that highlights further reading as presented in the article.

Conclusion and Next Steps for Readers

The purpose of this handbook is to present a compendium of research devoted to K-12 online and blended learning. The goal is that any researcher or practitioner would be able to return to this Handbook and seek relevant and current information. There is value in having clearinghouses that attempt a similar purpose by linking to all the existing evidence (e.g. http://k12onlineresearch.org/). The value of this exercise is to move beyond collecting the research to also providing syntheses of those studies. The goal is to offer an understanding of where we have been and what research still needs to be conducted.

In order to continue to be relevant, our goal is to reproduce this Handbook each year, updating chapters to reflect current research. Readers will undoubtedly see gaps in the chapters and in the topics that are present—or missing—in this book. In some cases, these gaps were related to researchers who weren't able to contribute to this iteration of the book. In other instances, gaps in chapters or missing topics in the book were related to a lack of literature in the field.

It is worth noting that we attempted to collect chapters even if there was limited research in the field. We wanted existing and new researchers and practitioners to see where we had gaps. We often had conversations with authors where we told them that it was ok to have a short research synthesis section of their chapter. We encouraged them to focus instead on what we knew outside of the literature to point to promising new areas of research and practice. Thus, in one year a chapter might have a small research synthesis section and a large section on research needs. A few years later and the ratio of text may have drastically flipped.

In conclusion, we ask readers to think of this work not as a completed product but rather a flowing conversation. We have attempted to get authors to note areas for future research. And, we ourselves have pointed at chapters we would like to have in future iterations. We encourage authors to contact us at handbookresearch@gmail.com to propose missing research studies for certain chapters or for proposals on new chapters for future iterations.

We are so pleased to be able to present this iteration of the *Handbook of Research on K-12 Online and Blended Learning*. We believe the authors have contributed thoughtful and thorough syntheses of existing literature. Researchers, practitioners, and policymakers will find useful evidence as well as next steps for conducting studies or improving practice. **Our authors have written such thoughtful and well-written pieces that people will read this book and be able to help further understand not if K-12 online and blended learning works, but when, how, and under what circumstances.** We invite you, the reader, to join the conversation.

Respectfully,

Richard E. Ferdig, *Research Center for Educational Technology, Kent State University*
Kathryn Kennedy, *MVU, Michigan Virtual Learning Research Institute*

September 1, 2014

Acknowledgements

An edited book would not be possible without the contributions of authors. We would like to thank our authors for their hard work and dedication to the book. We would also like to thank Drew Davidson, Shirley Yee, and the review board from ETC Press (Carnegie Mellon) for taking on this project. Drew brought a wealth of experience in publishing open-source content. He was always quick to respond to a phone call or email and guided us through this process. We appreciate Drew's attention to the details surrounding the publishing of this book. We also enjoyed meeting and getting to work with Shirley who worked closely with us during the submission and publication process.

In closing, we wish to thank our families for their support of our professional efforts, allowing us to give up personal time to complete this task.

Handbook of Research on K-12 Online and Blended Learning

Edited by
Richard E. Ferdig
&
Kathryn Kennedy

I. A Background and Historical Perspective

1. A History of K-12 Online and Blended Instruction in the United States
John Watson & Amy Murin **1**

2. History of K-12 Online and Blended Instruction Worldwide
Michael K. Barbour **25**

3. Research and History of Policies in K-12 Online and Blended Learning
Kerry Rice **51**

4. A Brief Look at the Methodologies Used in the Research on Online Teaching and Learning
Susan Lowes **83**

II. Research on Learning and Learners

5. Research on At-Risk Learners in K-12 Online Learning
Jeanne B. Repetto & Carrie J. Spitler **107**

6. Reviewing a Decade (2004-2014) of Published, Peer-Reviewed Research on Online Learning and Students with Disabilities
Diana Greer, Mary Rice, & Bryan Dykman **135**

III. K-12 Learning in Content Domains

7. Few in Number: Research on Mathematical Teaching and Learning in the Online Setting
Karl W. Kosko, Lauren Sobolewski-McMahon, & Md Amiruzzaman **163**

8. Research on Literacy Instruction and Learning in Virtual, Blended, and Hybrid Environments
Kristine E. Pytash & W. Ian O'Byrne, ... **179**

9. Research on Teaching Blended and Online Physical Education
David N. Daum & Craig Buschner, ... **201**

IV. Research on Teaching

10. Teacher Preparation for K-12 Online and Blended Learning
Leanna Archambault & Kathryn Kennedy **225**

11. Professional Development for K-12 Online Teachers
Kara Dawson & Nancy Fichtman Dana **245**

12. Mentoring for Online Teachers
Kara Dawson & Nancy Fichtman Dana **267**

V. Research on the Role of the Other

13. School Administrators and K-12 Online and Blended Learning
Scott McLeod & Jayson W. Richardson **285**

14. Parental Involvement in K-12 Online and Blended Learning
Lisa Hasler Waters, Michael P. Menchaca, & Jered Borup **303**

15. On-site and Online Facilitators: Current and Future Direction for Research
Jered Borup & Jeff S. Drysdale **325**

16. The Role of the School Psychologist in K-12 Online & Blended Learning
P. Dawn Tysinger, Jeffrey A. Tysinger, & Terry Diamanduros **347**

17. K-12 Online and Blended Learning, School Libraries, and School Librarians
Brenda Boyer & Rebecca Kelly **365**

VI. Research on Technological Innovations

18. K-12 Mobile Learning
Cathy Cavanaugh, Dorit Maor, & Aidan McCarthy **391**

19. Open Learning in K-12 Online and Blended Learning Environments
Lee Graham, Randy LaBonte, Verena Roberts,
Ian O'Byrne, & Colin Osterhout **415**

20. Personal Learning Environments in K-12
Wendy Drexler. **447**

I.
A Background and Historical Perspective

What's this section about? The main goal of this book is to provide a summary of the existing research related to K-12 online and blended learning. Readers will have the opportunity to more fully explore significant topics in both breadth and depth. And, in doing so, the reader will more fully understand what we knew, what we know, and what we have yet to learn.

Prior to that exploration, it is important to set the stage for understanding that research. When did K-12 online and blended instruction begin? Do the advancements in the United States mirror international contexts? What is the past, current, and future relationship between research, policy, and practice? Are there specific research methods that have been used or have proven successful in K-12 online and blended research? The four chapters in this section set the stage for this entire book by asking and answering those important questions and more.

What's in this section? Watson and Murin convey the simple nature of K-12 online learning when it first began and admit that today the "landscape is much more complex." They emphasize that research says K-12 online learning can work, however, various implementation factors need to be taken into account for programs' potential to come to fruition.

Barbour's chapter sheds light on what is happening internationally in regard to K-12 online and blended learning. Barbour discusses how government funding is the impetus for change, varying terms are used to describe online and blended learning, use of legacy delivery models, and the prevalence of secondary implementation over any other grade level.

Rice shares a comprehensive overview of U.S. education policy where she illustrates a tendency for political maneuvering and fragmented implementations. She suggests a shift in culture surrounding education and learning to move towards transparency and accountability, where students' learning is fostered, teachers' and administrators' contributions are heard, and innovation and risk-taking are front and center. This shift would help policy to reform in a way that is conducive to the learning environments that are here today and those that will be here tomorrow.

Lowes advocates for mixed methods research to ensure a full picture of K-12 online and blended learning environments, examining from both the narrow and the broad. She also sees research in this area open for burgeoning methodologies that may build on existing ones and take into account the various nuances apparent in our field.

What's missing from this section? Future iterations of this book will provide chapters that continue to lay a framework for research in K-12 online and blended instruction. There are opportunities for new authors to add to this Handbook by writing about critical background and historical information such as: program evaluations, deepening definitions in the field, cultural perspectives, asking the right questions about K-12 online and blended instruction, understanding diversity, appreciating changes in school culture, and explorations of the relationships between blended, virtual, and traditional schools.

Chapter 1

A History of K-12 Online and Blended Instruction in the United States

John Watson, *Evergreen Education Group, john@evergreenedgroup.com*
Amy Murin, *Evergreen Education Group*

Abstract

This chapter will cover the history and progression of online and blended learning in K-12 education in the United States. Program categories covered include state virtual schools, fully online schools, and blended learning. Key policy issues affecting the development of online and blended learning are also addressed, including online learning requirements, student achievement, and funding.

Introduction

Many of the early adopters in K-12 online learning were programs that evolved from correspondence schools or distance education programs (Watson, 2012). This includes, for example, the North Dakota Center for Distance Education, which began offering correspondence classes in 1935 and evolved to offer classes through many different delivery methods, including online learning. The University of Nebraska High School began delivering paper-based correspondence courses in 1929, launched its first "Tele Learning courses" where students submitted work by email in 1985, and offered its first full diploma sequence online in 2001.

Other programs launched in the 1990s and early 2000s in an effort to offer online courses in order to expand course catalogs, better serve students who need to recover credit, and serve undercredited and overage students, including the programs below.

- The Virtual High School (VHS) is a nonprofit collaborative of schools founded in

1995 that began offering online classes in fall 1997. It has over 700 partner schools in 40 states, as well as 35 international schools. VHS has expanded its offerings over the years to include private and custom courses, blended learning support, and online professional development to help educators develop the skills they need to teach online and integrate technology into their classrooms. (Retrieved July 18, 2014 from http://thevhscollaborative.org/about-us/virtual-high-school-glance)

- Florida Virtual School (FLVS) began as the "Web School" in Orange County, Florida, during the 1996 school year. Encouraged by the Florida Department of Education (DOE), it then partnered with Alachua County and received a $200,000 grant from the DOE in November 1996 intended to develop the Florida High School (FHS) project. FHS officially launched with seven staff members in August of 1997. Following the original grant, FLVS operated from a recurring line-item in Florida's legislative budget until school year 2003-04, when FLVS became fully funded as a statewide virtual school and became part of the Florida Education Finance Program (FEFP). From the $200,000 grant in 1996, FLVS continued to grow and became a statewide school district, serving both full-time and part-time students. FLVS is affiliated with all 67 Florida school districts; it served over 400,000 supplemental course enrollments and 5,300 full-time students in school year 2012-13 (Florida Virtual School, 2013).

- The DIAL Virtual School is an initiative of the Dakota Interactive Academic Link consortium and began offering distance classes in 2002 for students in grades 6-12 to students throughout South Dakota for a course fee. A variety of courses are available including career and technical education (CTE), credit recovery, original credit classes, and remedial coursework for high school seniors (Watson, 2013).

Ten years ago, the K-12 online learning world was mostly contained within a few well-defined dimensions: there were state virtual schools and fully online charter schools, but there was essentially no blended learning and very little district-level activity. The landscape was dominated by the cyber charters offering a fully online education to students in Pennsylvania and Ohio, and the state virtual schools offering supplemental online classes to students in states like Florida, Illinois, and Kentucky.

The landscape is not nearly as simple now, from the standpoint of either policy or practice. While some challenges continue—including a constant tug and pull between Pennsylvania's cyber charters and district schools, and ongoing funding battles in Florida—nearly every aspect of the online and blended landscape has become more complex, more interconnected, and more volatile. Providers have multiplied and diversified: yesterday's virtual charter school operator is also today's course vendor and blended learning consultant, while the leading state virtual schools now serve fully online students, blended students, and perhaps even teachers with professional development. As customers, schools are aiming for a wide range of virtual, blended, part-time, full-time, and mobile offerings. Multiply this by thousands of districts, charter schools, private schools, education agencies, and all 50 states, and the source of the proliferation becomes clear (Watson, 2013).

Perhaps because of the speed and complexity of online and blended learning expansion, state legislatures have moved in uneven bursts to create statewide supplemental course options, build online schools into charter laws, and incentivize districts to create opportunities for students. The end result for students is a varying set of options that is entirely dependent upon zip code. In some states, students in all districts have access to a variety of providers of full-time and supplemental options, whereas in other states the only options are those made available to a handful of students by their own districts (Watson, 2013).

As the field has evolved, categories have been identified that allow for data collection and sharing of best practices of similar teaching methodologies. These strands developed on independent paths, and include full-time online programs/schools; programs that provide supplemental online courses; and schools implementing a wide variety of blended learning models in individual classrooms, across grade levels, or school-wide. This chapter profiles policy and program activity nationwide in these different categories, which are defined in Figure 1 (iNACOL, 2011).

Supplemental online courses

Supplemental online programs provide a small number of courses to students who are enrolled in a school separate from the online program. Some states call these programs part-time programs.

The first statewide supplemental online programs were state virtual schools, which sought to level the playing field for all students statewide by making robust course catalogs available to all students, not just to those in larger urban and suburban schools. The first state virtual schools were groundbreaking, opening the door for dozens of states to offer similar opportunities to their students over the last 20 years:

- Utah Electronic High School began serving students in 1994.

Figure 1: Definitions

Definitions

Blended learning

Is defined by the Clayton Christensen Institute as a formal education program in which a student learns at least in part through online learning, with some element of student control over time, place, path, and/or pace; at least in part in a supervised brick-and-mortar location away from home; and the modalities along each student's learning path within a course or subject are connected to provide an integrated learning experience.

These modalities could include small group instruction, online learning, individual instruction, group projects, and pencil and paper assignments.

Online learning

Delivers instruction and content primarily over the Internet. Used interchangeably with Virtual learning, Cyber learning, e-learning. Students can participate in online learning through one course (supplemental), or a fully online school or program.

Supplemental programs

Provide a small number of courses to students who are enrolled in a school separate from the online program. Sometimes referred to as part-time.

Digital learning

Is an umbrella term that may include any or all of these options.

- Hawaii Department of Education e-School formed in 1996.
- Florida Virtual School (FLVS) began serving students with supplemental courses in January 1998 and has served many hundreds of thousands of students (Clark, 2001).

Other programs followed closely on the heels of these early adopters. Michigan Virtual School was funded by the Michigan Legislature in 2000 to be operated by the Michigan Virtual University, a private, nonprofit corporation; it has grown to become one of the largest state virtual schools in the country, serving 20,812 course enrollments in school year 2012-13. The Illinois Virtual School has been serving students since 2001, originally focusing on high school courses, but expanding in recent years to include middle school courses and professional development. The Idaho Digital Learning Academy was created by the state legislature in 2002, and has served over 65,000 course enrollments since its inception. Georgia, Kentucky, North Carolina, and Arkansas are among the other states that made supplemental courses available to students statewide with some of the first state virtual schools.

At their peak, state virtual schools were operating in 31 states, and served 450,000 total course enrollments (defined in supplemental programs as one student taking one supplemental online course) in school year 2009-10. Since then, a few state virtual schools have closed, and 27 programs served 740,000 total course enrollments in school year 2012-13. While total enrollments nationwide have continued to grow year after year, not all of these schools are able to serve students in their states equally, resulting in steady growth in some programs, and enrollments staying steady or even shrinking in other states.

There are two likely causes for this shift. First, in most states individual districts, consortia, and private providers have grown to play an increasingly larger role in providing supplemental online courses to students. Second, in many states the state virtual school has been underfunded or defunded in recent years, resulting in inadequate funding to meet demand, which is having a significant impact on students in those states.

The group of state virtual schools with enrollments that are relatively large based on their size relative to the state student population, and are growing year over year, are operating in about a dozen states as of school year 2013-14. These schools are either funded based on a formula that taps into the public education funding formula (e.g., FLVS and North Carolina Virtual Public School), or are well-funded via state appropriations relative to the size of the state (e.g., Alabama ACCESS, Idaho Digital Learning) so that districts pay little or nothing for their students to take an online course.

FLVS remains by far the largest state virtual school, growing from 10,000 course completions in school year 2000-01 to 410,962 completions in school year 2013-14. The growth of FLVS reflects a straightforward set of policy and funding choices: FLVS was first supported with state appropriations totaling more than $20 million in the late 1990s and early 2000s; subsequently Florida passed a law that allows any student in Florida to choose an FLVS course, and that student's funding follows the student to pay for the FLVS course.

The other group is the state virtual schools that are small or shrinking, have been created relatively recently (e.g., Vermont), have not grown over time (e.g., Colorado, Hawaii), or have dropped in size in recent years due to funding cuts (e.g., Iowa, Missouri). Most of the small state virtual schools have not received annual appropriations of more than a few hundred thousand dollars, and sell courses to districts at rates similar to the fees charged by private providers. This list includes Texas, which served 22,910 course enrollments in school year 2011-12, after which it saw a significant drop in funding, and its enrollments dropped 76%.

In addition, in recent years states are beginning to shut down state virtual schools. Kentucky Virtual School, one of the oldest state virtual schools but one that never grew much, closed in 2012. The Kentucky Department of Education is focusing its efforts on supporting schools involved in online learning, and linking students and families to existing programs around the state. In Tennessee, the state virtual school, e4TN, had been funded via Enhancing Education through Technology grant money, and with the loss of the funds it closed prior to school year 2011-12. Connecticut closed its state virtual school at the end of school year 2012-13 due to funding challenges and lack of enrollments. Louisiana redirected its state funds from the state virtual school, Louisiana Virtual School, to a new state program beginning in school year 2013-14.

This leaves the door open for different types of providers to serve students with supplemental online courses. Another way states are offering supplemental options to students statewide is through state-supported course choice programs, which are designed to allow students to choose the course and provider that best meets their needs. A course choice program is one in which:

- students can choose to take a course from one of multiple providers,
- a district cannot deny a student's request to enroll in an out-of-district course, and
- funding follows the student at the course level.

There are seven states that have course choice programs in school year 2013-14 (Arizona, Florida, Georgia, Louisiana, Michigan, Minnesota, and Utah), although some of these operate with some restrictions. Most of these programs are still in their infancy, and are achieving the goal of giving students choice in their course providers with mixed success. The programs in Florida and Utah are the most frequently discussed as they are the two states that have passed laws giving students choice of providers and allowing funding to follow the student at the course level. These two programs fit the full definition of course choice in which students are meant to have significant control over their online course options.

The remaining programs have restrictions in place that stretch along a continuum that may include available grade levels, number of funded courses, whether the course is core or elective, whether multiple providers are authorized, and the funding method. In other programs, districts have a variety of reasons in policy that they can deny students their online course preferences. Some of these are related to funding or educational goals (e.g., students can't retake a course that they already passed, students can't take an out-of-district course if the district offers that course, or students can take online courses only if the courses are consistent with the students' educational plans), but they may be used to restrict options when students do not have a course of appeals if their online course choice is denied.

The states with course choice programs have reported relatively low numbers in these programs through school year 2012-13 and into school year 2013-14. Utah's course choice program served 1,279 course enrollments (one student enrolled in one semester-long course) in school year 2012-13, its second year of operation. In contrast, Utah's state virtual school, the Electronic High School, served 10,308 course enrollments in the same period. One theory behind the low enrollments in the course choice program is that many districts create online programs in response to the legislation, whether because the framework is in place to partner with providers or in an effort to serve out-of-district students, but in the end providing their own students with more options.

Florida's course choice program operates in conjunction with FLVS. It was the first state in the country to legislate that all K-12 students will have full- and part-time virtual options. All districts may use FLVS as an option, and many choose to create their own programs, join a consortium, or partner with neighboring districts to make more options available. Over 425,000 supplemental online course enrollments were served in Florida in school year 2013-14, including 410,962 at FLVS.

Louisiana has shifted its state resources from Louisiana Virtual School (LVS), the state virtual school that operated since school year 2000-01, to the state's new Course Choice program. LVS served 14,000 course enrollments at its peak in school year 2009-10; it then added a per student course fee and its enrollments decreased to 6,414 in school year 2012-13. The school is closed as of school year 2013-14, and all students are directed to 45 authorized course choice providers. As of September 2013, Course Choice funding has been secured for 3,500 course enrollments, and future funding is undetermined.

Full-time online schools

Full-time online schools, also called cyberschools, work with students who are enrolled primarily (often only) in the online school. Cyberschools typically are responsible for their students' scores on state assessments as required by No Child Left Behind, which is the primary way in which student outcomes, and school performance, are measured. In full-time online schools, students enroll and earn credit and diplomas issued by the online school.

Online schools typically have served students full-time from across multiple districts and often an entire state. Historically these schools were primarily charter schools, however, there has been a rise in the number of districts offering full-time online programs only to students within their district, and to district programs authorized to serve out-of-district students (also called multi-district online programs). These programs can issue a diploma from that district. States differ on whether or not these schools are allowed to serve out-of-district students, whether it must seek specific authorization to serve students entirely online, and whether it must report online enrollments to the state department of education. As a result, the amount of information available about full-time online schools varies widely, although it is improving.

Full-time online schools are responsible for all requirements determined by No Child Left Behind, including state assessments. Test administration can be a complex task, especially for programs serving most or all of an entire state. This challenge is exacerbated by the need for students to travel to testing sites during the customary testing dates set by the state, leaving the best-laid testing plans vulnerable to early spring snowstorms and other weather challenges.

While Pennsylvania wasn't the first state to allow full-time online schools, it was the first to see rapid growth in both the number of schools and students. Cyber charters have dominated K-12 online options in Pennsylvania since SusQ-Cyber Charter School first opened in 1998. Pennsylvania law requires that the home district of a student forward per-pupil funding allotments to the student's school of choice, creating tension between home districts and cyber charters. In response, districts have been opening their own cyber academies in order to keep students—and their per pupil funding—in the district. While legislation has been proposed many times over the years to remedy this situation, it has yet to change. As of school year 2012-13, Pennsylvania serves one of the largest numbers of fully online students of any state in the country with 34,694 students enrolled. Pennsylvania Cyber Charter School, with 10,434 students, is one of the largest online schools in the country; it graduated 1,500 students in 2013.

Colorado's current online learning policy framework dates to December 2006 when the Office of the State Auditor released an audit reviewing full-time online programs and the performance of the Colorado Department of Education (CDE) in overseeing online programs (Colorado Legislative Audit Committee, 2006). The Trujillo Commission, formed in response to the audit, and a task force formed by the State Board of Education, suggested recommendations for legislators, and expressed concerns about the lack of oversight of full-time online programs (Donnell-Kay Foundation, 2007). In response, the legislature passed SB215 in May 2007, which made numerous changes to online education regulations. The bill made many changes to online programs, the most significant of which was creating a distinction between multi-district online programs and single-district programs; while both types of programs must submit an annual report to the CDE, the multi-district online programs are subject to greater oversight because the authorizers of multi-district programs must be state certified as demonstrating capacity to run an online program.

As the number of states that allow full-time online schools continues to grow, so do the restrictions placed on those schools. These may include restrictions on the total number of schools, students, or out-of-district students who may be served. In 2010, for example, Michigan and Massachusetts both created their first full-time online schools, although with restrictions in each case. Michigan began with limited enrollments in two statewide schools. A state board of education ruling in Massachusetts requires online schools to enroll 25% of the students from within the district creating the school, but allowing for the possibility of a waiver to the 25% requirement. Online schools are also capped at 500 students.

Total enrollment in multi-district fully online schools continues to grow nationwide, although that pace has slowed in recent years. In school year 2012-13, 30 states served an estimated 310,000 students in fully online schools. Some states, including Michigan, Wisconsin, and Indiana, have all lifted various caps recently, allowing for easier student access and significant increases in student enrollment. However, in states where a fully online option has been readily available to students, the pace of growth tends to be slower, maxing out at less than 3% of a state's K-12 student population. This is the case in states like Colorado, Kansas, Ohio, and Pennsylvania, which all saw their statewide enrollments grow by less than 10% from school year 2011-12 to school year 2012-13.

District-led programs

While state virtual schools and online charter schools were responsible for most online learning activity in the early years, some traditional school districts began offering online options to their own students in the late 1990s, and the trend grew and accelerated throughout the first decade of the new millennium. This has been driven by a variety of factors:

- The increased acceptance of online learning, and the effectiveness demonstrated by early online programs;
- Perceived or real competition from state virtual schools and online charter schools;
- The increase in available content, software, and professional development, which allows more districts to start and grow their own online schools by mixing and matching elements that they outsource and develop in-house; and
- A recognition that blended learning can be a transformative factor that personalizes learning for students.

District online and blended programs—those that are created by a school district, entirely or primarily for that district's students—are growing quickly in response to student demand for flexibility and individualization. The numbers of programs and students, however, are not well known. In other categories of programs, data are generally more available because either 1) the schools are public schools that report data to the state and are identified as online (e.g., fully online charter schools); or 2) the number of programs is limited so they are able to be counted (e.g., state virtual schools and large consortium or district programs). Neither of these is true of most district programs. Most states do not require single-district programs to report online or blended learning enrollments any differently than they would report traditional classroom enrollments.

While there is a broad range of online offerings at the district level, most single-district programs share the following attributes (Watson, 2011):

- Often combine fully online and face-to-face components in blended courses or programs.

- Are mostly supplemental, with a growing number serving full-time online students. However, the distinction is blurred in a single-district program because while the students are full-time, they are likely to be mixing online and face-to-face classes.
- Often begin by serving credit recovery or at-risk students.
- Are funded primarily by the district out of public funds intermingled between the online program and the rest of the district. In most cases, there is no difference in funding between online students and students in the physical setting.
- Grade levels are primarily high school, with some middle school. A very small number of districts are beginning to create online and blended options for elementary students.

In recent years the understanding of district programs has partially improved, although the picture remains murky. A series of recent studies are giving shape to the field, including reports released by the National Center for Education Statistics (NCES) in 2011 (Queen and Lewis, 2011), the California Learning Resource Network (CLRN) in 2012 and 2013 (Bridges, et al, 2012 and 2013), the Southern Regional Education Board (SREB) in 2012 (Lynde, 2012), and the Evergreen Education Group for rural Colorado in 2012 (Watson and Murin, 2012). Taken together these reports paint a picture of a quickly growing field of options for many students across the country. Based on those numbers, *Keeping Pace 2012* stated that: "The total number of students taking part in [online and blended learning] is…likely several million, or slightly more than 5% of the total K-12 student population across the United States." It is likely that number has continued to grow steadily, although not explosively, and that most of the students and most of the growth is in single-district programs.

While as many as perhaps 75% of districts around the country are making some options available to students, it is apparent that in most cases districts have only a small percentage of students taking advantage of these online and blended opportunities, and many of those are in one category (e.g., recovering credit, taking online Advanced Placement® or dual credit courses). Most of these districts are using a single provider for their online courses, which may be a state virtual school or a private provider furnishing course content, the learning management system, and perhaps the teacher. Often one or more schools in the district have a learning lab with computers where students access the courses. Districts that are implementing blended schools may not be using fully online courses, but instead may be using a digital courseware provider that is focused on developing skills, usually in mathematics or reading/writing.

At the other end of the spectrum are the relatively few districts offering a comprehensive set of online and blended courses to a significant percentage of the district's students; this is likely fewer than 10% of all districts in the country. These districts are typically relatively large, and some are filling in a gap in states that do not have state virtual schools; a few notable comprehensive district programs are noted below.

- Nashville supports supplemental online classes and a fully online program through its MNPS (Metro Nashville Public School) Virtual School. Students can choose from a comprehensive course catalog of core, elective, and Advanced Placement® courses. All courses are taught by local teachers.
- Clark County School District Virtual High School (which includes Las Vegas, Nevada) launched in fall 2004. It served 28,391 supplemental course enrollments in school year 2012-13, an annual increase of 184%, as well as approximately 180 fully online students, an increase of 21% over the previous year. The enrollment total included 6,349 course enrollments in summer 2013, an increase of 32%. The majority of its enrollments are in-district students, although it does serve some out-of-district students.
- Riverside Virtual School (California) launched with a pilot program in fall 2006, followed by a full school program in 2007. The school now serves full-time student in grades 3–12 and offers supplemental courses to concurrently enrolled students in grades 6–12. It offers comprehensive online and blended learning programs to Riverside Unified School District (RUSD) students as well as out-of-district students. It served 1,803 course enrollments for full-time students, a 4% annual increase, and 3,396 supplemental course enrollments, a 15% annual increase, for a total of 5,199 course enrollments during school year 2012-13. RUSD is one of the few districts in the country that tracks blended learning enrollments, and served 22,700 students in school year 2012-13, an increase of 27%.

These are just a few examples of districts with comprehensive online offerings for students, including a fully online option, often for students who are hospitalized, homebound, or who are unable to attend physical schools for some other reason.

Blended learning and fully blended schools

Blended learning evolved from face-to-face classrooms seeking to provide students with flexibility and increase individualization, and fully online schools that recognized the need to provide some students with face-to-face support. In some cases it was a slow evolution with its roots in educational technology, while in others it has been a dramatic shift from entirely online or entirely face-to-face classrooms. The Clayton Christensen Institute for Disruptive Innovation (formerly known as the Innosight Institute) defines blended learning as, "a formal education program in which a student learns at least in part through online learning, with some element of student control over time, place, path, and/or pace; at least in part in a supervised brick-and-mortar location away from home; and the modalities along each student's learning path within a course or subject are connected to provide an integrated learning experience" (2013).

The Christensen Institute's May 2013 report—*Is K-12 Blended Learning Disruptive?*—looks at whether blended learning, as conceived and implemented in many schools, will be transformative, meaning will it produce significant improvements in student outcomes. The Christensen Institute provides a valuable theoretical grounding to this question.

> [Some] industries experience a hybrid stage when they are in the middle of a disruptive transformation. A hybrid is a combination of the new, disruptive technology with the old technology and represents a sustaining innovation relative to the old technology… The models of blended learning that follow the hybrid pattern are on a sustaining trajectory relative to the traditional classroom. They are poised to build upon and offer sustaining enhancements to the factory-based classroom system, but not disrupt it.

Within the definition of blended learning are included fully blended schools, which are defined by *Keeping Pace 2013* as stand-alone schools with a school code (as opposed to programs within a school) that deliver much of their curriculum in a blended format, and that require students to show up at a physical site for more than just state assessments.

Fully blended schools have an element of student control over time/pace/path/place that, in one or more ways, changes the instructional model away from one-to-many (teacher-to-students) instruction and toward a personalized, data-driven approach. Some of these schools have eliminated traditional bell schedules and allow students to attend the physical school for fewer hours or at non-conventional times, while other schools follow a fairly customary schedule. Fully blended schools are often charter schools, although they may be non-charter district schools that take a whole-school blended approach to instruction. Charter or innovation status allows schools to meet student needs with more flexibility than in a traditional school, which is particularly important when students have some control over when they come to school.

This definition does not include credit-recovery and alternative education programs within an existing brick-and-mortar school, as such data are typically not disaggregated from the larger traditional school, although they are often critical options for students. This definition also does not include schools that have blended curriculum for a department, such as the math department, or a grade level, such as all freshmen. Thousands of these examples exist around the country and are collectively serving millions of students (see the Single-District Programs discussion), but the blended experience may only occur in a fraction of the school's instructional time. Fully blended schools are an essential category for tracking, however, because they are at the vanguard of education innovation.

Data for the blended schools category as a whole are not readily available, because such schools are typically not recognized as a group in state reporting. However, Keeping Pace identified an estimated 75 fully blended schools in 24 states and Washington, D.C., in school year 2013-14. As this is a first effort to count these schools as a category, it is likely an underestimate.

Many fully blended schools across the country are charter schools started by education management organizations or charter management organizations. Most of the largest online education management organizations, including Connections Education and K12 Inc., have expanded their offerings to include blended schools. Other schools are associated with charter management organizations that were begun as blended learning organizations and are beginning to expand outside of their original geographic areas. These include Rocketship Education, which operates eight schools in California, opened the first of what is expected to be eight schools in Milwaukee in fall 2013, and has been approved to open schools in Nashville in 2014, and Aspire Public Schools, which operates 34 schools in California and opened its first two schools in Memphis in fall 2013.

Key policy issues

Online course requirements

Some states have begun to require students to complete an online course in order to graduate from high school. As of September 2013, four states require students to complete an online course to graduate:

- Alabama's began with students entering 9th grade in school year 2009-10.
- Florida's began with students entering 9th grade in school year 2011-12.
- Michigan's began with students entering 8th grade in 2006, making it the first such requirement in the country.
- Virginia's is the most recent, and launched with students entering 9th grade in school year 2013-14.

Two more states, North Carolina and Arkansas, are in the process of implementing such a requirement. The State Board of Education in North Carolina has passed a requirement that is expected to be implemented in school year 2014-15. Arkansas is piloting its requirement with a handful of districts and charter schools in school year 2013-14 to allow the state to learn implementation lessons before the requirement expands statewide in school year 2014-15.

Other states, including Georgia, New Mexico, Massachusetts, and West Virginia, have passed rules or legislation encouraging but not requiring online learning.

Student achievement

Educators and policymakers often ask the same question about any technology integrated in teaching and learning: does this technology work? This question is important because it validates the effort and costs of implementing the technology; K-12 online and blended learning follows this historical trend. Researchers have been interested in determining whether students can learn online or how instructors teach in such an environment.

Research from K-12 online and blended courses and schools have provided over a decade's worth of evidence to suggest that teaching and learning online can work. Studies that have shown positive outcomes include the 2009 U.S. Department of Education meta-analysis (Means, 2009) (which included a large proportion of studies looking at post-secondary students) and the meta-analysis done by NCREL in 2004 (Cavanaugh et al.). In addition, data from and studies of specific schools have shown positive outcomes. For example, Florida Virtual School received a positive review of its performance by the Florida TaxWatch Center in 2008. The rating was based on extensive research into student achievement, demographics, AP scores, and enrollment information. Virtual High School (VHS) reports that, for the 7th consecutive year, the organization's scores outpaced the national average of 59% as reported by the College Board. On average, 70.7% of students taking a VHS AP® course earned a passing score of 3 or higher on their AP exam, an 8% increase over the 2011 numbers. In addition, more than 50% of their students scored a 4 or 5.

However, just because online learning can work does not mean online learning *will* work. As with traditional brick-and-mortar education, there are many high-quality schools, and many that fall short. Many online teachers are well-trained, while others are not. Many online courses are steeped in current pedagogy, while others are not. Determining which courses, schools, and instructional models are creating positive outcomes remains a challenge for all educators and policymakers, but particularly for online providers because they can attract students from across entire states and therefore have the potential to work at a larger scale than most physical schools.

This finding is not unique to K-12 online and blended learning. Researchers studying educational technologies ranging from educational radio and television (Salomon and Gardner, 1986) to asynchronous online environments (Swan, 2003), have all found evidence of relevant studies that have shown both positive and negative outcomes. Researchers often refer to this as no significant difference. In some cases, the studies might essentially be comparing apples and oranges; in other cases, there are both good and bad examples of the actual implementation. Therefore, the challenge accepted by many researchers is to change the question from "does online work?" to "under what conditions does online learning work?" (Ferdig, 2010). Some of the studies and findings in this category are noted in Table 1. Additional research on online and blended learning can be found at the Research Clearinghouse for K-12 Blended and Online Learning (http://k12onlineresearch.org), managed by Michigan Virtual University and the International Association for K-12 Online Learning (iNACOL).

Table 1: Online learning research

Finding	Citation
K-12 online learning can act as a successful path for graduation of students who were expelled or who had dropped out.	Ferdig, R.E. (2010). *Understanding the role and applicability of K-12 online learning to support student dropout recovery efforts.* Lansing, MI: Michigan Virtual University.
K-12 online instructors practice skills that are: a) similar to those practiced by K-12 face-to face instructors; and b) similar to those practiced by post-secondary online instructors; but c) also practice skillsets that are unique to teaching and learning online at the K-12 level.	DiPietro, M., Ferdig, R. E., Black, E.W. & Preston, M. (2008). *Best practices in teaching K-12 online: Lessons learned from Michigan Virtual School teachers.* Journal of Interactive Online Learning, 7(1), 10-35.
Many K-12 online and blended schools/programs are woefully unprepared for the collection and analyses of data that is required to truly inform and transform practice.	Ferdig, R.E. & Cavanaugh, C. (Eds.) (2011). *Lessons learned from virtual schools: Experiences and recommendations from the field.* Vienna, VA: International Association for K-12 Online Learning.
Professional development (PD) for K-12 online instructors has shown promise when instruction is not just focused on pedagogical content knowledge, but also on building a community of learners who can examine their practice in process.	Ferdig, R.E. (2010). *Continuous quality improvement through professional development for online K-12 instructors.* Lansing, MI: Michigan Virtual University.

Funding

Online schools and programs are funded in a variety of ways. Some are linked to the funding for physical schools and some are not. Funding methods include:

- Appropriation, which is often used for state virtual schools.
- Standard average daily attendance (ADA) or average daily membership (ADM), which is often used by district programs.
- Online student funding, which sets a funding level or calculation for fully online schools.
- Charter school funding, which sets a funding level or calculation for all charter schools, including online charter schools.
- Independent study or other alternative programs, whose funding levels and calculation methods vary by state.

Course-level funding, especially funding that follows the student, is relatively new. It is a subset of ADM/ADA funding, with the funding going to the course provider instead of to the student's enrolling district.

A further subset of funding, most often applied at the course level, is performance-based funding. Several states have begun funding individual online courses partly based on demonstrated student success. In Utah, the provider receives 50% (25% per .5 credit) after the withdrawal period and the remaining 50% upon credit earned. In Louisiana, online course providers will receive 50% upon the student's beginning of the course and 50% upon successful completion. In Texas, state funding to the home district for courses taken through the Texas Virtual School Network (TxVSN) is based on a student's successful completion; in addition, 70% of the payment by the student's home district to the TxVSN provider is earned for students in the course after the withdrawal period, with the remaining 30% earned upon student's successful completion and credit earned. Florida is going a step further: funding for courses with end-of-course exams will be performance-based for both brick-and-mortar and virtual schools beginning in their fourth year of implementation; the first course will be Algebra 1 in 2016-17.

Conclusion

K-12 online and blended learning continue to evolve in new directions. While now familiar segments of the field, such as online charter schools and state virtual schools, have continued to grow, relatively new forms such as consortium programs and single-district programs are expanding even more rapidly, as is the range of private providers competing to work with districts. As of early 2014, online and blended learning opportunities exist for at least some students in all 50 states plus the District of Columbia, but only Florida and Minnesota have a full suite of full-time and supplemental options for students at all grade levels. Key highlights and trends of K-12 online and blended learning as of 2014 include:

Single district programs are the fastest growing segment of online and blended learning.
Growth within single district programs—run by one district for that district's students—is outpacing all other segments. Several years ago, state-level and statewide schools and programs were driving most online learning activity. That is no longer the case; now the bulk of activity is at the district level. A second important area of growth is among consortium programs, as districts choose to combine resources to create cost-effective online opportunities.

Most district programs are blended, instead of fully online.
A corollary to the growth of district online programs is that many of these options blend online and face-to-face learning, instead of being entirely online as many state-level schools were. One reason is simple: Districts are often serving their own students, who are local, so there is limited need to bridge large distances. Even when the district is providing an online course with a remote teacher, the local school often provides a computer lab, facilitator, or other on-site resources that may define the course as blended instead of fully online. Many of the schools that have received significant media attention fall into this category.

Intermediate units, BOCES, county offices, and other education service agencies are taking on important roles.
States have less funding available to develop state virtual schools and other state-level efforts, but many districts recognize that creating online schools requires high investment and expertise, more than small districts can provide. In states as diverse as New York, Wisconsin, Colorado, and California, educational service agencies are forming consortia to help districts gain expertise and provide economies of scale. This follows a similar pattern for dissemination of education technology since the 1980s.

Full-time, multi-district online schools continue to grow.
Even as district programs grow, multi-district schools continue to flourish as well. There were 30 states with full-time, multi-district schools that enrolled an estimated total of 310,000 students in school year 2012-13, an annual increase of 13%. Indiana, Maine, Massachusetts, and Michigan are among the states that have, in the last few years, changed their laws to allow full-time online schools for the first time, or to allow significant growth in them.

State virtual schools are dividing into two tiers—those with significant impact and those without— largely based on funding model.
While 27 states have a state virtual school, these programs are increasingly falling into two divergent categories: those that are sustainably funded at a level to have a real impact on their states, and those that do not have a level of reliable support. States in the former category include Florida, North Carolina, Michigan, Montana, Idaho, and Alabama. Other state programs are in decline, mostly due to funding cuts. These include programs in Colorado, Connecticut, and Iowa. Nonetheless, all state virtual schools together accounted for 740,000 course enrollments (one student taking one semester-long course) in school year 2012-13, an annual increase of 19%. The largest 10 state virtual schools served 92% of the total enrollments served by state virtual schools in school year 2012-13; FLVS served about 55% of the enrollments served by all state virtual schools.

The Common Core State Standards are taking hold, common assessments are next, and open educational resources are an increasingly important element.
The move toward the Common Core means that providers are able to create content for use across dozens of states and by millions of students. That is helping push online and blended learning, and the trend will accelerate as the common assessment consortiums progress. Open educational resources, from sources including Khan Academy and the NROC Project, are helping districts add a digital component without investing in developing or acquiring content.

The provider landscape is changing rapidly.
Both new start-ups and consolidations are affecting the market landscape. In recent years, K12 Inc. acquired Advanced Academics, and Pearson Education acquired Connections Education. New providers such as Education Elements, a start-up focused on blended learning, continue to enter the field. Providers are increasingly offering services that combine elements of content, technology, instruction, and other services.

Special student needs gain new focus.
The release of a Request for Proposal in mid-2011 by the U.S. Department of Education Office of Special Education Programs (OSEP), for the establishment of a Center on Online Learning and Students with Disabilities, suggests that the federal government believes that online learning can serve all students. In general, there is a newly sophisticated emphasis on meeting special student needs in online and blended learning.

Suggestions for future research
As discussed above, a long history of research exists showing that online learning can work, but that whether it *will* work depends on implementation conditions. The most valuable research therefore will be in determining the conditions that produce successful outcomes. As more online programs are created and grow, and as state data collection increasingly includes markers for online courses and schools, much of this research can be done by mining existing data. Although there will always be a role for large-scale longitudinal assessments of what works under various specific conditions, research funders should put more emphasis on reviewing outcomes from online schools and courses, and determining what factors from within those schools appear to correlate with student success based on existing data.

References

ACT. (2013). *The Reality of College Readiness.* Retrieved from http://www.act.org/readinessreality/13/pdf/Reality-of-College-Readiness-2013.pdf.

Battelle for Kids. (2011). *Selecting Growth Measures: A Guide for Education Leaders*. Retrieved from http://www.edgrowthmeasures.org/documents/Selecting_Growth_Measures_Guide.pdf.

Bridges, B. (2013). *California eLearning Census: Between the Tipping Point and Critical Mass.* Retrieved from http://www.clrn.org/census/eLearning_Census_Report_2013.pdf.

Cavanaugh, C. S., Gillan, K. J., Kromrey, J., Hess, M., & Blomeyer, R. (2004). *The Effects of Distance Education on K-12 Student Outcomes: A Meta-Analysis.* Retrieved from http://faculty.education.ufl.edu/cathycavanaugh/docs/EffectsDLonK-12Students1.pdf.

Christensen, C., Horn, M., Staker, H. (2013) *Is K-12 Blended Learning Disruptive?* Retrieved from http://www.christenseninstitute.org/wp-content/uploads/2013/05/Is-K-12-Blended-Learning-Disruptive.pdf.

Clark, T. (October 2001). *Virtual Schools: Trends and Issues.* Retrieved from http://www.wested.org/online_pubs/virtualschools.pdf.

Colorado Legislative Audit Committee. (November 2006). *Report of the State Auditor: Online*

Education Department of Education. Retrieved from http://www.leg.state.co.us/OSA/coauditor1.nsf/All/6D2762978BB1D6DF8725723E005ED7D4/$FILE/1768%20Online%20Ed%20Perf%20rel%20Dec%202006.pdf.

Donnell-Kay Foundation. (2007). *Trujillo Commission on Final Findings and Recommendations.* Retrieved from http://www.dkfoundation.org/trujillo-commission-online-education-final-report-2007

Ferdig, R.E. (August 2010). *Continuous quality improvement through professional development for online K-12 instructors.* Keynote presentation at Michigan Virtual University's fifth annual Collaboration of the Minds conference. East Lansing, MI.

FloridaTaxWatch. (2008). *Final Report: A Comprehensive Report of Florida Virtual School.* Retrieved from http://www.flvs.net/areas/our_commitment/Documents/TaxWatch%20Study.pdf.

Florida Virtual School. (2013). Florida Virtual School® *2013–14: The Nation's Premier Online Public School.* Retrieved from https://www.flvs.net/areas/contactus/Documents/Florida_Virtual_School_Summary.pdf.

International Association for K-12 Online Learning. (2011). The Online Learning Definitions Project. Retrieved from http://www.inacol.org/cms/wp/content/uploads/2013/04/iNACOL_DefinitionsProject.pdf.

Lynde, H. (2012) *Increasing Online Learning Options for K-12 Students: The Role of School Districts.* Retrieved from http://publications.sreb.org/2012/12T01_Inc_Online.pdf.

Means, B., Toyama, Y., Murphy, R., Bakia, M., & Jones, K. (2009). *Evaluation of evidence-based practices in online learning: A meta-analysis and review of online learning studies.* Retrieved from http://www.ed.gov/rschstat/eval/tech/evidence-based-practices/finalreport.pdf.

Patrick, S., Edwards, D., Wicks, M., and Watson, J. (2012) *Measuring Quality from Inputs to Outcomes: Creating Student Learning Performance Metrics and Quality Assurance for Online Schools.* Retrieved from http://www.inacol.org/cms/wp-content/uploads/2012/11/iNACOL_Quality_Metrics.pdf.

Queen, B., and Lewis, L. (2011). *Distance Education Courses for Public Elementary and Secondary School Students: 2009–10.* Retrieved from http://nces.ed.gov/pubsearch/pubsinfo.asp?pubid=2012008.

Salomon G. & Gardner, H. (1986). *The computer as educator: Lessons from television research. Educational Researcher,* 15 (1), 13-19.

Schwirzke, K., Rouse, T., and Bridges, B. (2012). *California eLearning Census: Trending Past the Tipping Point.* Retrieved from http://www.clrn.org/census/eLearning_Census_Report.pdf.

Swan, K. (2003). *Learning effectiveness: what the research tells us. In J. Bourne & J. C. Moore; Elements of Quality Online Education, Practice and Direction.* Needham, MA: Sloan Center for Online Education, 13-45.

Watson, J., and Murin, A., (2012). *Blended Learning in Rural Colorado: Status and Strategies for Expansion*. Retrieved from http://www.cde.state.co.us/sites/default/files/documents/onlinelearning/download/ruralblendedlearning_evergreen.pdf.

Watson, J., Murin, A., Vashaw, L., Gemin, R., Rapp, C. (2011). *Keeping Pace with K-12 Online and Blended Learning: A Guide to Policy and Practice.* Retrieved from http://kpk12.com/reports/.

Watson, J., Murin, A., Vashaw, L., Gemin, R., Rapp, C. (2013). *Keeping Pace with K-12 Online and Blended Learning: A Guide to Policy and Practice.* Retrieved from http://kpk12.com/reports/.

Chapter 2

A History of International K-12 Online and Blended Instruction

Michael K. Barbour, *Sacred Heart University, mkbarbour@gmail.com*

Abstract

Many involved with the practice or study of K-12 online and blended learning are familiar with the American context. It surrounds us in the media and published research. However, online and blended learning is occurring in meaningful ways to address specific K-12 student needs all around the globe. There are several areas where the international practice is consistent with what we know about the United States (e.g., similar evolutions, early initiatives were government-funded, many of the labels are similar). At the same time, there are some key differences internationally (e.g., the prevalence of legacy forms of distance education, a lack of online learning below the secondary level, and blended learning being seen as a form of technology integration). While far less is known about K-12 online and blended learning in international contexts, programs in these jurisdictions are just as keen to tell their own success stories and undertake cyclic research to improve the design, delivery and facilitation of their programs.

Introduction

Many of us who have been involved in K-12 online and blended learning, both practitioners and researchers, are familiar with the development of the field within the United States. We have all read the history outlining the growth of the field. The first online private school in the United States began in 1991 (Laurel Springs School, 2011). The first full-time online public schools began around 1994 in California (Darrow, 2010), which was about the same time that Utah's Electronic High School began transitioning from exclusive correspondence offerings to some supplemental online courses (Clark, 2003). As Watson and Murin describe in the previous chapter, in 1996-97 several key state- and federally-funded initiatives began (e.g., Florida Virtual School and Virtual High School respectively) – and many in the field often peg this as the real beginning of K-12 online and blended learning in the United States. The first estimate of the level of activity was in the 2000-01 school year, when Clark (2001) stated that there were between 40,000 and 50,000 K-12 students enrolled in at least one distance education course. A little more than a decade later, we talk about there being more than two million students from all fifty states involved in K-12 online and blended learning (Watson, Murin, Vashaw, Gemin, & Rapp, 2013). Within the American context, this is the history that we have become familiar with.

Unfortunately, many of us who are involved in the field cannot say we have the same level of familiarity of the history, development, and/or current status of K-12 online and blended learning outside of the United States. Those that do have some level of understanding of the international context have often been through the publications of the International Association of K-12 Online Learning (iNACOL) (see Barbour, Brown, Hasler Waters, Hoey, Hunt, Kennedy, Ounsworth, Powell, & Trimm, 2011; Barbour, Hasler Waters, & Hunt, 2011; Powell, & Patrick, 2006). This is not to suggest that these perceptions are inaccurate, only that they are based on a US-defined understanding.

Given the level of familiarity of the American context, it may be useful to leverage this knowledge in our discussion of the international context by examining how the history, development and current state of K-12 online and blended learning internationally is similar and different to the United States. In the following sections, I will discuss how the evolution, the use of government funding to instigate initiatives, and the descriptive labels are similar in both the international and American contexts. I will also discuss how internationally there is a reliance on legacy delivery models, an absence of free market advocates, a lack of proliferation beyond the secondary environment, and blended learning is seen as an effective information communications technologies (ICT) or e-learning is quite different.

Consistencies Between the International and American Contexts

There are three main areas of consistency between what most readers are familiar with in the United States and what occurs in the international context. First, the evolution of K-12 distance education from correspondence education to various media (e.g., radio, instructional television, telematics, videoconferencing, etc.) to online is quite consistent. Second, many of the early K-12 online learning programs in the United States were created through grants provided by the federal or individual state governments, which is consistent with the experience of K-12 distance education programs in many international jurisdictions. Third, terms such as supplemental and full-time, as well as district-based and state-wide (could be nation-wide or province-wide, depending on the international jurisdiction) are all consistently used to describe K-12 online and blended programs in both the United States and internationally.

Evolution Of Delivery Models

Clark (2013) provided one of the most detailed descriptions of the evolution of K-12 distance education in the United States. According to Clark, this evolution began with the use of print-based materials – also known as correspondence education – at the University of Nebraska-Lincoln. As Clark noted, this medium was a mainstay in K-12 distance education until the 1990s, with rural students who were otherwise unable to access these courses being the primary audience. Clark also described early initiatives using audio distance education (e.g., the Ohio School of the Air and the Wisconsin School of the Air), instructional television (e.g., Midwest Program on Airborne Television Instruction), and early computer-based (e.g., Plato III). This evolution of mediums is quite consistent in many other jurisdictions outside of the United States.

Correspondence education was the first form of K-12 distance education used in many international jurisdictions. For example, the first correspondence school in Canada was Elementary Correspondence School in British Columbia, which officially opened in 1919 with 86 students (Dunae, 2006). Thirteen of these students were the children of lighthouse keepers, and thus lived too remote to any other school that correspondence was the only education that could be provided to them. Similarly, The Correspondence School in New Zealand, now known as *Te Aho o Te Kura Pounamu,* began around 1922 to provide educational opportunities to those living in rural areas (Rumble, 1989). As within the American experience, correspondence education was the only educational opportunity that many of these students were able to avail themselves of (beyond homeschooling).

As other technologies became available, international jurisdictions also began to adopt these technologies for distance education. Following the introduction of correspondence education in Australia around 1922 (Stevens, 1994), K-12 distance education programs in Australia became extensive users of educational radio (Stacey & Visser, 2005). Moore and Kearsley (1996) indicated that the first School of the Air was established in Australia in 1948 on the Alice Springs Royal Flying Doctor Service base. In the 1980s, several rural jurisdictions in Australia began to experiment with telematics, also known as audiographics (Oliver & Reeves, 1994). Telematics makes use of an audio-conferencing telephone link, an interactive blackboard that is networked using computers, and facsimile to transmit print materials. The Canadian province of Newfoundland and Labrador were also heavy users of the telematics technology to deliver distance education. This program operated by the provincial government began in 1988-89 with a single course that enrolled 36 students from 13 rural schools (Brown, Sheppard & Stevens, 2000), grew it to eleven courses by1999–2000 that had 898 enrollments from 703 students representing 77 different rural schools.

In the late 1990s and early 2000s, there were several initiatives in New Zealand that began to explore the use of video-conferencing to provide distance education to students attending rural schools (Roberts, 2009; Treadwell, 2010; Wenmoth, 1996). Further, Barbour and Wenmoth (2013) described the evolution of correspondence and video-conferencing technologies to provide distance education in that country in the section entitled "Background and History of Primary and Secondary Distance Learning in New Zealand." Finally, there have been several articles that provide comprehensive discussions of the evolution of Canadian K-12 distance education in various jurisdictions from correspondence education, through to other mediums, concluding with the current online learning model (Haughey & Muirhead, 2004). For example, the development of K-12 distance education in the province of Newfoundland and Labrador (Barbour, 2005), and a more detailed accounting of a similar development in the province of British Columbia (Winkelmans, Anderson, & Barbour, 2010).

Use of Government Grants to Fund Initiatives

In their chapter, Watson and Murin described two early K-12 online learning initiatives that had been created using government grants (i.e., Virtual High School and Florida Virtual School). The Virtual High School was created using a five-year, $7.4 million Stars Initiative federal grant (Pape, Adams, & Ribeiro, 2005), while the Florida Virtual School was created through a Florida Department of Education allocation of $200,000 (Friend & Johnston, 2005). In fact, many of the early K-12 online learning programs in the United States were created through grants provided by the federal or individual state governments.

This is consistent with the experience of K-12 distance education programs in many international jurisdictions. For example, the *Te Aho o Te Kura Pounamu* – The Correspondence School in New Zealand (discussed in the previous section), was originally created and continues to receive significant funding from the national Government of New Zealand (Wenmoth, 2005). Further, the various regional e-learning clusters of the Virtual Learning Network (VLN) in New Zealand also make use of resources from the national government, such as the Ministry of Education's sponsored video-conferencing bridge system (Barbour, 2011a; Roberts, 2010; Wenmoth, 2011).

The Ministry of National Education in Turkey funded the creation of an open high school (Demiray & Adiyaman, 2002; Sakar & Ozturk, 2011). By the end of its first decade, the open high school had grown from serving approximately 45,000 students to over 1.3 million students. More recently, the government has funded a project to develop asynchronous online learning content, as well as equip schools with the necessary infrastructure to leverage that content (Barbour, Brown, et al., 2011). Further, Gedik and Goktas (2011) outlined the role of the Ministry of National Education, along with the Council of Higher Education (an agency of the national government), in the development of K-12 online and blended learning – including several individual programs to develop online content, teacher expertise, and technological infrastructure.

Similarly, one of the more extensive examples of an international government-funded K-12 online learning initiative is the Cyber Home Learning System in South Korea. Based upon a series of "Master Plans," the national government sponsored the creation of a program that provided K-12 students access to the entire primary school and secondary school curriculum, including content-based tutors (Bae, Han, Lee, & Lee, 2008; Song & Kim, 2009). According to the Korea Education and Research Information Service (2011), this government-funded initiative was serving more than four million students. The South Korean experience is actually quite consistent with the role of the national governments of many other Asian and European nations (Barbour, Brown, et al., 2011; Powell, & Patrick, 2006). There are many other examples that could be used (e.g., ScienceNet in Singapore [Hin & Subramanian, 2004], the Virtual Classroom Technology on EDUSAT for Rural Schools initiative in India [Centre for Civil Society, 2011], Ensino a Distância para a Itinerância in Portugal or Rīgas Tālmācibas Vidusskola in Latvia [Bacsich, Pepler, et al., 2012]), suffice to say that the use of external funding initiatives to initiate or expand K-12 online and blended programs in the United States and internationally.

Terms to Describe K-12 Online Learning

In their chapter, Watson and Murin define several terms used to describe the nature and medium of K-12 online and blended learning. These terms included supplemental online courses, full-time online schools, and district-led programs. Many of these same terms, as well as others that are commonly used in the United States, are also appropriate descriptors for K-12 online and blended learning programs internationally.

Supplemental online learning programs are ones where students were enrolled in a brick-and-mortar school, but took one or more courses from an online provider to supplement their face-to-face learning (Barbour, 2013a). On the other hand, full-time online programs are ones where the student was not enrolled in a brick-and-mortar school, but took all of their courses from an online provider. These two terms are quite applicable to the international context, although the majority of K-12 online and blended learning programs internationally are supplemental in nature. According to the *State of the Nation: K-12 Online Learning in Canada* reports, the majority of K-12 distance education programs in Canada are supplemental in nature (Barbour, 2013b). The same is true of programs in New Zealand (Roberts, 2010), South Korea (Cho, 2009; Jang, 2006), and most European nations (Bacsich, Bristow, Camilleri, de Beeck, Pepler, & Phillips, 2012; Bacsich, Pepler, Phillips, Öström, & Reynolds, 2012). This is not to suggest that there are no full-time online and blended learning programs outside of the United States. For example, there are some full-time K-12 distance education programs in Canada, primarily at the elementary level (Barbour, 2013b). There is also a full-time blended learning program, the Northern Beaches Christian School, in Australia (Harris, 2005, 2008).

In addition to the consistency in describing the nature of K-12 online and blended learning, there are also some similarities in the way in which the scope of the K-12 online and blended program is described. Watson, Gemin, Ryan, and Wicks (2009) described comprehensive reach and operational control as two of the dimensions for describing K-12 online learning programs. Variables such as district-level and local board controlled are typical of the vast majority of the K-12 distance education programs that exist in Canada (Barbour & Kennedy, 2014). Similarly, the geographic variable of state or, in the case of Canada, province is another accurate description. The geographic variable national is an accurate descriptor for many of the K-12 online programs in Asia (Barbour, Brown, et al., 2011). In addition to being geographic descriptions, these variables often describe the level of operational control.

One limitation of these American-based descriptors is in international jurisdictions where there are no states or provinces. For example, the vast majority of e-learning clusters in the VLN in New Zealand are regional in their primary focus, but these programs serve students from all over the country (Roberts, 2010). The same is true of many of the European K-12 online and blended learning programs – they are managed at a local or regional level, but often enroll students from anywhere in the nation (Bacsich, Pepler, et al., 2012). For example, IVIO@school and Wereldschool in the Netherlands are managed at the local level, but they serve students throughout the country and in Dutch colonies abroad, respectively. Another limitation of these terms is when the operational control and the geographic reach conflict (e.g., the Canadian provinces of Ontario and British Columbia both have programs that are largely managed by local school districts but enroll students from all over the province) (Barbour, 2013b).

Inconsistencies Between the International and American Contexts

There are four main areas of inconsistency between what most readers are familiar with in the United States and what occurs in the international context. First, in many international jurisdictions there is still a significant use of correspondence education, audio distance education, and video conferencing. Second, internationally the primary driver of K-12 online and blended learning are government forces, and corporations are largely contractors that provide content, learning technologies, and other services to these government-run programs. There are few, if any, proponents of the application of free market principles to public education through K-12 online and blended learning. Third, in most countries K-12 online and blended learning is primarily used at the secondary level. Even the use of K-12 distance education in general is largely focused on the secondary grades. Fourth, as corporations and free market proponents are largely absent, blended learning – and even online learning – is generally regarded as the next evolution of effective technology integration.

Continued Reliance Upon Legacy Delivery Models

While the evolution of K-12 distance education from correspondence education to audio, telematics, and video technologies to online learning was one of the similarities between the American experience and international jurisdictions, the continued reliance of many of these jurisdictions on these pre-cursor K-12 distance education technologies is one of the main differences with the international experience. Simply put, in many jurisdictions, there is still a significant use of correspondence education, audio distance education, and video conferencing.

New Zealand is one of the better examples of this reliance on legacy delivery models. While *Te Aho o Te Kura Pounamu* – The Correspondence School was first established in 1922, according to an article that appeared in the *Dominion Post* on March 19th, 2012, there were 14,000 students that were enrolled in one or more courses through this correspondence education model (included in materials provided to attendees of the 04 April 2012 Board of Trustees Meeting). Over the past two decades, there has been a significant development of regional e-learning clusters that utilized video-conferencing as the primary means of instructional delivery – such as CANTANet (Wenmoth, 1996), *Kaupapa Ara Whakawhiti Mätauranga* (Waiti, 2005), OtagoNet (Lai & Pratt, 2009; Pullar & Brennan, 2008), and FarNet (Barbour & Bennett, 2013; Bennett & Barbour, 2012; Rivers & Rivers, 2004; Stevens & Moffatt, 2003). However, even though there were approximately 20 of these regional clusters operating (Compton, Davis &

Mackey, 2009), by 2009 there were only 1401 student enrolments (Roberts, 2009). The vast majority of K-12 distance education being provided in New Zealand was still using correspondence education, and the distance education that is not delivered via correspondence education is primarily offered through video-conferencing. The only use of online learning is to support the video-conferencing instruction by providing students with access to asynchronous course content.

New Zealand is not the only international jurisdiction where correspondence education is still used extensively. According to the annual *State of the Nation: K-12 Online Learning in Canada,* K-12 distance education programs in Canada still use a more traditional, print-based correspondence education delivery model on a frequent basis compared to the US context (Barbour, 2012). This is particularly true of elementary level offerings, which are almost exclusively full-time, correspondence-based programs. In a more recent report, Barbour (2013b) described how approximately two thirds of the students taking distance education courses in Nova Scotia and Ontario, and one third in Manitoba, were using correspondence education. These figures do not include all of the elementary school students in British Columbia, which is the jurisdiction that has the largest proliferation of K-12 distance education in Canada.

Similar to the New Zealand example, while online learning is present within the Mexican context, there are still programs that provide a significant portion of their K-12 distance education through compact discs that are mailed to the student or school (Secretaría de Educación Básica, 2010). As was mentioned earlier, Australia has a long history of K-12 distance education. While there are at least five identified K-12 online or blended learning programs in the country (Barbour & Kennedy, 2014), there are three times as many School of the Air distance education programs that are still operating in Australia (see http://www.assoa.nt.edu.au/_SNAPSHOT/othersoa.html for a listing of current programs). These are just some of the examples where online learning technology is available to be used within the K-12 education system, but these legacy delivery models of distance education persist. This brief discussion does not include the large number of jurisdictions where access to online learning technology is simply not available (Barbour, Brown, et al., 2011), and legacy delivery models are the only K-12 distance education options.

Absence of Free Market Advocates

One of the main differences between the American and international experiences is what is driving the use of K-12 online and blended learning. Within the United States, there has been a strong push to expand access to K-12 online and blended learning based on the belief that by providing students with choice it will improve the quality of education – as students will select those opportunities that are high quality, forcing the low quality opportunities to either improve or close due to a lack of interest (Apple, 2001, 2005; Fiske & Ladd, 2000). K-12 online and blended learning programs – many of which are directly or indirectly managed by for profit corporations – can provide students with choice regardless of geographical location, in a medium that may provide a higher quality opportunity for students (Moe & Chubb, 2009; Petersen, 2010; Vander Ark, 2012). Others have argued that the use of technology-based innovations, such as online and blended learning, presents opportunities for students to personalize or customize their education – and thus provide a more meaningful, higher quality educational experience (Christensen, Horn, & Johnson, 2011; Packard, 2013; Vander Ark, 2012). Within this American context, some have argued that these claims may be exaggerated and the motives of the proponents may also be questionable (Ravitch, 2010, 2013). Internationally, these kinds of proponents and this kind of push towards K-12 online and blended learning are largely absent.

The phrase 'largely absent' is purposefully used, as there are some free markets proponents of K-12 online and blended learning outside of the United States. For example, there are proponents of free market principles within K-12 online and blended learning in the Canadian context. In 2012 the Society for Quality Education published *The Sky Has Limits: Online Learning in Canadian K-12 Public Education*, which argued that "school choice [was] rationed or channeled, learning conditions [were] carefully state regulated, and the delivery of education limited by teacher union contracts" – particularly when it came to K-12 online and blended learning (Bennett, 2012, p. 3). Bennett cited British Columbia, which has a regulatory regime where the funding follows the student based on what body delivered the individual course, as the only jurisdiction where true choice existed. Interesting, in the *State of the Nation: K-12 Online Learning in Canada* reports, British Columbia has been described as the most regulated province or territory in Canada (Barbour, 2009, 2010, 2011b, 2012, 2013b; Barbour & Stewart, 2008), and the British Columbia Teachers Federation (i.e., the provincial teachers' union) has been described as having conducted more research into K-12 distance education than any other Canadian organization (Barbour & Adelstein, 2013).

Further, at present there is only one Canadian province that permits charter schools – Alberta, which first enabled charter schools in 1994. In response to the Government's *Inspiring Action on Education* initiative (see https://inspiring.education.alberta.ca/), which promoted personalized, innovative, and technology-based learning, the Parkland Institute released *Delivery Matters: Cyber Charter Schools and K-12 Education in Alberta.* In this report, Clements and Gibson (2013) argued that the evidence from cyber charter schools – and full-time K-12 online learning in general – from the United States did not support the creation or pursuit of cyber charter schools within the province. This attention to research-based, measured growth – along with the a teachers' union that is supportive of K-12 online learning (McRae, 2013) and lack of direct corporate involvement in charter schooling – may explain why Alberta has not developed any online charter schools over the past decade. Essentially, the proliferation of K-12 distance education has not been due to advocates of free market principles, it has been due to the fact that online and blended learning offers opportunities for K-12 students that are not available in the brick-and-mortar environment (Barbour, 2012, 2013b).

New Zealand is another jurisdiction that has a system of education based on free market principles. Beginning in 1989, the Government of New Zealand introduced an initiative known as "Tomorrow's Schools," which transferred the governance of every public school in the country to an elected board (Fiske & Ladd, 2000). These self-governing schools, which were free from geographic enrollment restrictions and/or boundaries, created a system where each school was in competition with each other for students. However, even in this competitive environment the individual e-learning clusters of the VLN have been able to partner with individual schools where the brick-and-mortar schools provide the equivalent of one teacher, teaching one class, in order to enroll students in courses offered through the VLN (Barbour, 2011c; Roberts, 2010). Essentially, proponents of online and blended learning tout its ability to operate in a co-operation fashion with these competitive brick-and-mortar schools. Further, the use of K-12 distance education in New Zealand is also seen as an agent of change in transitioning school from traditional to networked to connected schools (21st Century Learning Reference Group, 2014). A connected learning environment is one "where the integration of face-to-face learning and virtual learning has become seamless and an onlooker would have difficulty in determining if students were learning in a face-to-face or online context" (Barbour & Wenmoth, 2013, p. 7). "The description of *connected schools* is similar to what many in the United States would consider a blended instructional environment.

While Canada and New Zealand are jurisdictions that have education systems with varying levels of free market principles, proponents of these principles are largely absent in advocating for increased proliferation of K-12 online and blended learning. It is interesting to note that in many other international jurisdictions there is even less involvement of the free market in advocating for the use of K-12 online and blended learning. Barbour and Kennedy (2013) described five additional jurisdictions (i.e., Mexico, Australia, Singapore, South Korea, and Turkey) where the primary driver of K-12 online and blended learning are national government forces, and corporations are largely contractors that provide content, learning technologies, and other services to these government-run programs.

Lack of Proliferation Beyond Secondary School

One of the trends that Watson and Murin reported in their chapter was the fact that full-time, multi-district online schools continue to grow. The authors estimated that there are approximately 310,000 students enrolled in these programs. These full-time, multi-district online schools serve students from kindergarten through to grade 12, and in many states the enrollment in these programs is skewed towards students in the elementary grades. While not unique in the field of K-12 online learning, this is a trend that is more common in the United States.

Internationally, the majority of K-12 distance education outside of the United States is focused on the secondary level. One of the best examples of this focus is the Lifelong Learning Programme of the European Commission funded VISCED Project, whose mission was focused on "a transnational appraisal of virtual schools and colleges with a systematic review at international and national levels of fully virtual schools and colleges" (Bacsich, Pepler, et al., 2012, p. 18). What is most telling about this European initiative is that the review focused on students aged 14 to 21. While the listing of virtual schools and colleges created by the VISCED Project[1] included online programs that served elementary and middle school students, the vast majority of programs outside of North America were primarily focused on secondary school students.

In keeping with the trend in Europe, the provision of distance education in New Zealand is also primarily focused on the secondary levels. The VLN in New Zealand is comprised of approximately 20 geographic and thematic e-learning clusters (Barbour, 2011), one of which is a nation-wide cluster that focuses upon primary level students (i.e., Years 1 to Year 8). While some of the geographic clusters do offer courses for students in Year 7 and Year 8, the VLN-Primary is the major provider of non-secondary level enrollments. A review of the VLN indicated that only a small percentage of the enrollments in the network came from the VLN-Primary e-learning cluster (Barbour, 2011). In one of the most comprehensive accounting of student enrollments in the VLN, the CISCO Corporation case study reported that there were 1400 children engaged in distance education through one or more of the e-learning clusters (CISCO, 2011). Based on the most recent data available, the VLN-Primary enrolled 312 students enrolled in one of more courses during the 2013 school year (Roberts, 2013). This

---

1 See the complete listing of K-12 distance education programs worldwide, organized by continent, on the VISCED Project Wiki at http://www.virtualschoolsandcolleges.eu/index.php/Main_Page

2013 VLN-Primary enrollment was a significant growth over the past two years.

The inclusion of younger students in K-12 distance education is not limited to New Zealand. For example, in Canada the majority of K-12 distance education occurred at the secondary level (Barbour, 2013b), and the majority of distance education at the elementary level was delivered using correspondence education – almost exclusively on a full-time basis. Similarly, while the majority of K-12 distance education in Australia is delivered to secondary school students (Pendergast & Kapitzke, 2004), the Schools of the Air in Australia generally provide distance education opportunities to younger students (Stacey & Visser, 2005). Further, in addition to their Open High School, Turkey also has an Open Elementary School (Gedik & Goktas, 2011). Finally, the Cyber Home Learning System in South Korea is a K-12 online learning program that spans the realm of K-12 (Bae, et al., 2008). So there is K-12 distance education occurring at the elementary level outside of the United States, however, it still only encompasses a small percentage of the activity internationally.

Blended Learning is Effective ICT or E-Learning

iNACOL originally defined blended learning as:

> ...any time a student learns at least in part at a supervised brick-and-mortar location away from home and at least in part through online delivery with some element of student control over time, place, path, and/or pace; often used synonymously with Hybrid Learning. (iNACOL, 2011, p. 3)

This definition was subsequent from a more generalized understanding of online learning. For example, in their 2006 publication of the *International Perspective of K-12 Online Learning* iNACOL described online learning as including:

> a range of web-based resources, media, tools, interactivity, and curricular or instructional approaches. Internationally, a variety of terms are used to describe online learning--including distance education, virtual schools, virtual learning, e-learning, electronic learning. In general, the common theme is that this type of learning takes place over the Internet. (Powell & Patrick, 2006, p. 3)

This broader description of online learning contains many of the features that would be incorporated into the more recent definition of blended learning (e.g., a range of web-based resources being used in various instructional approaches). In fact, the variety of terms are one of the potential confounding issues.

The New Zealand Ministry of Education defined e-learning as "learning and teaching that is facilitated by or supported through the smart use of information and communication technologies" (Ministry of Education, 2006, p. 2). However, e-learning in New Zealand is not synonymous with online or virtual learning. In fact, Powell and Barbour (2011) wrote how the national government's vision for increased e-learning in the K-12 environment allowed for the development of online learning programs (i.e., the implication is that if one allows for the other to occur, then they cannot be the same). The confounding of online and blended learning with ICT or e-learning is consistent with countries like Australia, China, Singapore, and South Korea (Barbour, Brown, et al., 2011; Barbour, Hasler Waters, & Hunt, 2011).

Further, in his case study on online education in Finland, Kajander (2011) indicated that online and blended learning was a teaching method and content source as any other, and it had no special standing in evaluation, quality assurance, procurement, or otherwise. This perception, of online and blended learning as another arrow in any teacher's pedagogical quiver, is seen in many European nations. It is also likely one of the reasons why online and blended learning practices have often emerged from earlier SchoolNet initiatives (Bacsich, Bristow, et al., 2012; Bacsich, Pepler, et al, 2012).

This is not to suggest that blended learning does not occur internationally, only that it is generally not called blended learning or not seen as being connected with online learning. For example, in the *State of the Nation: K-12 Online Learning in Canada* report, it stated:

> while blended learning is occurring across Canada, practitioners do not always consider it part of the distance education or online learning movement. Within the Canadian context blended learning is largely considered an extension of effective ICT, or effective technology integration—to use more of an American phraseology. Many teachers not directly involved with K-12 distance education may not realize they are practicing blended learning according to the iNACOL definition. (Barbour, 2012, p. 15).

In fact, there are several Canadian provinces where any teacher or student can access the Ministry-operated K-12 online learning programs asynchronous course content to use in their own face-to-face teaching and learning (e.g., Newfoundland and Labrador, New Brunswick, and Ontario).

Summary

The goal of this chapter was to expose the reader to the international context of K-12 online and blended learning. As many readers will likely be familiar with the American context, I chose to compare and contrast that American experience with the international experience. In doing so, I have described three main similarities and four main differences between the two contexts. The international examples that I have used, as well as the amount of coverage that they have received, is representative of the availability of English-language literature about each of these jurisdictions.

In terms of the areas of consistency, the first was the fact that international K-12 distance education has had a similar evolution to the United States. Both contexts began with a traditional print-based correspondence education model and transitioned through several technological advances in the delivery medium to the present day use of online and blended learning. The second consistency is that many of the early K-12 distance education programs – both legacy programs and current online and blended programs – were created through government grants or other investment. The third area of consistency is that many of the labels that we use to describe K-12 online learning in the United States (e.g., supplemental, full-time, statewide, district-based, multi-district, etc.) are applicable to many international jurisdictions.

In terms of the areas of inconsistency, the first was the prevalence of correspondence education, educational radio, telematics, video conferencing, and other legacy forms of distance education mediums that are still in use at the K-12 level internationally. The second was a lack of proponents of the application of free market principles within K-12 education international in general, and K-12 online and blended learning specifically, driving regulatory reform and growth within the field. The third was the lack of online learning occurring below the secondary school level in most international jurisdictions. Finally, the fourth was a lack of a connection between online learning and blended learning, with blended learning simply being seen as a form of technology integration.

It is important to underscore the fact that while K-12 online and blended learning may not be as prevalent or as expansive internationally than it is in the United States, it is occurring in meaningful ways to address specific student needs. However, it is worth adding that many international jurisdictions do not come to the positive conclusions regarding the research into online learning and student achievement. For example, Canadian researchers have found that students in online environments often perform at similar or lower levels than their classroom-based counterparts (Ballas & Belyk, 2000; Barbour & Mulcahy, 2008, 2009; Barker & Wendel, 2001), and these researchers often comment about the selective nature of the online sample increasing that cohort's results (Ballas & Belyk, 2000; Mulcahy & Barbour, 2010; Mulcahy, Dibbon, & Norberg, 2008). Further, the Parkland Institute report detailed the various government reports, investigative journalism, and independent researchers that have found consistently poor results for full-time online schools in the United States (Clements & Gibson, 2013). This alternate perception of the effectiveness of K-12 online and blended learning is one of the leading causes for many of the differences in both how K-12 online and blended learning is perceived and how it has been operationalized in international contexts.

Call for Action

The purpose of this chapter was to expose the reader to the development and activity related to K-12 online and blended learning internationally. Regardless of your role – researcher, practitioner, policymaker, publisher, etc. – this chapter was created to promote the exploration of the field outside of the United States. There are many ways to get involved and there is much to be learned from and by our international counterparts.

For researchers, there are many opportunities to undertake empirical studies with international K-12 online and blended learning programs. Throughout this chapter, you have been exposed to numerous international programs. In much the same way that American-based virtual and cyber schools are looking for research partners, these international programs are equally interested. However, they are in the unfortunate situation that the vast majority of active K-12 online and blended learning researchers are based on the United States. Simply put, many of these programs don't have local researchers to work with. As most of these programs are unable or simply don't attend academic or professional conferences in the United States, the onus is on you to reach out to them. Most will be appreciative of the opportunity to work with you – and you will find that most of the countries referenced in this chapter have similar research ethics policies as the United States.

For the practitioner reader the opportunities presented by international K-12 online and blended programs are substantial. As has been explored in this chapter, there are many ways in which the design, delivery, and support of K-12 online and blended learning is consistent between the United States and various international jurisdictions. This means that the lessons learned in these jurisdictions have relevance within the American context. Resources like the *Research Clearinghouse for K-12 Blended and Online Research* [2] provide practitioners with access to research that has been published in the field, and organizations like the Canadian E-Learn-

---

2 *The Research Clearinghouse for K-12 Blended and Online Research* is an initiative of the Michigan Virtual Learning Research Institute, a division of MVU, and iNACOL, and can be accessed at http://k12onlineresearch.org

ing Network (CANeLearn) have partnered with the clearinghouse to ensure that this international research is represented. Further, one of the most exciting aspects of the implementation of online and blended learning is the potential for breaking down geographic barriers. In many instances we often view this as a way to provide educational opportunities to students regardless of where they live in the State. However, it also has the potential to provide access for our students to have diverse cultural experiences with students engaged in online and blended learning in international jurisdictions. Resources like the VISCED listing of international K-12 online and blended programs[3] provide practitioner with potential contacts for online, international, cultural exchanges for their students – students who may often be facing similar challenges of learning in a different environment.

Further, in recent years there have been increased efforts by policymakers to look for ways to both increase and regulate the use of K-12 online and blended learning. Interesting, many governments of international nations have played an active role in various aspects – depending on the jurisdiction – of the development and growth of K-12 online and blended learning. As educational reformers look to other jurisdictions for policies that have proven to be successful, it should be incumbent on these policymakers to also examine the nature of government involvement, support and regulation of K-12 online and blended learning. This is particularly true of jurisdictions where online and blended learning are another arrow in the teacher's pedagogical quiver or where connected schools are beginning to become the norm, rather than the exception.

Finally, as was noted earlier, one of the limitations of our knowledge about international K-12 online and blended learning programs is the availability of English-language literature. Much of what is known and has been researched on many of these international programs is written in their native language. For example, there has been a great deal written about South Korea's Cyber Home Learning System in Korean-language publications (see Lim & Kim, 2007 as one of many examples). There are several examples of foreign language journals translating and publishing English-language research for their readership. For example, the Mexican-based *Revista Mexicana de Bachillerato a Distancia* has translated several of my own articles from English into Spanish (see Barbour and Plough [2014] or Hawkins, Barbour, and Graham [2012] as two examples). Lessons from these international programs could be quite useful for researchers, practitioners, and policymakers. Regardless of the professional context that originally brought you to this chapter, its content should simply be the first stop on your journey

3 See the VISCED Project Wiki for a complete listing of K-12 distance education programs worldwide, organized by continent, at http://www.virtualschoolsandcolleges.eu/index.php/Main_Page

around the "world" of K-12 online and blended learning – not your final destination!

References

21st Century Learning Reference Group. (2014). *Future-focused learning in connected communities.* Wellington, New Zealand: Government of New Zealand. Retrieved from http://www.minedu.govt.nz/theMinistry/EducationInitiatives/UFBInSchools/FutureFocused-Learning.aspx

Apple, M. (2001). *Educating the "right" way: market, standards, God, and inequality.* New York: RoutledgeFalmer.

Apple, M. (2005). Doing things the 'right' way: legitimating educational inequalities in conservative times. *Educational Review, 57*(3), 271-293.

Bacsich, P. Bristow, S. F., Camilleri, A., de Beeck, I. O., Pepler, G., & Phillips, B. (2012). *VISCED handbook – Volume 2 – Virtual schools and colleges – Providing alternatives for successful learning*. Roosbeek, Belgium: ATiT bvba. Retrieved from http://www.virtualschoolsandcolleges.info/sites/default/files/VISCED_Handbook-Volume-2.pdf

Bacsich, P., Pepler, G., Phillips, B., Öström, M., & Reynolds, S. (2012). *VISCED handbook – Volume 1 – Virtual schools and colleges – Providing alternatives for successful learning.* Roosbeek, Belgium: ATiT bvba. Retrieved from http://www.virtualschoolsandcolleges.info/sites/default/files/VISCED_Handbook-Volume-1.pdf

Bae, H., Han, K-W., Lee, E. K., & Lee, Y. J. (2008). The cyber home learning system for primary and secondary schools students in Korea: Current state and challenges. In K. McFerrin, et al. (Eds.), *Proceedings of the annual conference of the society for information technology and teacher education* (2887–2891). Norfolk, VA: Association for the Advancement of Computing in Education.

Ballas, F. A., & Belyk, D. (2000). *Student achievement and performance levels in online education research study.* Red Deer, AB: Schollie Research & Consulting. Retrieved from http://web.archive.org/web/20051031044348/http://www.ataoc.ca/files/pdf/AOCresearch_full_report.pdf

Barbour, M. K. (2005). From telematics to web-based: The progression of distance education in Newfoundland and Labrador. *British Journal of Educational Technology, 36*(6), 1055-1058.

Barbour, M. K. (2009). *State of the nation study: K-12 online learning in Canada*. Vienna, VA: International Council for K-12 Online Learning. Retrieved from http://www.inacol.org/research/docs/iNACOL_CanadaStudy_200911.pdf

Barbour, M. K. (2010). *State of the nation study: K-12 online learning in Canada*. Vienna, VA:

International Council for K-12 Online Learning. Retrieved from http://www.inacol.org/research/docs/iNACOL_CanadaStudy10-finalweb.pdf

Barbour, M. K. (2011a). *Primary and secondary e-learning: Examining the process of achieving maturity.* Christchurch, New Zealand: Distance Education Association of New Zealand. Retrieved from http://www.vln.school.nz/mod/file/download.php?file_guid=114023

Barbour, M. K. (2011b). *State of the nation study: K-12 online learning in Canada.* Vienna, VA: International Council for K-12 Online Learning. Retrieved from http://www.inacol.org/research/docs/iNACOL_CanadaStudy_201111.pdf

Barbour, M. K. (2011c). *Primary and secondary e-learning: Examining the process of achieving maturity.* Christchurch, New Zealand: Distance Education Association of New Zealand. Retrieved form http://www.vln.school.nz/mod/file/download.php?file_guid=114023

Barbour, M. K. (2012). *State of the nation study: K-12 online learning in Canada.* Victoria, BC: Open School BC/Vienna, VA: International Council for K-12 Online Learning. Retrieved from http://www.openschool.bc.ca/pdfs/iNACOL_CanadaStudy_2012.pdf

Barbour, M. K. (2013a). The landscape of K-12 online learning: Examining what is known. In M. G. Moore (Eds.), *Handbook of distance education* (3rd ed.) (pp. 574-593). New York: Routledge.

Barbour, M. K. (2013b). *State of the nation study: K-12 online learning in Canada*. Victoria, BC: Open School BC. Retrieved from http://www.openschool.bc.ca/pdfs/state_of_nation-2013.pdf

Barbour, M. K., & Adelstein, D. (2013). *Voracious appetite of online teaching: Examining labour issues related to K-12 online learning*. Vancouver, BC: British Columbia Teachers Federation. Retrieved from http://www.bctf.ca/uploadedFiles/Public/Issues/Technology/VoraciousAppetite.pdf

Barbour, M. K., & Bennett, C. (2013). The FarNet journey: Effective teaching strategies for engaging Māori students on the Virtual Learning Network. *Journal of Open, Flexible and Distance Learning, 17*(1), 12-23. Retrieved from http://journals.akoaotearoa.ac.nz/index.php/JOFDL/article/viewFile/195/156

Barbour, M. K., Brown, R., Hasler Waters, L., Hoey, R., Hunt, J., Kennedy, K., Ounsworth, C., Powell, A., & Trimm, T. (2011). *Online and blended learning: A survey of policy and practice from K-12 schools around the world*. Vienna, VA: International Association for K-12 Online Learning. Retrieved from http://www.inacol.org/research/docs/iNACOL_IntnlReport2011.pdf

Barbour, M. K., Hasler Waters, L., & Hunt, J. (2011) *Online and blended learning: Case studies from K-12 schools around the world.* Vienna, VA: International Association for K-12 Online Learning.

Barbour, M. K., & Kennedy, K. (2014). K–12 online learning: A worldwide perspective. In A. Hirumi (Ed.), *Grounded designs for online and hybrid learning: Trends and technologies* (pp. 53-74). Washington, DC: International Society for Technology in Education.

Barbour, M. K., & Mulcahy, D. (2008). How are they doing? Examining student achievement in virtual schooling. *Education in Rural Australia*, 18(2), 63-74.

Barbour, M. K., & Mulcahy, D. (2009). Student performance in virtual schooling: Looking beyond the numbers. *ERS Spectrum*, 27(1), 23-30.

Barbour, M. K., & Plough, C. (2014). Odisea de la mente: Redes sociales en la escuela cibernética [Odyssey of the mind: Social networks in the cyber school]. *Revista Mexicana de Bachillerato a Distancia, 6*(11). Retrieved from http://revistas.unam.mx/index.php/rmbd/article/view/46971

Barbour, M. K., & Stewart, R. (2008). *A snapshot state of the nation study: K-12 online learning in Canada.* Vienna, VA: North American Council for Online Learning. Retrieved from http://inacol.org/resources/docs/NACOL_CanadaStudy-lr.pdf

Barbour, M. K., & Wenmoth, D. (2013). *Virtual learning as an impetous for educational change: Charting a way forward for learning in New Zealand*. Christchurch, New Zealand: CORE Education. Retrieved from http://www.core-ed.org/sites/core-ed.org/files/VLN_Barbour_Wenmoth-v3a.pdf

Barker, K., Wendel, T., & Richmond, M. (1999). Linking the literature: School effectiveness and virtual schools. Vancouver, BC: FuturEd. Retrieved from http://web.archive.org/web/20061112102653/http://www.futured.com/pdf/Virtual.pdf

Bennett, P. (2012). *The sky has limits: Online learning in Canadian K-12 public education.* Toronto, ON: Society for Quality Education. Retrieved from http://www.societyforqualityeducation.org/parents/theskyhaslimits.pdf

Bennett, C., & Barbour, M. K. (2012). The FarNet journey: Perceptions of Māori students engaged in secondary online learning. *Journal of Open, Flexible & Distance Learning, 16*(1). Retrieved from http://journals.akoaotearoa.ac.nz/index.php/JOFDL/article/view/105

Brown, J., Sheppard, B. & Stevens, K. (2000). *Effective schooling in a tele-learning environment.* St. John's, Newfoundland and Labrador: Centre for TeleLearning and Rural Education, Faculty of Education. Retrieved from https://web.archive.org/web/20050105204359/http://www.tellearn.mun.ca/es_report/index.html

Centre for Civil Society. (2011). Use of online education in K- 12 sector in India. In M. K.

Barbour, L. Hasler Waters, & J. Hunt (Eds.), *Online and blended learning: Case studies from K-12 schools around the world* (pp. 61-69). Vienna, VA: International Association for K-12 Online Learning.

Cho, Y-S. (2009). *Cyber Home Learning System improves quality of public education*. Alexandria, VA: Advanced Distributed Learning.

Christensen, C. M., Horn, M. B., & Johnson, C. W. (2011). *Disrupting class: How disruptive innovation will change the way the world learns* (2nd ed.). New York: McGraw-Hill.

CISCO. (2011). *New Zealand's Virtual Learning Network* (VLN). San Jose, CA: Author. Retrieved from http://www.cisco.com/web/strategy/docs/education/NewZealandsVirtualLearningNetwork.pdf

Clark, T. (2001). *Virtual schools: Trends and issues – A study of virtual schools in the United States.* San Francisco, CA: Western Regional Educational Laboratories. Retrieved from http://www.wested.org/online_pubs/virtualschools.pdf

Clark, T. (2003). Virtual and distance education in American schools. In M. G. Moore & W. G. Anderson (Ed.), *Handbook of distance education* (pp. 673-699). Mahwah, NJ Lawrence Erlbaum Associates, Inc.

Clark, T. (2013). The evolution of distance and online education in American schools. In M G. Moore (Ed.), *Handbook of distance education* (3rd ed.) (pp. 555-573). New York: Routledge.

Clements, J., & Gibson, D. (2013). *Delivery matters: Cyber charter schools and K –12 education in Alberta*. Edmonton, AB: Parkland Institute. Retrieved from http://parklandinstitute.ca/research/summary/delivery_matters

Compton, L. K., Davis, N. E., & Mackey, J. (2009). Virtual field experience in virtual schooling. *Journal of Technology and Teacher Education, 17*(4), 459-477.

Darrow, R. (2010). *A comparative study between online charter high schools and traditional high schools in California.* Unpublished doctoral dissertation, California State University, Fresno, CA.

Demiray, U., & Adiyaman, Z. (2002). *A review of the literature on the open high school in Turkey on its tenth anniversary between the years 1992–2002*. Eskisehir, TR: Turkish Republic, Ministry of National Education, General Directorate of Educational Technologies. Retrieved from http://www.midasebook.com/dosyalar/AOLING_PDF.pdf

Dunae, P. A. (2006). *The homeroom: Correspondence education*. Nanaimo, BC: Malaspina University. Retrieved from http://www.mala.bc.ca/homeroom/content/topics/programs/corresp.htm

Fiske, E. B., & Ladd, H. F. (2000). *When schools compete: A cautionary tale*. Washington, DC:

Brookings Institution Press.
Friend, B., & Johnston, S. (2005). Florida virtual school: A choice for all students. In Z. L. Berge & T. Clark (Eds.), *Virtual schools: Planning for success* (pp. 97–117). New York: Teachers College Press.
Gedik, N., & Goktas, Y. (2011). Online learning for Turkish public education (Ages 5-18). In M. K. Barbour, L. Hasler Waters, & J. Hunt (Eds.), *Online and blended learning: Case studies from K-12 schools around the world* (pp. 81-96). Vienna, VA: International Association for K-12 Online Learning.
Harris, S. (2005). *Online learning in senior secondary school education: Practice, pedagogy and possibilities.* New South Wales, AU: Sydney Centre for Innovation in Learning (SCIL).
Harris, S. (2008). *ICT innovation transforming the heart of the classroom*. New South Wales, AU: SCIL. Retrieved from http://static.squarespace.com/static/510b86cce4b0f6b4fb690106/t/512eb34be4b0c046ed7a70da/1362015051278/stephen-harris_ict-innovation-transforming-the-heart-of-theclassroom.pdf
Haughey, M., & Muirhead, W. (2004). Managing virtual schools: The Canadian experience. In C. Cavanaugh (Ed.), *Development and management of virtual schools: Issues and trends* (pp. 50-67). Hershey, PA: Idea Group Inc..
Hawkins, A., Barbour, M. K., & Graham, C. (2012). "Todo el mundo es su propia isla": la desconexión del docente en la escuela virtual ["Everybody is their own island": Teacher disconnection in a virtual school]. *Revista Mexicana de Bachillerato a Distancia, 4*(8). Retrieved from http://revistas.unam.mx/index.php/rmbd/article/view/44284
Hin, L. T. W., & Subramanian, R. (2004). ScienceNet: A virtual school for the extension (science) education of the public in Singapore. In C. Cavanaugh (Ed.), *Development and management of virtual schools: Issues and trends* (pp. 244-261). Hershey, PA: Idea Group Inc..
International Association for K-12 Online Learning. (2011). *The online learning definitions project.* Vienna, VA: Author. Retrieved from http://www.inacol.org/research/docs/iNACOL_DefinitionsProject.pdf
Jang, S-H. (2006). *Analysis on the effectiveness of Cyber Home Learning System.* Soeul: Ministry of Education, Science and Technology. Retrieved from http://english.keris.or.kr/ICSFiles/afieldfile/2006/08/10/KERISRandD.pdf
Kajander, P. (2011). Online learning in Finnish public education. In M. K. Barbour, L. Hasler Waters, & J. Hunt (Eds.), *Online and blended learning: Case studies from K-12 schools around the world* (pp. 97-103). Vienna, VA: International Association for K-12 Online Learning.

Korea Education and Research Information Service. (2011). *Connect global, create future adapting education to the information age: White paper.* Seoul: Ministry of Education, Science and Technology. Retrieved from http://english.keris.or.kr/whitepaper/WhitePaper_eng_2011_wpap.pdf

Lai, K.-W., & Pratt, K. (2009). Technological constraints and implementation barriers of using videoconferencing for virtual teaching in New Zealand secondary schools. *Journal of Technology and Teacher Education, 17*(4), 505-522.

Laurel Springs School. (2013). *About us*. Ojai, CA: Author. Retrieved from http://laurelsprings.com/aboutus

Lim, B., & Kim, S. (2007). Issues and Possibilities of CHLS (Cyber Home Learning System). *Multimedia Assisted Language Learning, 10*(3), 171-195.

McRae, P. (2013). *Rebirth of the teaching machine through the seduction of data analytics: This time it's personal*. Edmonton, AB: Author. Retrieved from http://philmcrae.com/2/post/2013/04/rebirth-of-the-teaching-maching-through-the-seduction-of-data-analytics-this-time-its-personal1.html

Means, B., Toyama, Y., Murphy, R., Bakia, M., & Jones, K. (2009). *Evaluation of evidence-based practices in online learning: A meta-analysis and review of online learning studies.* Washington, DC: U. S. Department of Education, Office of Planning, Evaluation, and Policy Development. Retrieved from http://www2.ed.gov/rschstat/eval/tech/evidence-based-practices/finalreport.pdf

Ministry of Education. (2006a). *ICT strategic framework for education 2006–2007*. Wellington, New Zealand: Author. Retrieved from http://www.minedu.govt.nz/~/media/MinEdu/Files/EducationSectors/PrimarySecondary/Initiatives/ICTStrategy/ICTStrategicFrameworkEducation.pdf

Moe, T. M., & Chubb, T. M. (2009). *Liberating learning: Technology, politics and the future of American education*. San Francisco CA: Jossey-Bass.

Moore, M. G. & Kearsley, G. (1996). *Distance education: A systems view.* Belmont, CA: Wadsworth.

Mulcahy, D., & Barbour, M. K. (2010, May). *Duck and cover: Are rural students taking basic courses to avoid taking them online?* A roundtable presented at the annual meeting of the American Educational Research Association, Denver, CO.

Mulcahy, D. M., Dibbon, D., & Norberg, C. (2008). *An investigation into the nature of education in a rural and remote region of Newfoundland and Labrador: The Straits*. St. John's, NL: The Harris Centre, Memorial University of Newfoundland.

Oliver, R., & Reeves, T. C. (1994). *Telematics in rural education: An investigation of the use of telematics for the delivery of specialist programmes for students in rural schools*. Perth, Western

Australia: InTech Innovations.
Packard, R. (2013). *Education transformation: How K-12 online learning is bringing the greatest change to education in 100 years*. Hillsboro, OR: Beyond Words.
Pape, L., Adams, R., & Ribeiro, C. (2005). The virtual high school: Collaboration and online professional development. In Z. L. Berge & T. Clark (Eds.), *Virtual schools: Planning for success* (pp. 118–132). New York: Teachers College Press.
Pendergast, D., & Kapitzke, C. (2004). Virtual vignettes and pedagogical potentials: Insights into a Virtual Schooling Service. In C. Cavanaugh (Ed.), *Development and management of virtual schools: Issues and trends* (pp. 192-211). Hershey, PA: Idea Group Inc..
Peterson, P. (2010). *Saving schools: From Horace Mann to virtual learning*. Cambridge, MA: Belknap Press of Harvard University Press.
Powell, A., & Barbour, M. K. (2011). An examination of government policies for e-learning in New Zealand's secondary schools. *Journal of Open, Flexible and Distance Learning, 15*(1), 75-89. Retrieved from http://journals.akoaotearoa.ac.nz/index.php/JOFDL/article/view/17/18
Powell, A., & Patrick, S. (2006). *An international perspective of K-12 online learning: A summary of the 2006 NACOL international e-learning survey.* Vienna, VA: North American Council for Online Learning. Retrieved from http://files.eric.ed.gov/fulltext/ED514433.pdf
Pullar, K., & Brennan C. (2008). Personalising learning for secondary students working in a blended (distance/face to face/vocational) learning environment. *Computers in New Zealand Schools, 20*(2), 6 – 16.
Ravitch, D. (2010). *The death and life of the great American school system: How testing and choice are undermining education.* New York: Basic Books.
Ravitch, D. (2013). *Reign of error: The hoax of the privatization movement and the danger to America's public schools.* New York: Alfred A. Knopf.
Rivers, J., & Rivers, L. (2004). *A summary of the key findings of the evaluations of the digital opportunities pilot projects (2001– 2003): A summary report to the Ministry of Education.* Wellington, New Zealand: Ministry of Education. Retrieved from http://www.educationcounts.govt.nz/publications/ict/5767/23745
Roberts, R. (2009). Video conferencing in distance learning: A New Zealand schools' perspective. *Journal of Distance Learning, 13*(1), 91-107. Retrieved from http://journals.akoaotearoa.ac.nz/index.php/JOFDL/article/view/40/38
Roberts, R. (2010). Increasing access for learners – The Virtual Learning Network. In V. Ham & D. Wenmoth (Eds.), *e-Learnings: Implementing a national strategy for ICT in education, 1998-2010* (pp. 144-152). Christchurch, New Zealand: CORE Education Ltd.

Roberts, R. (2013). *VLN Primary School 2013 – A year in review.* Wellington, New Zealand: Virtual Learning Network-Primary. Retrieved from https://storify.com/VLNPrimary/vln-primary-school-news-2013

Rumble, G. (1989). The role of distance education in national and international development: An overview. *Distance Education, 10* (1), 83-107.

Sakar, A. N., & Ozturk, O. (2011). The "community services" course through distance education: Evaluation of primary school students. *Turkish Online Journal of Distance Education, 12*(1). Retrieved from http://tojde.anadolu.edu.tr/tojde41/articles/article_11.htm

Secretaría de Educación Básica. (2010). *Enciclomedia Program.* Iztacalco, MX: Author. Retrieved from www.sep.gob.mx/en/sep_en/Enciclomedia_program

Song, K.-S., & Kim, S.-H. (2009, March). *E-learning applications to meet the special needs of K–12 education in Korea*. A paper presented at the First International Conference on e-Learning and Distance Learning, Riyadh, SA. Retrieved from http://ipac.kacst.edu.sa/eDoc/2009/173799_1.pdf

Stacey, E., & Visser, L. (2005). The history of distance education in Australia. *Quarterly Review of Distance Education, 6*(3), 253-259.

Stevens, K. (1994). Australian developments in distance education and their implications for rural schools. *Journal of Research and Rural Education, 10*(1), 78-83. Retrieved from http://jrre.vmhost.psu.edu/wp-content/uploads/2014/02/10-1_6.pdf

Stevens, K., & Moffatt, C. (2003). From distance education to e-learning: the organization of open classes at local, regional and national levels. In J. Bradley (Ed.), *The open classroom: Distance learning in and out of schools* (127-134). London, England: Kogan Page Limited.

Te Aho o Te Kura Pounamu – The Correspondence School. (2012). *Te Kura: Board of Trustees meeting – 04 April 2012*. Wellington, New Zealand: Author.

Treadwell, M. (2010). Personalising learning: The quiet revolution of learning management systems. In V. Ham & D. Wenmoth (Eds.), *e-Learnings: Implementing a national strategy for ICT in education, 1998-2010* (pp. 133-43). Christchurch, New Zealand: CORE Education Ltd.

Vander Ark, T. (2012). *Getting smart: How digital learning is changing the world*. San Francisco, CA: John Wiley & Sons, Inc.

Waitt, P. (2005). *Evaluation of Kaupapa Ara Whakawhiti Mätauranga (KAWM)*. Wellington, New Zealand: Ministry of Education. Retrieved from http://www.educationcounts.govt.nz/publications/ict/5087

Watson, J. F., Gemin, B., Ryan, J., & Wicks, M. (2009). *Keeping pace with K–12 online learning: A review of state-level policy and practice.* Evergreen, CO: Evergreen Education Group.

Retrieved from http://www.kpk12.com/downloads/KeepingPace09-fullreport.pdf

Watson, J., Murin, A., Vashaw, L., Gemin, R., Rapp, C. (2013). Keeping pace with K-12 online and blended learning: A guide to policy and practice. Evergreen, CO: Evergreen Consulting. Retrieved from http://kpk12.com/reports/

Wenmoth, D. (1996). Learning in the distributed classroom. *SET Research Information for Teachers, 2*(4). 1–4.

Wenmoth, D. (2005). The New Zealand Correspondence School and the video conferencing cluster schools network. In *Open Schooling Models*. Goa, India: Commonwealth of Learning for the International Conference on Open Schooling.

Wenmoth, D. (2010). The future – Trends, challenges and opportunities. In V. Ham & D.Wenmoth (eds.). *e-Learnings: Implementing a national strategy project for ICT in education, 1998-2010* (pp. 196-203). Christchurch, New Zealand: CORE Education.

Wenmoth, D. (2011). *Business case: Virtual Learning Network-Community* (VLN-C). Christchurch, New Zealand: CORE Education.

Winkelmans, T., Anderson, B., & Barbour, M. K. (2010). Distributed learning in British Columbia: A journey from correspondence to online delivery. *Journal of Open, Flexible and Distance Learning, 14*(1), 6-28. Retrieved from http://journals.akoaotearoa.ac.nz/index.php/JOFDL/article/view/29/26

Chapter 3

Research and History of Policies in K-12 Online and Blended Learning

Kerry Rice, *Boise State University, krice@boisestate.edu*

Abstract

This chapter provides a historical review of U. S. education policy from its earliest inception to the present day with a focus on policy developments in the 21st century that have influenced the growth and development of online and blended education and those that we can foresee will have the greatest impact moving forward. 21st century policies are synthesized into themes of Online and Distance Learning, Accountability, Innovation and Reform, and Teacher Preparation.

Introduction

What is policy? Technically, the term refers to decisions, rules, and regulations enacted through legislation, which can occur at the federal, state, and local levels. Ideally, it is the way in which the preferences of a society flow between public institutions but also how these same institutions influence and shape societal preferences. In reality, policy issues and their resulting legislative action, or inaction as the case may be, is oftentimes controversial and a messy business. Educational policy does not happen in a vacuum. The influence of the reigning political climate, more often than not polarized by competing ideologies, combined with an unpredictable economic climate, all of which in our current era are further fueled by rapid advancements in technology, make for an interesting study.

Policies addressing technology use in education go back some three decades. As early as 1983, when *A Nation at Risk* was published, the authors called for all high school graduates to have an understanding of computers, electronics, and related technologies in both personal and work environments (U.S. Department of Education, 1983). Since then, numerous federal reports have been written supporting technology use in the classroom. Culp, Honey, and Mandinach (2005), authors of The U.S. Department of Education report; *A Retrospective on Twenty Years of Education Technology Policy*, provide an excellent overview of these historical reports from 1983 to 2003. The story of educational policy does not begin there though. Perhaps the quote by historian James Burke says it best: *"If you don't know where you've come from, you don't know where you are."* In order to understand how we arrived where we are today, it is important to capture the historical context that has influenced the culture that drives our educational systems today.

Burke's quote is a fitting sentiment, in this time of what might be called educational regeneration. Regeneration is a biological term for renewal, restoration, growth, and even transformation, and aptly suited to an educational system that is straining for rebirth under intense pressure to reform. Global competition, dismal achievement reports, failing schools, and industry concerns about an unprepared workforce continue to serve as reminders that we may not be doing a good job of educating our children for the demands of the 21st century. And it seems the more policy decision, or indecision, constrains our attempts to change, the more we resist, subvert, or otherwise find ways to "work-around" existing barriers to that reform. We know this is not unusual, and perhaps even to be expected. In a system that spans across fifty states, each with independent policies of their own, 15,000 school districts and 100,000 schools that serve somewhere in the vicinity of 48 million students at a rate of $2 billion each day, change can be a challenge. But it may not be as slow as it first appears. In the case of online learning, Christensen, Horn, and Johnson refer to this as disruptive innovation, and predict that by 2019, 50% of all high school courses in the U.S will be delivered online (2008).

Indeed, online education has experienced unprecedented growth since its inception at the turn of the 21st century. However, even with growth percentages measured in the double digits, the entire population of students participating in *fully* online virtual schools is a mere ½ to 1 percent of the total public school student population (Molnar, 2014; Watson, Murin, Vashaw, Gemin, & Rapp, 2013). The number is greater when we consider students who participate in supplemental programs and take an online course here and there; almost four million students by some estimates. It is the acceptance and adoption of blended learning by mainstream education where we are beginning to see the greatest, and perhaps the most transformational change in our educational systems to date. The question of the moment is, do we have the capacity and wherewithal to support the kind of overhaul needed to manifest a disruption as great as this?

To try to answer this question, we'll begin with an overview of the historical landscape of educational policy and then fast forward to the policies that are driving transformative change today, with a particular focus on those policies that have the most impact on online and blended learning. This report is divided into two primary sections:

- *Section 1: American Public Education: A Brief History* provides a pre-21st century historical account of educational policy in the U.S. This is the critical foundation on which current educational policy is based and is intended to provide just a brief overview of where we have come and an understanding of the cultural and societal norms that have been highly influential in shaping our educational system.
- *Section 2: 21st Century Themes in Policy and Educational Reform* explores the most influential policies, publications and recommendations influencing the development and growth of online and distance learning in the first decade of the 21st century. Emerging policies and a synthesized analysis of the major policy themes surrounding online and blended learning are identified and then discussed in detail. These themes include accountability, access, innovation and reform, and teacher preparedness.

It should be noted, that in many cases, the reports reviewed are policy recommendations, rather than legislated action. Nonetheless, recommendations that begin at the federal or state level are often tied to existing or pending policy initiatives, which are then tied to funding, so they serve as an accurate depiction of national and state-level policy trends.

American Public Education: A Brief History

The history of American public school is a history of tensions between competing goals, politics, and indefinable purposes. In its earliest configuration, education of a democratic citizenry was of paramount importance on a national level, despite a lack of mention in the constitution (Hirschland & Steinmo, 2003). And we can track through the history of policy, in varying degrees and depending on the societal influences of the time, that education has been seen as a vehicle to promote a dizzying array of purposes including the development of citizenship, personal growth, global competitiveness, content area skills, critical thinking, and workforce training to name just a few (Rice, Siemieniecki, Siemieniecka, & Kelly, unpublished manuscript).

It is in the 1830's when Horace Mann advocated for the Common School that public education was formally recognized as a legitimate enterprise. The end of the 19th century and beginning of the 20th harkened the era of industrialization, a wave of immigrants and the first public comprehensive high school, ostensibly to educate the masses, but in reality accessible only to the elite. Attempts at standardization and equity date back to 1892 when the Committee of Ten laid the foundation for standardized curriculum. The *1896 Plessy v. Ferguson* Supreme Court decision with its "separate but equal" verdict was the first judicial attempt to address the inequalities in educational opportunities (McBride, 2006).

We begin to see visible and substantial federal involvement in education in the mid 20th century under the U.S. Department of Education's equal access mission. It is an attempt by federal administrators to address states' inadequacies or downright refusal to submit to government recommendations for equity and equality in educational opportunities. The *1954 Brown v. Board of Education* decision, launched the desegregation of schools in the U.S., and Russia's launch of Sputnik into space, resulted in a national call to action for a more rigorous curriculum. In response, Congress passed the *1958 National Defense Act* (NDEA), which among other things, included support for the improvement of science, mathematics, and foreign language instruction in elementary and secondary schools. Other federal legislation and judicial action during the 1960's and 70's addressed inequities in services for low-income, special needs students, and minorities. The *1965 Elementary and Secondary Education Act* (ESEA) is perhaps the most comprehensive effort to address problems of quality and equity in the nation's schools, and includes the *1972 Title I* program of federal assistance for disadvantaged children. Other efforts include *Title VI of the Civil Rights Act of 1964, Title IX,* and *Section 504 of the Rehabilitation Act of 1973*, which prohibit discrimination based on race, sex, and disability. In 1975 the *Individuals with Disabilities Act* (IDEA), a law focused on meeting the needs of special education students, was passed.

The first inklings of the current state of educational reform occurred with the publication of the landmark report, *A Nation at Risk* in 1983. The report, written by the National Commission on Excellence in Education, was in response to the belief that the U.S. was losing its international competitiveness. A poor economy, the infusion of competition from international sources in the technology and car manufacturing sectors, and American students' subpar performance on standardized tests were the drivers then and continue to be drivers now for our current focus on accountability (Christensen, Horn & Johnson, 2008). The accountability and standards movement was further promulgated with enactment of the *Improving America's Schools Act* (IASA), a 1994 reauthorization of ESEA and the associated *Goals 2000: Educate America Act*. These legislative acts were an attempt to systematize school improvement efforts focused on increasing the rigor of state standards and holding states accountable for meeting those standards (U.S. Department of Education, 1994) with stated goals to be achieved by the year 2000, including a 90% graduation rate, universal literacy and first in the world achievement in math and science. Importantly, for our discussion, the *Educate America Act* explicitly allowed for state discretion in implementing school choice programs. Because most fully online schools are charters, charter school laws, and the legislation regulating them, has been highly influential in their evolution.

I will conclude this brief history of educational policy with the enactment of the *No Child Left Behind Act (NCLB)* in 2001. NCLB was a reauthorization of the 1965 ESEA and perhaps the most highly controversial legislation at the time. This federal legislation, expanding on the *America's Schools Act of 1994*, required the use of explicit metrics to better analyze student achievement data, with the goal to ensure proficiency for every student in every demographic. It was particularly concerned with closing the achievement gap between low income and minority students, and all other students, the adoption of rigorous state standards, and standards-based assessment and accountability. Under NCLB, virtual schools were considered a legitimate option for school choice: *"A virtual school can be among schools to which eligible students are offered the opportunity to transfer as long as that school is a public elementary or secondary school as defined by state law"* (U.S. Department of Education, 2004, p. 13). Virtual schools were considered an acceptable alternative and in some cases, were seen to present the only option for districts that might not otherwise meet the school choice requirements of NCLB with traditional brick and mortar classrooms (Hassel & Terrell, 2004). With the advent of school choice firmly entrenched in policy, and virtual schools recognized as a legitimate option, it is during this time that we see tremendous growth in innovative models of schooling.

When viewing educational policy, both current and historic, it is important to understand two competing themes in U.S. education. First, and perhaps the one sustaining belief until the mid-20th century, has been the belief in local control and authority over educational decisions. Hirschfield and Steinmo (2003) argue that federal intervention existed in the earliest conception of public education. The 1862 Morrill Act with the establishment of the nation's land grant institutions of higher education, "resulted in a unique policy outcome where the federal government ended up providing the greatest of foundations for education throughout the United States, all the while appearing to be out of the way. It is this type of development that contributes to the myth that education is strictly a local issue" (p. 359). Although the belief in local control has been challenged, it still remains a pervasive driving force in the policy arena.

Second, in all cases of federal legislation, federal funds have been tied to compliance with the mandates, laws, and regulations associated with that legislation. In 2011-2012, 10.8 percent of the total estimated 1.15 trillion spent on education nationwide, came from federal sources. This may represent a small percentage of the total budget for education, but given the current economic climate and progressively dwindling state funding, the federal government can exert enormous pressure on state and local governments to conform to its policies.

It is within these often conflicting messages and cultural norms that U.S. education policy operates, educational systems thrive, or in some cases fail to achieve their intended goals. And when federal policy lags, which it often does, change can be difficult. On the one hand, we have recommendations, and sometimes even the funding for innovation. But our hands are tied by lagging and outdated federal policies that constrain the limits of transformation.

21st Century Themes in Policy and Educational Reform

At the turn of the 21st Century, just a few short years after ubiquitous availability of the Internet, we begin to see policy recommendations targeted directly at K-12 elearning, distance education, or online learning. To provide some perspective, Florida Virtual School, which is now the largest online program in the country with 410,000 course completions (Watson, et al., 2013), was founded in 1997. Successful state-wide supplemental programs like the Michigan Virtual School and Idaho Digital Learning Academy were launched in 1999 and 2000 respectively. The Virtual High School Collaborative, begun as a consortium of 28 schools in 1997 now has a reported 45 member schools (VHS, Inc., 2002; Watson, et al, 2013).

In 2004, the first annual Keeping Pace with K-12 Online Learning report, tracking online education activity and policy at the state level, was published; in 2006, Rice published a comprehensive review of the literature in K-12 distance education, and in 2008, Roblyer outlined the major policy challenges facing our country. You will recognize most of the same policy discussions from those early reports are still relevant today. Issues with funding, curriculum, teacher qualifications, governance, accountability, equity, and access were identified early on. With time, clarity, and an unpredictable future, we have moved on to identify additional policy themes like innovation, efficiency, scalability, and more equitable opportunities for economic and social success (Molnar, 2014).

Identifying legislation and policy related to blended programs presents a greater challenge. In a sense, blended learning is in a developmental stage as we attempt to iron out frameworks and definitions of this "blending" of both mainstream and virtual education. However, true blended models borrow many of the tenets that drive virtual schools, and so many of the challenges are the same. Seat-time policies, flexible scheduling, grade-based assessment, grade-level progression, charter school laws etc. all impact the implementation of the innovative, personalized approaches to education in the U.S.

In the next section, we'll begin first, with a look at seminal policy and reports that address online learning specifically and move into a discussion on the major themes surrounding online and blended learning emerging in the policy arena.

Online and Distance Learning

In 2000, The Web-Based Education Commission charged by Congress and the President with assessing the potential of the Internet for learning, published *The Power of the Internet* for Learning. The authors of the report sounded a national call to action for the federal government to remove barriers to innovations in learning and to embrace e-learning as a centerpiece of federal education policy. In particular, the commission called for recognition of the value of the Internet as a viable delivery method to increase opportunities for learner-centered, anywhere, anytime, any pace educational opportunities, for improved access to Internet resources, and the development of high quality online content.

In the 2001 report, *Any Time, Any Place, Any Path, Any Pace: Taking the Lead on e-Learning Policy,* a study group for the National Association of State Boards of Education concluded that "e-learning will improve American education in valuable ways and should be universally implemented as soon as possible" (p. 4) and recommended that state education policy-makers move decisively in establishing policies that would ensure the rapid and equitable distribution of e-learning opportunities.

In 2000 the U.S. Department of Education published the revised National Educational Technology Plan: *E-Learning: Putting a World Class Education at the Fingertips of All Children* with its recognition that changes in education are driven in large part by digital technologies, and in some part by virtual schools. Particularly relevant is the plan's emphasis on e-learning as a key issue facing federal, state, and local education agencies focused on increasing access to highly qualified teachers, accountability, and teacher professional development through e-learning.
It should be noted that the original National Educational Technology Plan, *Getting America's Students Ready for the 21st Century: Meeting the Technology Literacy Challenge*, was published in 1996 as a national framework for states in developing technology use plans. The report focused on the use of technology in elementary and secondary education in order to improve student achievement and initiated federal programs such as the *Technology Literacy Challenge Fund* and the *E-rate program*, both programs that infused large sums of money to support technology use in mainstream classrooms. Even at this early date, distance learning, that which was delivered via live interactive transmissions, was noted for improving student achievement as much as traditional methods of instruction. And further, the advantages of using technology to reach

students who would otherwise not have access to quality educational experiences were also recognized.

As early as 2002, states were formally urging systematic reform with online education at the forefront. As an example, the Center on Education Policy report, *Preserving Principles of Public Education in an Online World: What Policy Makers Should be Asking About Virtual Schools* (Fulton & Kober, 2002), provided an action summary for policymakers in implementing virtual education opportunities. The authors called for preserving those elements of public education that we value such as effective preparation for life, work and citizenship, social cohesion and shared culture, universal access and free cost, equity and non-discrimination, public accountability and responsiveness, and religious neutrality, for supplemental rather than full time virtual programs, and for a revision of state policies for attendance, scheduling, and funding formulas to better support the growth and development of virtual programs and schools.

With the requirements of NCLB taking hold across the country, and the expanding interest and notoriety in online education, a newly revised National Educational Technology Plan, *Toward A New Golden Age in American Education: How the Internet, the Law and Today's Students are Revolutionizing Expectations*, was commissioned by Congress and published in 2004. This plan had a different twist from other plans, in that it used data to tell the story of where we were at the time and student voices to articulate where we should be headed. This was a time of significant advances in technology and the Internet, a time when schools had more access to technology and the Internet than ever before, but also a time where it was recognized that digital technologies were underutilized. It was also a time when schools were still debating whether or not there was value in technology at all! The authors of the report called for a new model in teaching and learning, for strengthened leadership, innovative budgeting, improved teacher training, support for elearning and virtual schools, increases in broadband access, a movement toward digital content, and integrated data systems.

These early efforts in the 21st Century set the stage for the latest wave of policy development related to educational reform. Often these recommendations and policies are not directed specifically at online learning, but they can have a significant impact on them. It should also be recognized that not all policy directives are initiated at the national level. In fact, in many, if not most cases, policy is driven at the state level through organized or grass roots initiatives. This is particularly true in the case of online and blended learning, where historically national policy has been slow to respond to transformative educational practices taking place in classrooms across the country.

Jumping ahead to 2010, we have policy guidance from the latest revised National Educational Technology Plan, *Transforming American Education: Learning Powered by Technology,* which called for "revolutionary transformation" in our educational systems, repeating similar dialog from NCLB with references to efficiency and accountability, but with added references to flexibility, competencies, and personalized learning. We also see reference to a set of "core" standards for what students should be able to learn (U.S. Department of Education, 2010a). As in the previous plans, it encourages states, districts, and others, to leverage the power of technology for anytime, anywhere learning opportunities.

Several reports, some of them annually distributed, are helpful in highlighting trends in state-level legislative action. Digital Learning Now examines state policy climates that support educational reform efforts to promote the necessary conditions for high quality, innovative learning opportunities. In their *2013 Digital Learning Report Card* the authors report that "states debated more than 450 digital learning bills with 132 signed into law" (p. 4) building on the 2012 legislative session when 700 bills were introduced with 152 enacted into law. Ten elements of high quality learning were identified and examined in the report: student eligibility, student access, personalized learning, advancement, quality content, quality instruction, quality choices, assessment and accountability, funding, and delivery.

Authors of the second annual report in a series published by the National Education Policy Center (NEPC), estimated that in 2012, 128 bills related specifically to online learning were considered in 31 states (41 enacted, 87 failed). In 2013, 127 bills were considered in 25 states (29 enacted, 7 failed, 92 pending at the time of the report). Significant policy issues identified in the NEPC report include: funding and governance, instructional quality, and recruitment and retention of high quality teachers (Molnar, 2014).

While it may appear that policy, at the state level at least, is keeping pace with rapid advancements and change, the truth is that it is simply not doing so. Some argue that the complexity of change is accelerating at such a fast pace, that policy cannot keep up. While we see pockets of activity and legislative action to address more immediate concerns, and easily solved problems like online charter school laws, legislation addressing the big problems such as equitable funding and accountability, have been slower to appear (Watson, et al, 2013). Nevertheless, substantial policy activity related to online and blended learning has occurred in the following areas:

- Accountability
- Access
- Innovation and Reform

- Teacher Preparedness

The remainder of this chapter will briefly discuss examples of policy action in these areas as they specifically relate to, impact, or influence online and blended learning.

Accountability

For the last three decades we have witnessed a move from a focus on procedural compliance to a focus on learner performance and outcomes. This focus on accountability represents a significant trend and driver for current educational reform and policy development in the U.S. (McDonnell, 2012). At its core, the accountability movement stems from a recognition that school attendance is no longer enough to support the claim that students are learning; there must be demonstrable evidence of learning. Politically, it is a response to disparate performance of students across states and growing frustrations with poor U.S. student performance on international tests indicating a growing decline in global competitiveness. Indeed, the Progamme for International Student Assessment, or PISA, test results for 2012 indicated that American students maintained a longstanding trend since 2000, performing about average in science and reading, but below average in mathematics.

Representative policies related to accountability in online and blended learning environments include the standards movement with its associated focus on standardized assessment, and the rise of learning analytics with a focus on the increased value of data in education.

The Standards Movement

Content area standards, or curricular goals, for subject areas have been a mainstay of the American public educational system since the *Nation at Risk* report in 1983. Historically, states have been responsible for determining their own standards for what students should and would be able to learn; the belief being that the local authorizing agencies would be a better judge of the needs of their constituencies. So the unprecedented adoption by 45 of 50 states of the national *Common Core State Standards* (CCSS) (CCSS, 2012) may seem surprising. However, when one takes into account the historical record, the movement to national standards appears to be an inevitable and natural progression of increased national influence and control (McDonnell, 2012).

The CCSS are built upon the requirements of the *Reauthorization of the U.S. Elementary and Secondary Education Act in 2010* (U.S. Department of Education, 2010 A Blueprint for Reform), which is itself an attempt to ameliorate flaws in NCLB. NCLB expanded the federal role in education; in particular to improve educational outcomes for minority and disadvantaged students, requiring annual reading and mathematics tests aligned to states academic standards. Standardized assessments are an integral part of the CCSS implementation, just as they were in NCLB. However, the tests proposed by the two major providers, Partnership for Assessment of Readiness for College and Career (PARCC) and the Smarter Balanced Assessment Consortium (SBAC), are according to these organizations, better aligned with highly valued next generation skills in that they are delivered via a computer, adaptive, and performance-based.

Whether in agreement or not, the implementation of the CCSS provides an exceptional advantage for scalability, efficiency, and productivity, particularly in online and blended models of education. For the first time, it is now possible on a national scale to vet, aggregate, and share high quality curriculum and teaching materials. Some states have already initiated clearinghouses for shared, reviewed, and approved online courses (Molner, 2014, p. 16). Illustrating one example of the impact of standardization, Florida enacted legislation in 2013 allowing students to enroll in online courses offered by other districts and to earn credit from massively open online courses (MOOCs). This type of flexible learning opportunity is made possible and more palatable by the existence of common standards and assessments.

Accountability measures, specifically targeted at virtual schools and programs, have increased in visibility and have been approached differently by each state. In 2012 and 2013 eleven states proposed legislation calling for broader assessment and evaluation of online schools (Molnar, 2014). Examples of the wide variability in how states approach policy for virtual schools include attempts to link per-pupil funding to accountability measures in Arizona, which failed, and a $4.3 million investment to support a center for online research and innovation in Michigan. In Tennessee, enrollment restrictions are placed on a virtual school until students have demonstrated a minimum level of achievement growth (Watson, et.al, 2013).

Learning Analytics

Data driven, or data-informed, decision-making has evolved into a vastly more sophisticated concept today, than in the past, and is often referred to as BIG data or learning analytics. Although still in its infancy in education, big data has been around in consumer-driven markets for some time. One reason for the delay is that the data in education has typically not been standardized enough to process using typical analytical methods. Second, educators, policymakers, and administrators have generally been pretty fearful of data, for many reasons.
Data can take on a variety of forms. Traditionally we think of standardized test scores and

other easily accessible data such as attendance and demographics. But data is much more than that and learning analytics has the potential to make great strides, especially in online and blended learning. In online environments, data stored in learning management server logs can provide a very rich source of data for investigating actual learner behaviors - something that is typically very difficult to do in face-to-face environments (Hung, Hsu, & Rice, 2012).

In 2009, $4.35 billion was set aside to support *Race to the Top* (RTT) grants which were focused on innovative school reform and the use of large scale student data systems to improve accountability measures and, it was hoped, student performance outcomes (The White House, n.d.). This was a national effort to measure student performance as well as increase transparency in reporting methods.

The increased collection and use of data in education has raised additional concerns. The *Family Education Rights and Privacy Ac*t (FERPA) (U.S. Department of Education, n.d.) is an example of federal policy enacted to protect the privacy of student education records and has created somewhat unpredictable consequences for the integrated data systems so necessary for accountability measures to be effective and for learning analytics in general. Legal and ethical issues surrounding privacy, ownership, and security can place institutions in a vulnerable position, especially if an analysis of student behaviors is construed as profiling, if sensitive information is collected, if data is released to non-education related parties, or if student data is saved to an externally hosted analytic server (Parry, 2011; U.S. Department of Education, 2012). Due to the emergent nature of learning analytics in education, only time and experience will reveal the full scope of the impact of policy.

Access

The question of equal access to high quality learning opportunities is not a new one. But the advent of the Internet and online learning has brought it to the forefront in ways that were unimaginable even 20 years ago. Improving the nation's infrastructure, supportive school choice policies, federal initiatives to improve global competiveness, and the significant expansion of institutions authorized to deliver publicly funded services have all served as powerful drivers in this policy area.

Equity

There are several recent federal policy initiatives supporting equity in educational opportunities. To ensure that federally guaranteed civil rights are not overwritten by state or local policies, the Equity and Excellent Commission was established in 2011, with the purpose of informing policy development aimed at examining disparities in educational opportunities that contribute to the achievement gap experienced by low income and minority students in the U.S.

Other federal initiatives are aimed at increasing Internet access through improved infrastructure. The *E-rate program,* which uses revenues from taxes on telephone landlines, has been in existence for some time, and in 2014, $2 billion in repurposed funding from *E-rate* was dedicated to the *ConnectED* program with the goal of connecting 99% of the nation's schools to high speed, wireless broadband within five years. According to the U.S. Department of Education (2013) *ConnectED* will also use existing funding through ESEA to improve the technology skills of teachers.

School Choice

Perhaps the greatest policy influence on the growth of online education, and in some cases blended learning, over the last three decades is school choice. The proliferation of school choice options for students and parents has been a significant driver of the growth in charter schools and other programs that can offer innovative alternatives to traditional educational environments. Charter schools are seen as a tuition free option for quality and choice. In general charter schools are formed under a charter, or contract, and are funded through state appropriations. However, they operate independent of public schools with unique educational approaches (e.g. experiential learning, project-based learning, online learning). In exchange for this operational freedom, they are often required to meet higher levels of accountability than traditional public schools.

Policies governing public charter schools are enacted at the state level, so each state varies, sometimes considerably, on what it will and will not allow as well as the types of restrictions it places on charter school creation, governance, enrollment caps, and funding. Online schools fall under school choice legislation and policies, and are usually governed under charter school law. Although online schools may technically fall under existing charter laws, it has been the case where policies have been enacted that address them more specifically, either favorably or unfavorably. However, whether or not older charter laws can be used to enforce the relatively new introduction of online or blended learning has been a significant challenge facing state policymakers. Oftentimes, it is a matter of how strictly those laws and policies are interpreted that will determine whether online or blended education are allowed. For example, in a recent case in New Jersey, the New Jersey Education Association (NJEA) challenged two charter schools that planned to implement a blended approach because the charter law did not explicitly allow for “blended learning.” Citing that blended learning fit within the implied intent of the law to allow “non-traditional teaching,” the challenge was rejected by the state appellate court (Freeland, 2014).

The National Alliance for Public Charter Schools (2014) estimates a four-fold increase in the number of public charter schools from 1500 schools in 2000, to 6500 schools in 2013 – 2014. Forty-two states have charter laws and charter schools, and served about 2.5 million students nationwide. According to the Center for Educational Reform (2014), favorable charter laws are those that consist of strong, permanent authorizing structures, equitable funding codified in law, and autonomy across state, district, and teacher rules and regulations. Whether or not a state has favorable charter laws is dependent on a variety of factors. In a 2008 examination of the disparity in charter school laws and enrollments, Stoddard and Cocoran (2008) determined that factors such as a higher rate of diversity in a district or state, lower than expected student achievement, and higher than expected school dropout rates were significant predictors of favorable charter laws and greater student enrollments in charter schools.

In states, where online education is allowed, oftentimes charter schools are created and operated using for-profit, education management organizations (EMO’s). This may not appear on the surface to be much different from traditional charter schools, which can also be operated by for-profit organizations that develop and manage their programs. The difference in online schools, however, is that students may not be limited to one geographic area and thus can have a much greater impact, and in some cases greater notoriety, across an entire state than place-based charter schools.

Somewhat related are emerging conversations about policies surrounding private and/or independent schools and students who are homeschooled. With mainstream transition to blended learning, private schools, which in the past have been relatively quiet on the subject of online education, have begun to express interest and acceptance of technology rich learning environments. In particular, policy questions revolve around whether or not students attending private schools or those that are homeschooled, can enroll in publicly supported supplemental courses. Eight states have polices that are explicitly favorable to these actions, two states explicitly deny access, while the remaining states either have no publicly supported online programs or have no state level policy explicitly addressing the issue (Watson, et al, 2013).

Privatization and Competition

Competition for education dollars has increased dramatically over the last decade. The significant expansion of institutions authorized to deliver publicly funded services has perhaps been one of the most powerful drivers in recent policy initiatives (McDonnell, 2012). In the U. S. the primary competition to traditional public and private education systems are for-profit institutions. Some believe these for-profit institutions are rapidly disrupting traditional education systems (Christensen & Horn, 2011). In part, because for-profits are entrepreneurial, they can respond to market demand more quickly and increase efficiencies through innovative processes. Although for-profits have traditionally targeted workforce training programs and drawn students who prefer a more vocational education, in the last decade, they have increased their markets to include all academic subject areas and all levels of education from K-12 to terminal degrees.

K-12 for-profit education management organizations (EMO's) have seen significant growth over the past 10-15 years. Grass and Welner estimated that in 2011, they served 68% of full-time virtual school students. Because online schools can operate outside of traditional enrollment boundaries, sometimes throughout an entire state, the potential reach of one for-profit management company can be quite extensive. EMO's have faced increased scrutiny, and in some cases, state level policies that deny them the opportunity to operate at all. Policy in this area tends to be reactionary and focused on challenges surrounding enrollments and boundaries. For example, primarily in response to accountability issues, in 2013 Illinois enacted a one-year moratorium on new virtual charter schools, Tennessee and Iowa legislated virtual school enrollments caps, and Massachusetts established limits and controls on the growth of virtual schools (Molnar, 2014).

Competition in online education also exists in other forms. Many states operate online supplemental programs, which offer distinct courses to schools that may not otherwise have access to qualified teachers for example. Course curriculum, management, and the sale of these courses may be a mix of public and private funding. Course choice legislation addresses the notion of providing students with the option of taking an online course from one of several providers while maintaining enrollment in their home district. Some form of course choice legislation has been enacted in seven states (Watson, et al, 2013).

Global Competitiveness

Maintaining our competitive edge in a global and digital world is really about universal access to education. In other words, providing opportunities for the best educational experiences possible to the greatest number of learners. Increasingly, opportunities to reach more students with quality education opportunities are made possible through online and blended education. To this end, several important policy trends have evolved.

First, recognizing the importance of access to high quality Science, Technology, Engineering, and Mathematics education is essential to maintaining our global competitiveness, we have seen rising interest in funding initiatives at the federal level for STEM related fields (Crow & Silver, 2008). The Committee on Science, Technology, Engineering and Math Education (CoSTEM), housed within the federal Office of Science and Technology Policy, was codified by the *America COMPETES Reauthorization Act of 2010* and has been tasked with developing a long-term strategic federal STEM education plan. Examples of proposed budget allocations for STEM related investments include $170 million in new funding to support STEM Innovative Networks of schools and colleges, preparing 100,000 STEM teachers, and to establish a national corps of outstanding STEM educators (U.S. Department of Education, n.d.). An example of a state policy is The Utah STEM Action Center which recently made ALEKS, a web-based adaptive learning tool for mathematics, available as part of an $8 million grant initiative by the Utah Governer's Office of Economic Development (Nagel, 2014).

College preparedness is also a high priority. In response to lagging international rankings of college graduates, U. S. federal policy has focused on improving college preparedness of high school graduates as well as increasing the number of graduates from higher education programs. The goal advocated by the administration is that by the year 2020, the U.S. will have the highest proportion of college graduates in the world. This equates to about 60% of the U. S. population. To achieve this goal, several national initiatives have been targeted at making education more affordable, but also at promoting community college enrollments, which are the fastest growing educational sector (46%). An $8 billion *Community College to Career Fund* is just one example of resource allocation to support college enrollments. Accelerated learning opportunities like dual enrollments and advanced placement in high school are other examples that have a particular impact for innovative models of education.

Following in this vein, the federal government has recognized this lack of preparedness as a national security risk. In 2012, a report prepared by a task force established by the Council on Foreign Relations, *U.S. Education Reform and National Security*, was published. The task force identified potential threats from our lack of preparedness including threats to economic growth and competitiveness, physical safety, intellectual property, U.S. global awareness, and U.S. unity and cohesion. They proposed three policy recommendations: 1) Implement common standards for content areas vital to protecting national security, 2) Make structural changes to provide students with enhanced options and competition with equitable resource allocation, and 3) Launch a national effort to assess whether students are learning the skills and knowledge necessary to safeguard American interests.

Innovation and Reform

Policies in this category represent movements to rethink traditional methods of how we teach and how we measure learning in the most efficient and productive way possible. Often these efforts include both for-profit and non-profit institutions, and may have a large philanthropic influence. Rowen (2002) dubbed this movement as the new "school improvement industry." Policies representative of this category tend to support models that are disruptive in nature, including online and blended education, which represents further evidence of their transformative influence on traditional systems.

Efficiency and Scalability

As the federal government increasingly encourages efforts to improve efficiencies and productivity, federal funding and investments have been focused on developing and scaling programs with demonstrable success. For example, the *Investing in Innovation Fund* is an attempt to create fewer, larger, and more flexible funding streams to assist local agencies. Other initiatives in this area have seen the federal government partnering with very large philanthropic organizations that have a vested interest in improving and/or reforming the U. S. educational system. The *Next Generation Learning Grants* is an example of such a partnership in which the federal government has partnered with The Bill and Melinda Gates Foundation and the William and Flora Hewlett Foundation to help fund innovation in education. Between 2009 and 2011, the Gates Foundation invested $76 million assisting state agencies and local districts in their CCSS efforts (Phillips & Wong, 2012). Over time, these partnerships have resulted in an infusion of billions of dollars in research, grant funding, and the establishment of innovative school models, including online and blended.

While we see efforts by the federal government to encourage efficiency on one hand, on the other, scalability of online programs and schools is being curtailed by some states in favor of a more thoughtful approach. Legislation to carefully assess and evaluate the impact of virtual learning was proposed by eleven states in 2012 and enacted by three; Colorado, Maine, and Michigan. Legislation placing enrollment limits on virtual schools were enacted by Illinois, Tennessee, and Massachusetts (Molnar, 2014).

Redefining School
As states have faced increasing pressure to recognize the value and importance of addressing school in a digital age, they have responded with an array of solutions. Some continue to rely on the more traditional technology integration policies to address the issue of online learning, either preferring a more holistic approach, or taking a wait and see stance, while others have been more proactive in developing policies that directly impact online programs. In 2013, online schools operated in 29 states, 26 states had state supplemental programs, and at least 24 states had blended schools, primarily operating as charters (Watson et al., 2013). Alabama, Florida, Michigan, and Virginia all required an online course for graduation, with similar pending legislation in North Carolina and Arkansas. And online courses were recommended in West Virginia, New Mexico, and Massachusetts (Watson et al., 2013).

On the surface, policy specific to the needs of blended learning environments is less evident. The reasons for this are varied, but one explanation is a lack of understanding by policy makers of either online or blended learning. It is often the definition of online and blended learning that is key in how these types of policies are shaped and implemented and will be an ongoing challenge for federal and state policymakers as they face continued pressure to reassess old policies in a digital world. And it is critical that policies for online and blended education consider the unique nature, substance, and affordances of each type of environment (Rice, 2009).

The *Online Definitions Project* by the International Association for K-12 Online Learning is one attempt to assist policy makers with this task (2011). Similarly, the Clayton Christensen Institute for Disruptive Innovation has worked over several years to develop a usable definition for blended learning along with an implementation framework (Christensen, Horn, & Staker, 2013). Regardless of the specific school or program model, policies that address greater educational needs, such as accountability, seat-time, funding, scalability, and the like, are the very policies that will ultimately determine the fate of the vast majority of innovative schools and programs.

Although true, comprehensive systemic change is hard to come by, we do see some movement in specific policies that impact our widely held cultural beliefs about school. Thirty-nine states allow flexibility in how they approach seat-time requirements, which is the system of equating learning to the amount of time a student spends in a class (Worthen & Pace, 2014). These types of policies are critically important to online learning particularly in attendance and truancy reporting where it can be a daunting task to track student attendance when the student is physically separated from the teacher (Archambault, Kennedy, & Bender, 2013). However, even in states like Colorado that specifically address online attendance policies, the formula is still based on the amount of time a student spends in a physical classroom (Colorado Department of Education, n.d.). Other state policy areas that deserve attention are those that legislate teacher-to-student ratios. Depending on the approach, online and blended environments may offer a more efficient measure of quality instructional time, making it a better metric than teacher-to-student ratios (Headden, 2013).

Funding

Funding, for online programs in particular, continues to be a high level concern in most states, and is perhaps one of the most pressing issues (Watson & Gemin, 2009). Pressure for change in funding formulas comes from a variety of directions. Funding based on attendance and seat time requirements have been standing issues for full time virtual schools since their inception, for obvious reasons. Other concerns related to funding usually revolve around issues of boundaries and how funding is allocated and include:

- Enrollment areas can be quite large. In many cases, students who enroll in online schools are not restricted to district boundaries.
- Loss of district funding for students who transfer to an online school.
- District responsibility for funding a student that was not originally in the district such as homeschoolers who enroll in a virtual school.
- Double dipping when using enrollment as a basis for funding if students do not complete courses. Florida is the only state that funds students based on course completion and an end of course exam.
- The actual per pupil cost of attending a virtual school has yet to be determined.

More and more states are building flexibility into their funding formulas to address these issues, but they tend to be reactionary and are not long-term solutions. We see a wide variety of action across states from increased per student funding in Georgia, to attempts to decrease per student funding in Pennsylvania, Virginia, Kentucky, and Florida. However, according to the NEPC report (2013), no state has yet implemented a funding solution that links the actual costs of operating a virtual school with funding allocations.

Funding mechanisms of state supplemental programs also continues to be a high level concern in states where these types of programs exist. In response to pressure from outside providers, including private, for-profit organizations, Florida changed its existing system in which it compensated the state supplemental school, Florida Virtual School, with funds for students who enrolled in their courses from a separate, appropriated budget. In 2012, the state created a single funding system for all online providers and now requires that they share in a prorated portion of funding with the home district in which a student is enrolled. This is a trend that is likely to continue.

Competency-Based Learning

If online has done nothing else, it has had the greatest influence on transformative instructional practices. When you remove seat time requirements, grade level designations, and learners can spend as much or as little time on content as they need or desire, pretty soon you come to a place where you realize that our outdated notions of school are just not an effective way to reach all learners. Unfortunately, on the whole, policy related to governance issues continues to reinforce an antiquated model of education through requirements for such things as place and pace based assessments, proficiency equated to grade level, and average GPA as a measure of mastery (Patrick & Sturgis, 2013; Worthen & Pace, 2014).

Despite policy barriers, pockets of innovation are beginning to spring up throughout the nation. For example, Oregon, perhaps the most innovative in terms of assessment, has adopted flexible assessment options including a longer testing window, adaptive assessment questions, and multiple testing opportunities for learners. New Hampshire has initiated a competency-based system to replace their seat time requirements, and along with Ohio and New York, implemented the development of performance-based assessments (Patrick & Sturgis, 2013; Worthen & Pace, 2014). Michigan has instituted a seat-time waiver and is exploring personalized learning options at the highest administrative level (Michigan Virtual University, 2012; U.S. Department of Education, n.d(b)). Maine has made great strides in moving towards a proficiency-based program going so far as legislating proficiency-based diplomas by 2017 and creating the *Collegiate Endorsement of Proficiency-Based Education and Graduation* which asks institutions of higher education to endorse and support their efforts to support college admissions for students from proficiency-based programs (Maine Department of Education, 2011; New England Secondary School Consortium, n.d.; Silvernail, Stump, Duina, & Gunn, 2013). These efforts are in their initial stages, but trends such as the performance-based Common Core assessments developed by PARCC and SBAC and the focus on College and Career Readiness point to a long awaited shift in national educational policy.

Teacher Preparation

Teacher preparation, qualifications, and effectiveness, which had primarily resided in the realm of state-level policy decisions, came under increased federal control with the highly qualified teacher requirements of the No Child Left Behind Act and continues today with efforts to move to more outcome-based indicators of teacher preparation program quality. In 2013 the federal government unveiled a new policy framework for transforming teaching and leading, largely culled from the *RESPECT Project: A National Conversation about the Teaching Profession* (launched in 2012). As part of the Obama administrations' attempts to reauthorize ESEA, this initiative also encompasses grant-based funding projects like *Race to the Top* and the *Teacher Incentive Fund* (U.S. Department of Education, 2013). Although guidelines for promoting "connected educators" and professional learning communities exist in various policy frameworks, specifically in the 2010 National Educational Technology Plan, there is currently no federal requirement that differentiates between how mainstream teachers are prepared vs. those who teach online or in blended classrooms.

Although national standards and guidelines for quality online teaching exist (iNACOL, 2011), traditional preservice teacher preparation programs have been slow to respond to the increased demand for teachers with the specialized skills necessary to teach online. The onus for this has historically been left to the state, which determines through accreditation policies and resource allocation, what criteria have priority when evaluating teacher education programs. Few states have adopted teaching standards specifically addressing the competencies and skills an online teacher should possess. Even fewer require specialized training, endorsements, or certifications. Georgia and Idaho are the only two states with K-12 online teaching endorsements. Several other states have standards, suggested guidelines or recommendations including Michigan, Louisiana, South Carolina, South Dakota, Utah, and Vermont. Wisconsin enacted legislation in 2011 requiring 30 hours of professional development for online teachers, which was subsequently repealed in 2013. Minnesota enacted legislation in 2012 requiring state board approved teacher preparation programs include the knowledge and skills teachers must possess to deliver instruction in digital and blended learning environments. However, what specific knowledge and skills this might entail were left to interpretation as they were not included in the legislation (Archambault, Debruler, & Freidhoff, 2014).

Somewhat related to teacher preparation, is the notion of administrator preparation. This is a relatively new and emerging field but represents a rather important component in online and blended education. As of this writing there are no known policy directives requiring administrator preparation programs that specifically prepare online school or program administrators either to manage and evaluate online program effectiveness or to supervise or evaluate online teachers. Most online school administrators receive on-the-ground training.

One final policy concern related to online and blended learning is the ability and flexibility of teaching across state borders. Despite early calls for action, reciprocal licensing across state lines is still not a reality. Oklahoma is only one example of a state that allows teachers with licenses from other states (Watson & Gemin, 2009). Reciprocity agreements in many states still require that a teacher become licensed in the state in which they teach.

Conclusion

Early leaders set the stage for the current culture of U. S. educational policy, which included elements of local control, attempts by the federal government to ameliorate discriminatory practices, and increased access to quality educational opportunities for all learners. In the last decades of the 20th century, predominately after the writhing *A Nation at Risk* report, we saw more fervent and explicit federal involvement with policies aimed at improved academic achievement and accountability measures that were increasingly tied to federal funding. In the early 21st century, policies directed at technology-enabled learning and school choice drove the exponential growth in online education witnessed to date. The most recent policy enactments, exemplified by the No Child Left Behind Act and the Common Core National Standards, attempt to identify and standardize proficiency outcomes that better enable us to develop more consistent measures of academic achievement.

Arguably, one of the most disruptive influences on U.S. education systems has been the advent and proliferation of online learning for K-12 public schools (Christensen, 2008). Just a little more than a decade old, their influence on education reform has been remarkable. When teaching and learning moved online, it created an opportunity to question the timeworn structures driving classrooms today. Why do only students in affluent schools and districts have access to quality teachers? Why can't a student advance at a pace that is personalized to their individual characteristics? Why do we equate learning with seat-time? These questions along with advances in affordable technologies, advances in learning analytics, and the search for more affordable and efficient education options are the drivers of significant change in U.S. policy and representative of mainstream and emerging practices in U.S. education. Transformation is still in the early stages, by no means systemic, and with considerable challenges ahead, but there are ways that we can improve our chances of a successful transition to a 21st century model of school.

Institute transparent and consistent accountability measures across all educational modalities. Policies of accountability can add legitimacy to innovative programs (Searson, Wold, &

Jones, 2011), but they should be applied consistently and fairly. Policies that promote consistent accountability measures across all educational delivery modalities along with research that identifies best practice in different modalities are essential to understanding what makes a quality educational program, for whom and when, regardless of delivery method. Comparison studies, while informative, are not helpful in identifying those factors that lead to improved student outcomes. In addition, policy should reflect the growing importance of and demand for learning analytics. We should strive to establish basic protocols to protect student data, while educating the public on the power of learning analytics to personalize the educational experience of every child.

Put student learning first. As we have witnessed with online, and to some extent, blended models; learning is no longer bound by geographic and demographic borders. Nor is it bound by traditional school structures; discrete blocks of time allocated to learning, or grade level designations for example. Policies that promote equal access to quality educational opportunities such as school choice, flexible seat-time requirements, and competency-based education promote and put student learning front and center. We now have the ability to ensure that all students receive the type of educational experience they need, at the time they need it.

Value innovative and alternative educational delivery methods and learn from them. Thanks to the influence of competiveness we have witnessed increased differentiation and affordability options for both K-12 and higher education. Policies that allow for alternative funding models, reciprocal teaching certifications, and scalability models are essential in allowing innovation to thrive. In order to learn from the most successful programs, robust research priorities must be implemented and supported. And then we must be willing to take it a step further and bring those successful models to mainstream education. This is not an easy task with an entire industry and infrastructure built upon an assembly-line vision of education. The mainstream adoption of blended learning, the full implementation of the Common Core Standards, and the increasing availability of quality open source educational materials may provide a solution.

Prepare teachers and administrators for a digital age. Recognizing first, that all teachers and administrators will be faced with classrooms and school structures that look very different from those of the past, and that these transformative educational environments require a unique set of skills, is critical. State polices for teacher and administrator preparation should target programs in higher education and make technology enabled education a priority. Teacher preparation, which is almost non-existent for online teachers, would establish baseline skills and knowledge (Rice & Dawley, 2009). Teacher prep programs should be held to a minimum set of standards for developing technology skills in pre-service teachers, including those skills necessary to teach in online environments (Kennedy & Archambault, 2012; Archambault, 2011). Schools of education must take a leadership role in establishing partnerships with innovative schools to develop a better understanding of how they function in order to establish appropriate and effective teaching practice and research protocols.

Some would argue that U. S. classrooms have not changed much since the days of the industrial revolution. For the most part, mainstream classrooms still revolve around a structured bell schedule, where learners are expected to learn the same content in the same amount of time during the same time each day. Despite the wide availability of information, the primary instructional strategy is direct instruction and lecture. However, this does not, by any means, convey the complete picture. Everyday, in hundreds or perhaps thousands of classrooms across the country, dynamic changes are occurring. Some of these changes are systemic; whole states, districts, and schools that advocate and implement sweeping change through legislative action and policy reform. Change is also manifested through grass roots acts of innovation and disruption by teachers who are not afraid to let students bring their own devices to class, who extend learning time outside of the classroom, who experiment with multiple delivery modalities and who themselves influence the evolution of educational policy. It is these localized efforts that most often push state or federal action.

The history and evolution of educational policy is fraught with reactionary political maneuvering and inconsistent and fragmented implementation. Sarason argues that in order to be successful, changes made within a system must be made with a comprehensive understanding of the whole system in which those changes are made (1993). In the end though, systemic change may be more a function of cultural change than anything else (Woodbury & Gess-Newsome, 2002). It is in establishing a new culture of education where we may find mainstream transformation both in classroom practice and in policy. Our culture of teaching and learning is a deeply embedded ideal, often defined by how we were taught – it is all we know after all. The Internet and technology have offered us an opportunity and ability, for the first time in recent history, to transform our cultural expectations and norms. New cultural ideas of open access to information, broadened professional and social networks, global communication and collaboration, transparency in news reports and government action, crowd-sourced problem solving and research – these are all new societal norms. But how do we translate this new culture to our classrooms today? Just as a society's culture shapes its policy, policy is one avenue that can shape and redefine culture. Policies can be implemented that reinforce our cultural priorities.

Creating a culture that values transparency and accountability, a culture that values student learning, a culture that values innovation and risk-taking, and a culture that values teacher and administrator preparation are all educational goals that can be realized through policy reform.

References

Archambault, L. (2011). The practitioner's perspective on teacher education: Preparing for the K-12 online classroom. *Journal of Technology and Teacher Education, 19*(1), 73-91.

Archambault, L., Debruler, K., & Freidhoff, J. R. (2014). K-12 online and blended teacher licensure: Striking a balance between policy and preparedness. *Journal of Technology and Teacher Education, 22*(1), 83-106.

Archambault, L., Kennedy, K., & Bender, S. (2013). Cyber-Truancy: Addressing Issues of Attendance in the Digital Age. *Journal Of Research On Technology In Education (International Society For Technology In Education), 46*(1), 1-28.

Christensen, C. M., Horn, M. B., & Staker, H. (2013). Is K-12 blended learning disruptive? An introduction to the theory of hybrids. San Mateo, CA: Clayton Christensen Institute for Disruptive Innovation. Retrieved from http://www.christenseninstitute.org/wp-content/uploads/2013/05/Is-K-12-Blended-Learning-Disruptive.pdf

Christensen, C. M., Horn, M. B., & Johnson, C. W. (2008). *Disrupting class: How disruptive innovation will change the way the world learns.* New York: McGraw-Hill.

Colorado Department of Education. (n.d.). Calculating and reporting attendance and truancy in online schools. Retrieved from http://www.cde.state.co.us/sites/default/files/documents/onlinelearning/download/ol_attendance_guidance.pdf

Council on Foreign Relations. (2012). *U. S. education reform and national security: Independent task for report no. 68*. New York: Author. Retrieved from: http://www.cfr.org/united-states/us-education-reform-national-security/p27618

Crow, M. M., & Silver, M. (2008). American education systems in a global context. Technology in Society, 30(2008), 279-291. Retrieved from http://president.asu.edu/sites/default/files/Technology_in_Society_052308_American_Education.pdf

Culp, K. M., Honey, M., & Mandinach, E. (2005). A retrospective on twenty years of education technology policy. *Journal of Educational Computing Research, 32*(3), 279-307. Retrieved from http://ocw.metu.edu.tr/file.php/118/Week12/Culp_JECR.pdf

Digital Learning Now. (2013). Digital Learning Report Card 2013. Retrieved from Digital Learning Now website: http://reportcard.digitallearningnow.com/#grade0

Freeland, J. (2014). How laws (and judges) comtemplate innovation. Clayton Christensen

Institute for Disruptive Innovation. Retrieved from: http://www.christenseninstitute.org/how-laws-and-judges-contemplate-innovation/

Glass, G. V., & Welner, K. G. (2011). Online K-12 schooling in the U.S.: Uncertain private ventures in need of public regulation. Boulder, CO: National Education Policy Center. Retrieved from http://nepc.colorado.edu/publication/online-k-12-schooling

Headdon, S. (2013, Feb.). An L.A. school succeeds with blended learning. Quick & ED. Retrieved from http://www.quickanded.com/2013/02/an-l-a-school-succeeds-with-blended-learning.html?utm_source=feedburner&utm_medium=feed&utm_campaign=Feed%3A+TheQuickAndTheEd+%28The+Quick+and+the+Ed%29

Hentschke, G. C., & Wohlstetter P. (2007). *Conclusion: K-12 education in a broader privatization context. Educational Policy, 21*(1), 297-307. http://epx.sagepub.com.libproxy.boisestate.edu/content/21/1/297.full.pdf+html

Hirschland, M. J., & Steinmo, S. (2003). Correcting the record: Understanding the history of federal intervention and failure in securing U.S. educational reform. Educational Policy, 17, 343- http://epx.sagepub.com.libproxy.boisestate.edu/content/17/3/343.full.pdf+html

Hung, J. L., Hsu, Y. C., & Rice, K. (2012) *Integrating data mining in program evaluation of K-12 online education. Educational Technology and Society, 15*(3), 27-41.

International Association for K-12 Online Learning. (2011). *National standards for quality online teaching, Version 2*. Vienna VA: International Association for K-12 Online Learning. Retrieved from http://www.inacol.org/cms/wp- content/uploads/2013/02/inacoL_teachingstandardsv2.pdf

International Association for K-12 Online Learning. (2011). The onlinen learning definitions project. Vienna, VA: International Association for K-12 Online Learning. Retrieved from http://www.inacol.org/cms/wp-content/uploads/2013/04/iNACOL_DefinitionsProject.pdf

Kennedy, K. & Archambault, L. (2012). Offering pre-service teachers field experiences in K-12 online learning: A national survey of teacher education programs. *Journal of Teacher Education,* 63(3), 185-200.

Mackenzie, J. C., (1894). The report of the committee of ten. *The School Review, 2*(3), 146-155. Retrieved from: http://www.jstor.org/stable/1074830

Maine Department of Education. (2011). Proficiency based diploma standards: Statute 4722-A. Retrieved from http://www.mainelegislature.org/legis/statutes/20-a/title20-asec4722-a.html

McBride, A. (2006). Landmark cases: Plessy vs. ferguson. *Public Broadcasting System: Supreme*

Court. Retrieved from: http://www.pbs.org/wnet/supremecourt/antebellum/landmark_plessy.html

McDonnell, L. M. (2012). Educational accountability and policy feedback. Educational Policy, 27(2), 170-189. DOI: 10.1177/0895904812465119

Michigan Virtual University. (2012). Moving Michigan farther, faster: Personalized learning and the transformation of learning in Michigan. Retrieved from http://www.crcmich.org/PUBLICAT/2010s/2013/PSC-CRC_Personalized_Learning_Report.pdf

Molnar, A. (2014). Virtual schools in the U.S. 2014: Politics, performance, policy, and research evidence. Boulder, CO: National Educational Policy Center. http://nepc.colorado.edu/files/virtual-2014-all-final.pdf

Nagel, D. (2014, March). ALEKS now eligible for STEM grant in Utah. The Journal. Retrieved from http://thejournal.com/articles/2014/03/17/aleks-now-eligible-for-stem-grant-in-utah.aspx

National Alliance for Public Charter Schools. (2014). The public charter schools dashboard: A comprehensive data resource from the National Alliance for Public Charter Schools. Washington D.C.: Author. Retrieved from http://dashboard.publiccharters.org/dashboard/policy/page/overview/year/2013

National Governors Association Center for Best Practices and Council of Chief State School Officers. (2012). *Common core state standards initiative: Implementing the common core state standards*. Retrieved from: http://www.corestandards.org/

New England Secondary School Consortium. (n.d.). Collegiate Endorsement of Proficiency-Based Education and Graduation. Retrieved from http://newenglandssc.org/resources/endorsements

Parry, M. (2011, July 10). Harvard researchers accused of breaching students' privacy. *The Chronicle of Higher Education*. Retrieved from http://chronicle.com/article/Harvards-Privacy-Meltdown/128166/?sid=wb&utm_source=wb&utm_medium=en

Patrick, S., & Sturgis, C. (2013). Necessary for success: Building mastery of world-class skills: A state policymakers guide to competency education. Competency Works Issues Brief. Retrieved from http://www.competencyworks.org/wp-content/uploads/2013/02/inacol_cw_issuebrief_building_mastery_final.pdf

Phillips, V., & Wong, C. (2012). Teaching to the Common Core by design, not accident. Phi Delta Kappan, 93, 31-37.

Programme for International Student Assessment (PISA). (2012). Key findings. Retrieved from http://www.oecd.org/pisa/keyfindings/pisa-2012-results.htm

Rice, J. K., Huerta, L., Shafer, S. R., Barbour, M. K., Miron, G., Gulosino, C., Horvitz, B. (2014). Virtual schools in the U.S. 2014: Politics, performance, policy, and research. A.

Molnar (Ed.). Boulder, CO: National Educational Policy Center. Retrieved from: http://nepc.colorado.edu/publication/virtual-schools-annual-2014
Rice, K., Siemieniecki, D., Siemieniecka, B., & Kelly, P. (unpublished manuscript). Crossing borders: An Exploration of educational technology in the U. S. and Poland. Funded by Nicolaus Copernicus University, Torun Poland.
Rice, K. (2009). Priorities in K-12 distance education: a delphi study examining multiple perspectives on policy, practice, and research. *Journal of Educational Technology & Society,* 12, 3, 163–177.
Rice, K., & Dawley, L. (2009). The status of professional development for K-12 online teachers: Insights and implications. *Journal of Technology and Teacher Education, 17*(4), 523-545.
Rice, K. L. (2006). A comprehensive look at distance education in the K-12 context. *Journal of Research on Technology in Education, 38*(4), 425-448.
Roblyer, M. D. (2008). Virtual schools: Redefining "A place called school". In J. Voogt and G. Knezek (Eds.) *International Handbook of Information Technology in Primary and Secondary Education, 20*(695-711). U.S.: Springer. The Center for Educational Reform. (2014). Choice and Charter: Laws and legislation. Retrieved from: http://www.edreform.com/issues/choice-charter-schools/laws-legislation/ The White House. (n.d.). Race to the top. Retrieved from http://www.whitehouse.gov/issues/education/k-12/race-to-the-top
Sarason, S. B. (1993). *The predictable failure of educational reform: Can we change course before it's too late?* San Francisco, CA: Jossey-Bass.
Searson, M., Wold, K., & Jones, W. M. (2011). Editorial: Reimagining schools: The potential of virtual education. *British Journal of Educational Technology, 42*(3), 363-371.
Silvernail, D. L., Stump, E. K., Duina, A. A., & Gunn, L. M. (2013). Preliminary implementation of Maine's proficiency-based diploma program. Maine Education Policy Research Institute. Portland, Maine: University of Southern Maine. Retrieved from http://usm.maine.edu/sites/default/files/cepare/SBE%20Report.pdf
Stoddard, C., & Corcoran, S. P. (2008). Charter politics: Why some places have more students in charter schools and others have fewer. *Education Next.* Retrieved from: http://educationnext.org/charter-politics/
U.S. Department of Education. (n.d.). Science, Technology, Engineering and Math: Education for Global Leadership. Retrieved from http://www.ed.gov/stem
U.S. Department of Education. (1958). National Defense Education Act (NDEA). *National Archives Online Public Access*. Retrieved from: http://research.archives.gov/description/299869
U.S. Department of Education. (1965) Elementary and Secondary Education Act (ESEA):

Retrieved from: http://www2.ed.gov/policy/elsec/leg/esea02/beginning.html and http://en.wikipedia.org/wiki/Elementary_and_Secondary_Education_Act

U.S. Department of Education. (1972). Title I: Improving the academic achievement of the disadvantaged. *State of Washington, Office of the Superintendent of Public Instruction.* Retrieved from: http://www.k12.wa.us/ESEA/Programs.aspx

U.S. Department of Education. (1983). *A nation at risk: The imperative for educational reform.* Washington D. C.: National Commission on Excellence in Education. Available: http://www2.ed.gov/pubs/NatAtRisk/index.html

U.S. Department of Education. (1992). Title IX and sex discrimination. *Office for Civil Rights.* Retrieved from: http://www2.ed.gov/about/offices/list/ocr/docs/tix_dis.html

U.S. Department of Education. (1994). Improving America's Schools Act of 1994. Washington, D.C.: ?? Retrieved from: http://www2.ed.gov/legislation/ESEA/toc.html

U.S. Department of Education. (1994). Goals 2000: Educate America Act. Washington, D.C.: ?? Retrieved from: http://www2.ed.gov/legislation/GOALS2000/TheAct/index.html

U.S. Department of Education. (1996). *Getting America's Students Ready for the 21st Century: Meeting the Technology Literacy Challenge.* Washington D.C: Office of Educational Technology. Retrieved from: http://www2.ed.gov/about/offices/list/os/technology/plan/national/index.html?exp=3

U.S. Department of Education. (2001). *The No Child Left Behind Act of 2001: Public Law 107-110*. Washington D.C.: ?? Retrieved from: http://www2.ed.gov/policy/elsec/leg/esea02/index.html

U.S. Department of Education. (2001). *E-learning: Putting a World Class Education at the Fingertips of All Children.* Washington D.C: Office of Educational Technology. Retrieved from: http://www2.ed.gov/about/offices/list/os/technology/reports/e-learning.pdf

U.S. Department of Education. (2004). *Toward a New Golden Age in American Education: How the Internet, the Law and Today's Students are Revolutionizing Expectations.* Washington D.C: Office of Educational Technology. Retrieved from: http://www2.ed.gov/about/offices/list/os/technology/plan/2004/index.html?exp=3

U.S. Department of Education. (2004). *Individuals with Disabilities Education Act (IDEA)*. Washington D.C.: Special Education and Rehabilitative Services. Retrieved from: http://www2.ed.gov/policy/speced/guid/idea/idea2004.html

U.S. Department of Education. (2010a). *Transforming American Education: Learning Powered by Technology*. Washington D.C: Office of Educational Technology. Retrieved from: http://www.ed.gov/technology/netp-2010

U.S. Department of Education. (2010b). *A blueprint for reform: The reauthorization of the* *elementary and secondary education act.* Washington D.C.: Office of Planning Evaluation and Policy Development. Retrieved from: http://www.ed.gov/esea

U.S. Department of Education. (2012). Enhancing teaching and learning through educational data mining and learning analytics: An issues brief. Washington, D.C.: Office of Educational Technology. Retrieved from http://www.ed.gov/edblogs/technology/files/2012/03/edm-la-brief.pdf

U.S. Department of Education. (2013). ConnectED Initiative. Washington D. C.: Office of Educational Technology. Retrieved from http://www.ed.gov/edblogs/technology/connected/

U.S. Department of Education. (2013b). A blueprint for R.E.S.P.E.C.T. Recognizing educational success, professional excellence and collaboration. Retrieved from http://www2.ed.gov/documents/respect/blueprint-for-respect.pdf

U.S. Department of Education. (n.d. (a)). Family educational rights and privacy act. Retrieved from http://www.ed.gov/policy/gen/guid/fpco/ferpa/index.html

U.S. Department of Education. (n.d. (b)). Competency-based learning or personalized learning. Retrieved from http://www.ed.gov/oii-news/competency-based-learning-or-personalized-learning

VHS, Inc. (2002). VHS, Inc. annual report: Innovation education online. Retrieved from http://thevhscollaborative.org/sites/default/files/AR.VHS_.final_.pdf

Watson, J., & Gemin, B. (2009). Promising practices in online learning: Policy and funding frameworks for online learning. Washington, D.C.: International Association for K-12 Online Learning. Retrieved from: http://www.inacol.org/cms/wp-content/uploads/2012/09/NACOL_PP-FundPolicy-lr.pdf

Watson, J., Murin, A., Vashaw, L., Gemin, B., & Rapp, C. (2013). Keeping pace with K-12 online & blended learning: An annual review of policy and practice. Durango, CO: Evergreen Education Group. Retrieved from http://kpk12.com/cms/wp-content/uploads/EEG_KP2013-lr.pdf

Web-based Education Commission. (2000). *The power of the Internet for learning: Moving from promise to practice.* Website name?? Retrieved from: http://interact.hpcnet.org/webcommission/index.htm

Woodbury, S., Gess-Newsome, J. (2002). Overcoming the paradox of change without difference: A model of change in the arena of fundamental school reform. *Educational Policy, 16,* 763-
http://epx.sagepub.com.libproxy.boisestate.edu/content/16/5/763.full.pdf+html

Worthen, M., & Pace, L. (2014). A K-12 federal policy framework for competency education: Building capacity for systems change. A Competency-Works Issues Brief. Washington, D.C.: International Association for K-12 Online Learning. Available: http://www.competencyworks.org/wp-content/uploads/2014/01/CompetencyWorks_A_K-12_Federal_Policy_Framework_for_Competency_Education_February_2014.pdf

Chapter 4

A Brief Look at the Methodologies Used in the Research on Online Teaching and Learning

Susan Lowes, *Institute for Learning Technologies, Teachers College/Columbia University, lowes@tc.edu*

Abstract

This chapter looks at the research methods used during the first ten years of research on online teaching and learning. It first reviews overall approaches and research designs, moves on to a brief discussion of the early studies that compared online and face-to-face learning, and then looks at the specific methods used by different researchers, including surveys, interviews, and ethnographic studies, and at the different types of analysis, including content analysis and learning analytics. The discussions of each approach and method are illustrated with examples from studies in the field.

Introduction

The goal of this chapter is to look at the methodologies that have been used during the first ten years of research on online teaching and learning at the K-12 level. In what follows, we will first look at the overall approaches and research designs (methodologies) and then at the specific means of collecting and analyzing data within an approach, such as surveys and interviews (methods). Researchers generally break research designs into two categories. The first is quantitative research designs, which include both experimental and quasi-experimental studies. The second is qualitative research designs, which are primarily case studies, including ethnographies and more narrowly framed studies of smaller groups (teachers, students, classrooms). Although some methods and types of analysis tend to be associated with specific research designs—statistical analysis with experimental designs, for example, and content analysis with case studies—data collected using almost any method is often analyzed quantitatively. In addition, many researchers, and particularly evaluators, use a mix of methodologies, for example by combining an experimental study with a series of smaller qualitative case studies to help explain the results and give voice to the participants. All of these approaches, when done carefully and transparently, are equally valid. Each brings a different perspective and type of information to the research question. In addition, different methods may also allow us to address new and different questions.

When we look at the research designs used to study online learning at the K-12 level, we find that there are very few experimental studies and only a few more quasi-experimental studies, most of which were done in the early days when comparing online and face-to-face learning seemed important. The rest of the research therefore falls under the broad heading of case studies—of classes, courses, schools, or groups (teachers, administrators, students)--published as journal articles and chapters in edited collections. To date, there are no books by a single author. Not only was there a great deal of groundwork that needed to be done before classic in-depth academic studies could begin--we had to know more about what we were studying in order to know what questions to ask--but academic books often derive from dissertations, and it is only in the last several years that any dissertation-level studies have been completed.

The lengthiest studies are program evaluations of virtual schools or virtual schooling course providers, often undertaken to meet the requirements for outside (federal, state, or private) funding. These evaluators' reports are a tremendous resource, but they are seldom published, although some (but not all) schools and evaluation organizations put them online. They will only be discussed here if the evaluators published their results in research journals.

We also have a great deal of practical experience, much of which has been built into guidelines and standards for teaching, administration, and course design. It should be noted, however, that although these guidelines may be sound in terms of past experience, a study of some of the standards (Ferdig, Cavanaugh, et al., 2009) argued that many are not backed by research, particularly at the K-12 level. There are also many articles written by practitioners from personal experience, such as some of the chapters in the volumes edited by Cavanaugh and Blomeyer (2007) and Ferdig and Cavanaugh (2010). These are not research in a traditional academic sense and so will not be discussed here, but they are an invaluable resource for understanding this rapidly expanding world and provide the base for subsequent academic research.

In addition, this review will not discuss those articles and reports that, although written by academics, are designed for advocacy purposes. They include lessons relating to policy and practice that are based on the researchers' experience working with virtual schools, often as evaluators or advisors, and suggest best practices or revisions of current practice—for example, iNACOL's series *Promising Practices in Online Learning* and its many *Research Briefs;* the reports from the National Education Policy Center at the University of Colorado (2011, 2012); and the reports written for state governments (for example, the Trujillo Commission report on Colorado in 2007 and the report from the Office of the Legislative Auditor in Minnesota in 2011).

The research described in the following pages has been chosen as illustrative and is not by any means exhaustive. Unlike a traditional literature review, articles are not summarized but instead used as examples of approaches. The focus is entirely on K-12 online teaching and learning. There is a far more extensive body of research on online learning in higher education, but adult learners are different from K-12 learners (even from high school learners), and it is an as-yet unresolved (but researchable) question which aspects of what has been learned from higher education can be applied to K-12. The focus is also entirely on fully online learning, although that can encompass different instructional models, from paced virtual classrooms with both student-teacher and student-student interaction to self-paced courses that rely primarily on student-teacher interaction, from courses where most of the interaction is synchronous to those where it is almost entirely asynchronous. One of the weaknesses of the literature is that the model is often unspecified, although it clearly affects both teaching and learning.

Experimental and Quasi-experimental Research: Comparing Online and Face-to-Face Environments

Many of the early studies of K-12 online learning compared online to face-to-face, the result of an early policy need to show that learning online is just as good as (or better than) learning in classrooms in brick-and-mortar schools. Administrators and online course providers wanted this type of analysis in order to argue for funding. Many research hours were spent on these comparisons, including not only individual studies but extensive meta-analyses (the three examples of meta-analyses are Bernard, Abrami, et al., 2004; Cavanaugh, Gillan, et al., 2004; U.S. Department of Education, 2009). In general, the meta-analyses suggested that online (done well) is as good as face-to-face (done well). However, very few of the studies included in the meta-analyses were found to have been well designed, many were actually referring to blended or hybrid courses, only some came from K-12 environments, and most had very small populations of students. In fact, the most recent meta-analysis, done by SRI for the US Department of Education, found only nine studies conducted with K-12 students and all of these were in some kind of blended environment.[1]

These studies can be classified as quasi-experimental because randomization into the two situations (online and face-to-face) is almost never possible. Instead researchers attempted to match the two groups on the characteristics that they believed to be most important. However, this proved to be very difficult. We know from prior research (as well as our own experience) that many different factors have an impact on student results in face-to-face classrooms. These include teacher expertise, student characteristics (including the most important variable, prior achievement), the curriculum itself, and the design of the instruction. Thus if we were studying the benefits of a new course in a face-to-face setting, we would consider the new course's results (however we define them) to be the variable under study and control for as many of the other factors as possible. For example, we would want the same teacher or one with comparable qualifications, and we would want the students to be similar in terms of background and prior learning, would want them to have to spend the same amount of time on the subject under study, would want them tested with the same end-of-course test, and so on. The same holds true for comparing online and face-to-face classrooms. If the environment is the variable we are testing, then we need to control for every variable except the environment itself.

The problem is that this has not been possible, for a number of understandable reasons. Probably the most important is that the students in the online course are almost always different from the students in the face-to-face course, simply because they made this choice. For example, as part of their evaluation of the Alabama ACCESS distance-learning program, Peggy Roblyer and colleagues (Roblyer, Freeman, Donaldson, & Maddox, 2007) compared the results of synchronous online delivery with in-person classroom delivery. Although the students in the face-to-face delivery classrooms had significantly better achievement scores, the authors note that there was no control for prior student abilities, making the results unreliable. In

1 This raises the issue of how to define a course as online. For example, two excellent studies cited in the DOE report as examples of online learning would today be considered blended. One was a study of an online algebra course delivered to students in school settings by in-class teachers that was compared to the same course delivered to students in a school setting by distance teachers with in-class assistant teachers as support (O'Dwyer, Carey, & Kleiman, 2007) and the second was an evaluation of a Spanish course delivered to students in a combination of face-to-face and online in a school setting (Rockman et al., 2007); both therefore had a major face-to-face component and an in-class teacher or teaching assistant. By our definition, these are blended rather than online courses.

other words, it was possible that the students in the synchronous online courses were the lower achieving students to start.

A second important reason for the difficulty in making these comparisons is that there is a greater likelihood of attrition in online courses than in face-to-face classrooms, so even if the students are comparable at the start, the online students are a self-selected group by the end. Both of these were issues faced by Hughes, McLeod, et al. (2007) in their study of algebra students in online and face-to-face schools. Not only were the students different from the start, with a much higher percentage of the face-to-face students being college-bound, but many students did not complete the online course, presumably leaving only the stronger students with final grades. To make the situation even more difficult, the end-of-course assessment was voluntary for the online students--and few of them volunteered. Given these issues, it is not surprising that the online students appear to have outperformed the face-to-face students.

It seems likely that differences in instructional design play an important role in differences in outcomes in the two environments but comparing the impact of design factors has been difficult because the costs of course design make providers reluctant to alter design aspects for the sake of a comparison. One of the few attempts was that of Cathy Cavanaugh and her colleagues in 2005, when they compared the use of a module in an Algebra course that included an interactive toolset for teaching linear equations, a particularly difficult concept in Algebra, with one that did not (Cavanaugh, Gillan, et al., 2008). The courses with and without tools were carefully aligned, the students were pre-tested in order to remove those who could have completed the module with no difficulty, and the students were assigned to the two conditions based on their time of entry into the course, with later students using the interactive tools. Although this was not random assignment, there was no reason to assume bias. However, the results were inconclusive because of the small group size and the very different size of the two groups at the end. Again, attrition in the online group, as well as incomplete assessment results, may have affected the results.

An example of an effort to control for all these issues is a recent quasi-experimental study of middle school students' attitudes to learning online compared to learning face-to-face (Edwards & Rule, 2013). The study was quasi-experimental rather than experimental because the two groups of students, although both were of mixed ability, had not been randomly assigned to each condition but had been previously assigned by their teachers. This was handled by having the groups alternate between online and face-to-face versions of the course over two semesters. As with the Cavanaugh study, the course modules were carefully aligned (printed textbook versus digital textbook, stand-up lecture versus recorded lecture, etc.), although in this case the result was to remove the potential advantages of online learning in favor of controlling for the differences. The students were surveyed three times during the year to assess their understanding of mathematics, their enjoyment of learning, and their enjoyment of each mathematics topic. Students favored online learning for enjoyment—although there was a drop in the effect size over the course of the year—and for learning mathematics concepts, primarily because they could work at their own pace, but did not like the online mode of teacher-student communication. Subsequent analysis of gain scores showed no difference between the groups (Edwards, Rule, & Boody, 2013).

As noted above, it is very difficult to do experimental studies in established educational settings where students, classrooms, or schools can be randomly assigned into treatment and control conditions. It is even more difficult in the area of online learning, much of which is supplemental, where both students and teachers are distributed across many geographic spaces. However, it is generally agreed that students taking online courses need support in their schools, a role fulfilled by a local facilitator. One of the few examples of an experimental design is a study of whether having a local facilitator trained in learner-centered psychological principles (LCPs) would lead to greater engagement and higher completion rates among students in rural schools taking a supplementary online course compared to having a local facilitator without that training (Hannum, Irvin, Lei, & Farmer, 2008). The experimental design was possible because the intervention was specifically designed by the researchers to address their research question. Schools were recruited, paired for similar demographic characteristics, and then assigned to the treatment or control, with facilitators in both groups receiving training but the treatment facilitators receiving specific training in LCPs. The 246 students in 36 schools took the same single course with one of two teachers. The researchers found that the students in the experimental schools remained in the course longer and were more likely to complete than students in the control group, regardless of which teacher was teaching. They include a discussion of why their findings may not apply more widely that is at the same time an interesting analysis of the differences between rural and other students.

Overall, then, it has proved very difficult to find a situation where it is possible to keep teachers, students, and content equal, with the result that these studies have been comparing non--comparables. And the fact is that many of the variables *should* change—one of the points of having an online option available to students is that they may benefit from an environment that is very different from their face-to-face classrooms. The lack of success of these efforts has led to a shift in the research from comparing environments to trying to understand the online environment itself.

Case Studies: Looking Within the Online Environment

When little is known about a type of teaching and learning, case studies provide the background and insights on which further research can be built. They come in many forms—studies of groups, such as teachers, or of classrooms, or even individuals—and can use almost any data collection method or combination of methods, each with its advantages and disadvantages. In the sections below, we look at a number of case studies, beginning with the two most frequently used methods—surveys and interviews—and then briefly discussing content analysis and statistical modeling.

Surveys

Surveys are a useful tool for understanding a population, and early researchers in online learning tended to survey the populations they were interested in. This has provided us with a fairly large collection of analyses based on broad surveys of perceptions, attitudes, and experiences. All of these were extremely useful as a starting point and at the same time pointed to areas for further research and discussion.

Survey results have to be used carefully, however, particularly when the characteristics and size of entire population are not known, because it is impossible to know if those who respond are representative of the larger population. In the case of online learning, this has often been an issue. In addition, with broadcast surveys— surveys in which there is no personal relationship with those surveyed and/or no incentive to respond—the response rate is often low. This means that the results can only be analyzed using basic statistics (generally frequencies) and are not easily generalized to other groups (i.e., to other teachers, other students, or even to other types of teachers or students). If the responses are consistent across respondents, we can have some confidence that the findings are likely to apply to most of the rest. If they are not—if there is a great deal of variation—then there are a number of next steps that need to be taken to explain the results, for example by doing follow-up interviews with those at the extreme ends of whatever scale is in use.

In most of the early attempts to survey the field of online teaching and learning, the size of the specific population was unknown, the response rate from those surveyed was low, and the results have shown not consistency but variation. This work has thus been very useful in showing the range of experience in the field but less so in showing the proportions within that range.

Here are a few examples.

Surveys of Teachers

When the recent upsurge in online learning began in the mid-2000s, little was known about who was teaching online, so the goal of some of the early survey work was to find out more about these teachers and their needs. In 2007, Kerry Rice and Lisa Dawley conducted the first national survey of online teachers and their administrators and trainers in order to gather descriptive data on their experiences, with a focus on professional development (Rice & Dawley, 2009). They received 259 responses from a purposeful (i.e., deliberately chosen) sample of administrators, teachers, and professional development trainers working in a wide range of types of online schools or programs. There was no assumption that the respondents were representative of the larger population. Instead, the results showed that there were many different models for delivering professional development, with different amounts, different providers, and different topics covered.

While Rice and Dawley focused on professional development, Archambault and Crippen followed a similar procedure in their more general study of the characteristics of teachers who taught or had previously taught at least one online class with K–12 students in a state-sanctioned virtual school in the United States (Archambault & Crippen, 2009). They sent their survey to 1,795 teachers, using email addresses collected from the websites of state-sponsored schools listed in the annual *Keeping Pace with Online Learning* for 2006 (Watson, 2006). They found that those who responded were (at that time) more likely to be part-time than full-time, teaching only one or two courses online, had more years of traditional teaching experience than the national average for face-to-face teachers, and were more likely than the general teaching population to have Master's degrees. Equally important, in terms of personal characteristics, these teachers were generally adventurous and looking for new challenges. However, the researchers had a 33 percent response rate. This is low and, since the total population of teachers was unknown but presumably even larger than the number who received the surveys, we can assume the percent of actual teachers included in the results is even lower. This was therefore probably a biased sample, and although we do not know the direction of the bias, it seems likely, given the data, that those who responded were the most satisfied and engaged online teachers.

The authors were able to follow up with the 80 respondents who had reported that they were teaching secondary science, sending them a new survey that asked how laboratory activities were being enacted in these courses (Crippen, Archambault, & Kern, 2013). The response rate was still low (35 percent) so the percentages of each activity may not be representative, but the real value of the results was in the examples of the range of activities rather than in the proportion of each practice.

Other researchers have surveyed smaller sets of teachers, generally from one school. For example, Lowes (2010) surveyed teachers at Virtual High School in order to look at the migration of teaching practices between face-to-face and online classrooms as these teachers moved back and forth between the two. Oliver, Kellogg, Townsend, and Brady (2010) surveyed elementary and middle school teachers at North Carolina Virtual Public School to elicit their needs in developing their online courses, finding that they wanted bite-sized and targeted professional development that covered a wide range of topics beyond the actual curriculum itself.

Surveys of Students

Researchers who wanted to see how students perceived the benefits and challenges of online learning have also relied on surveys—in part because the students are often scattered across a wide geographical area and hard to reach by other means. Low response rates have been an issue here too. For example, in Michael Barbour's study of students taking an online course that combined synchronous and asynchronous modes of interaction (Barbour, 2008), it is unclear how large the surveyed population was—no numbers or response rates are given—but since the survey was circulated in 18 schools, 36 respondents seems small and the findings—high satisfaction rates, for example—suspect, since it is generally those who are satisfied who take the time to respond to surveys.

Much of the research on students has used existing end-of-course surveys, sometimes modified to address specific research questions. As with all surveys, these too suffer from possible response bias. A good example is a study of secondary students' expectations of their teachers at North Carolina Virtual Public School (Oliver, Osborne, & Brady, 2009). The researchers received 1,648 surveys, a large number but a response rate of only 32 percent. The findings were ambiguous and the reasoning behind the responses was unclear, leading to the need for in-depth content analysis of the responses to the open-ended survey questions (see below). In contrast, Ferdig (2010b) had a 70 percent response rate from a small group of 27 at-risk students at Michigan Virtual School and was able to use the results to look closely at what these students perceived as success. For example, he found that they felt that their relationships with their online teachers were better than their previous relationships with their site-based teachers, that their courses were better organized, and that they were better able to express themselves in the online environment—in other words, they found that some of the difficulties they had faced in their face-to-face classrooms were remedied in the online environment.

More recently, researchers have been able to develop their own surveys that address specific questions that they are interested in. For example, Jered Borup and colleagues (Borup, Graham, & Davies, 2013) developed a survey to measure the time that students in a full-time online school and their parents spent on course interactions and what those interactions focused on. They chose to look at students in a core freshman English course in two different semesters—a total population of 250. They had 82 student-parent paired responses, a 33 percent response rate. Although the respondents may have been a biased group, the range in the amount of interaction was large enough to presume it covered all likely responses—even if the percent of each may not be exact—and the fact that the researchers could correlate parent and student results, as well as correlate both with outcomes, make this a particularly innovative study.

Some researchers have used the results of end of course surveys to investigate differences among the course subjects. For example, in analyzing student surveys from North Carolina Virtual Public School, Kevin Oliver and his colleagues (Oliver, Kellogg, & Patel, 2010, 2012) found significantly lower levels of satisfaction among students taking foreign languages and math, with lower percentages feeling they were likely to succeed, that they were learning as much or more online as they would have in a face-to-face course, reporting that the instructions were helpful, saying they would recommend the course to a fellow student, saying that their teacher was well prepared, and so on. It was clear that something was going on with these two subject areas. To understand these findings, they then did follow up surveys to both sets of students and teachers, this time with open-ended questions, which were analyzed qualitatively. Although the response rates were low—between 20 percent and 25 percent for the students--the two types of data together made it possible for them to develop an extensive set of recommendations for designing and teaching courses in these particular subject areas.

Surveys of Administrators

In the early days of online schooling, most of the teachers were face-to-face classroom teachers who moved into online teaching. As the field grew and it became evident that many more teachers would be needed, questions began to be raised about the extent to which schools of education were preparing pre-service teachers for online teaching, and particularly whether they were providing the online counterpart to the traditional field experience. Kathryn Kennedy and Leanna Archambault (Kennedy & Archambault, 2011) used a survey of administrators in order to explore what models of field experiences existed to prepare pre-service teachers for teaching online in the K-12 environment. They came at this from two directions--by surveying teacher education programs and also surveying K-12 online learning programs. The teacher educator survey went to field experience contacts at all teacher education programs listed by NCATE and AACTE, for a total of 1,525 recipients. The program survey went to the entire iNACOL list, which includes administrators, teachers, and others who had joined because of an interest in K-12 online learning, and was also posted on various websites. There was a 34 percent response rate for the first list, but the rate for the second list is unknown since the total population was unknown. Because the response rate was low, the authors note that the results were descriptive rather than definitive. Nevertheless, their finding that only a few of the colleges and universities that train students to teach in face-to-face classrooms are also training them for online teaching and that very few virtual schools were currently offering pre-service teachers training placements or field experiences confirmed what had been known only anecdotally and led several virtual schools to open their doors to these types of experiences.

Some of the research that has used surveys has drawn from more than one data source, generally in order to find factors that correlate with course success. For example, in early days of online learning when high drop-out rates were a major concern, researchers were interested in determining the characteristics of those most likely to succeed. In 2002, Roblyer and Marshall developed and administered an instrument (the ESPRI) that they hoped would predict the likelihood of a student succeeding in a course—not to discourage enrollment but to identify those who might need additional support. They then (Roblyer, Mills, Marshall, & Pape, 2008) surveyed all the students at one supplementary course provider using a revised ESPRI instrument. The response rate was relatively high—about 70 percent of the total number of students at the school—but in the end there were complete data sets (i.e., including such additional data as demographics and course scores) for only about 53 percent. A binary logistical regression analysis, using the ESPRI score and a series of background variables, showed that some variables were predictive, including students' past ability (as reflected in GPA), environmental conditions such as having time in school the complete the course, and such cognitive student characteristics as self-efficacy. However, these factors were far more predictive of success than of failure. In other words, it was easier to identify those who were likely to succeed than those who were likely to fail. Once again, this may have been because those students likely to fail had already dropped the courses.

Interviews

Interviews are used to probe for deeper understanding than surveys allow, but time constraints generally mean a much smaller number of respondents. Interviews have therefore been used less frequently than surveys. An early example was Roblyer's interviews with teachers from five virtual schools in order to find out what they believed to be the ingredients that supported student retention (Roblyer, 2006). A similar effort was Meredith DiPietro's study of 16 "successful" online teachers at a Midwestern virtual school in order to elicit the perceptions they held regarding their instructional roles and gain insight into the instructional strategies supporting their coordination of pedagogy, technology, and content (DiPietro, 2008, 2010). The teachers were deliberately chosen on the basis of their experience teaching online, their certification, and their identification as successful by the school. Analysis of the results elicited five themes or beliefs, each with associated specific pedagogical practices, that these teachers consistently held to be important--connecting with students, fluid practice into teaching online, engaging students with the content, managing the course, and supporting student success. This work made it clear that online teachers were highly aware of the differences between online and face-to-face and of what they had found were the "best practices" needed to be effective in the online environment.

Other interview-based research has focused on programs and administrators. Lowes (2007) interviewed four of the largest online course providers to learn how they had constructed their professional development offerings, including the underlying pedagogy and how that translated into practice. Similarly, Kathryn Kennedy (2010) interviewed six virtual school administrators across the United States and used these results to find out what mentors—individuals specifically given the role of helping teachers—were doing in virtual schools. She used the results to identify three quite different roles and then described how these played out in each school. This type of in-depth analysis shed much-needed light on the variety of practices across the world of virtual schools.

More recently, Jeffery Drysdale and colleagues interviewed online mentors—called "shepherds"-- for a full-time online public charter high school (Drysdale, Graham, & Borup, 2014) in order to determine how they perceived and fulfilled their roles and how they felt the shepherding affected their teaching. This is one of the few studies that started with focus groups, which are useful for providing information that is then used in developing surveys or interview protocols. Five of the focus group participants who taught different subjects were then invited to participate in additional in-depth interviews. The resulting qualitative analysis revealed the several different roles the shepherds felt they played, often simultaneously, and how they believed that the act of shepherding helped them become more effective teachers.

Ethnographic Studies

Ethnographic studies attempt to understand a setting from the inside (ethno) by looking at a research question from the point of view of the subjects of the study. Ethnographies generally involve fieldwork—visits to the site of teaching or learning—as well as interviews and document analysis. While the numbers of people observed is generally small, ethnographic studies provide rich detail that cannot be obtained in other ways. Ethnographies are generally case studies—one school, one course, or even one individual—and so may not be generalizable, but they provide a look into how virtual learning operates in a way that other methods do not.

There have been a few studies of online teaching and learning that could be called ethnographic, although most were fairly short term and focused on narrow research questions. Since it has proved difficult to get permission to look so deeply into a course, these types of studies have often been conducted by "insiders"—former or current teachers in the school under study or researchers working as part of evaluation teams for that school. And since ethnographies by definition need observation and observations are difficult in a virtual environment where the participants (both teachers and students) are dispersed, most of these have focused on students as they take their online classes while sitting in their face-to-face classrooms.

An early example is the ethnographic case study of students in a rural school in Canada carried out by Michael Barbour and colleagues in 2005 but not published until recently (Barbour & Hill, 2011). Using interviews with students taking synchronous online courses, video-recorded classroom observations of these students in their distance-learning classrooms, and interviews with online teachers, they were able to provide a nuanced picture of how these students used their class time (generally not for class work), the extent to which a community developed among classmates, and their use (or not) of the resources provided. This was followed by analyses of two individual students: at-risk student and a female student who was struggling with her online course (Barbour & Siko, 2012; Barbour, Siko, Sumara, & Simuel-Everage, 2012). Although the data was collected some time ago, these case studies nevertheless provide insights student behavior in synchronous online courses that is still relevant today.

Another example of the use of an ethnographic approach is Laura Ingerham's study (Ingerham, 2012) of the benefits of interactivity among students in an Algebra course at North Carolina Virtual Public School. Here too the observations were of students working on their online course during regular class time, with a focus on four students in each of several classes. The result was a detailed look at how students spend their time "in" an online course—although in this case, a key finding was that they spent a great deal of the class period doing other things than the coursework itself.

Studying online teachers at work is even more difficult logistically than studying online students at work. Marley Belair attempted this in her study of how daily phone calls by teachers affect students in four virtual high schools (Belair, 2012). She observed and interviewed teachers at work and also interviewed a few of their students, and then combined these with archived communications, student submissions, phone logs, and teacher notes. Not all observations were strictly in-person—some were via webcam—but they were all scheduled for times when the teachers planned to be communicating with their students. Although it is possible that the information learned in the interviews could have been elicited with a survey, it is likely that the researcher would not have known enough about the communication process to ask the right questions. The teacher interviews, which immediately followed the observations, were able to add the teacher's perspective to the communication process.

A final example is Lisa Hasler Waters' recent study (Hasler Waters & Leong, 2014) of the multiple roles played by learning coaches and teachers in a cyber charter school in Hawaii. These were self-paced courses for home-schooled students where most of the interaction was one-on-one with the teacher, facilitated by the learning coach in the home. Hasler Waters used interviews, field observations (including home visits), and documents (such as email correspondence) in order to see these roles from the subjects' point of view.

Not surprisingly, given the amount of time involved in this kind of research, all of these articles were based on dissertation studies. In addition, none of these—and particularly the Ingerham and Barbour studies--were ethnographies of virtual environments as such but took place in the physical spaces where the individual students took their online courses. For a look at the teaching and learning inside these courses, we need to turn to two different types of research. One uses various forms of content analysis to look at interactions within the online courses and the other uses data from the course management systems used by the online programs in an attempt to discern patterns that indicate engagement or learning and can then be correlated with other indicators of success.

Content Analysis

Content analysis is used in qualitative studies to analyze any form of communication, written or oral.[2] It can take the form of highly complex semantic analysis or less linguistic content analysis. In the field of online learning, the "discourse" generally takes the form of written teacher-student or student-student communication, often in a discussion forum. In higher education, much of this work has been based on modifications and adaptations of the Community of Inquiry (COI) framework, which was developed for analyzing discourse in computer-supported environments (Garrison, 2007; Swan et al., 2008). COI comprises three analytical categories—social presence, cognitive presence, and teaching presence—and although not all researchers use the detailed analytic categories set out by Garrison and Swan, the term "teacher presence" in particular has infused the thinking in this area.

One of the first examples in the field of K-12 online learning is Sarah Haavind's study of dialogue in discussion forums in over 100 Virtual High School (VHS) courses offered in Spring 2003 (Haavind, 2007). This was still early days for fully asynchronous online courses and there was a great deal of discussion about best practices for facilitation and the challenges of encouraging student-student interaction in the main site of such interactions at VHS, the discussion forum. Haavind's indicator of collaborative dialogue was thread depth over three (in other words, beyond an initial post and a single response). She chose three classes that appeared, on the basis of thread counts, to be highly interactive and analyzed the threads in terms of the quality of the student conversations and the amount and type of teacher presence (discourse facilitation, evaluation, and feedback). She found a complex interplay among these, along with the instructional design of the course itself.

De la Varre, Keane, and Irvin (2011) also looked at teaching presence, but they did this by expanding the definition of teacher to include on-site facilitators and then used the components of teaching presence to analyze interviews with a subset of facilitators and instructors about the practices and activities of on-site facilitators who had been part of the randomized control study discussed above (Hannum, Irvin, Lei, & Farmer, 2008). Although they did not analyze the results quantitatively (i.e., counting the number or percent of each type of discourse), as

---

2 There is a distinction between discourse analysis and content analysis, and a distinction between both and conversation analysis. Most of the work cited here falls into the category of content analysis within a discourse analysis framework—in other words, it is inductive, contextualized, and exploratory but often using other scholar's coding schemes. It will be referred to as content analysis. For more on the differences between the two, see Hardy, Harley, & Phillips, 2004.

many who use the COI framework do, the results provide an in-depth look at how teachers see the role of facilitator and how facilitators see their own roles.

Other studies have used content analysis to analyze the open-ended questions in end-of-course surveys. For example, in their study of North Carolina Virtual Public School, referred to above, Oliver and colleagues (Oliver, Osborne, & Brady, 2009) used content analysis to analyze the responses to open-ended questions in order to explain their otherwise ambiguous quantitative results. They found that students had unrealistic expectations of what online teachers can be expected to do ("explain" things more), wanted voice or video explanations, wanted interactive things that help them learn (problems, quizzes, activities, exercises—not worksheets), wanted real-world examples and projects, and, most important, wanted lots of individualized attention. Although the results seem obvious now, at the time they provided new insights into how students view these courses and showed NCVPS areas in which it could improve its course design and delivery.

More recently, Lowes (2014) looked at group work in asynchronous online courses by conducting an in-depth analysis of student discourse during a series of group projects. The data included not only student contributions to the discussion forums but a step-by-step analysis of each student's contribution to a group wiki. Time consuming as it was, her overall finding--that there may not be as much "group" in group work as course designers and teachers believe—could not have been achieved with any other approach.

Learning Analytics

Moving beyond the basic who and what generally requires correlational studies. These studies range from those that look at simple correlations—for instance, between course success and such student factors as satisfaction with the teacher—to those that build sophisticated statistical models.

A good example of using only course provider outcome data is Ferdig's analysis of the relationship between teacher factors and course outcomes at Michigan Virtual School (Ferdig, 2010a). He found wide variations in student completion rates by teacher for some courses but not others and was then able to tease out differences among the teachers in terms of the environments in which they were more likely to be successful. For example, some teachers did better with large classes while some did better with small classes; similarly, some preferred specific course designs while for some this did not matter. This type of analysis moved beyond simple categorizations of "good" and "poor" teachers to look at the fit between teaching styles and online class situations.

As Ferdig and Cavanaugh noted in their introduction to *Lessons learned from virtual schools: Experiences and recommendations from the field* (2011), most K-12 online and blended schools and programs are woefully unprepared for the collection and analysis of the data that is required to truly inform and transform practice. There has therefore been very little use of data from the different Learning Management Systems (LMS), in part because online providers have been reluctant to provide datasets and in part because such data is difficult to manage and interpret. The analyses that exist have used this type of data to link in-course activity with student success or to combine it with data from other sources, such as background data or satisfaction survey results, to the same end. With the growing popularity of "data mining" and with growing technical understanding of how to extract and analyze such data, more such studies are likely in the next few years.

An early attempt to use LMS data was Patrick Dickson's brief analysis of Blackboard's very basic "click" results, part of a larger study of student behavior and performance at Michigan Virtual School (Dickson, 2005). Dickson found that total number of clicks was highly correlated with academic performance. There were no similar attempts until 2011, when Feng Liu published his much more statistically sophisticated set of studies of data from one virtual high school--one analysis of Biology courses, another of Algebra courses, and a summary article that analyzed 15 high enrollment courses, including those for Biology and Algebra (Liu & Cavanaugh 2011a, 2012a, 2011b). Liu used HLM to analyze the impact on achievement (as measured by end of course exam results) of learner background characteristics (such as race/ethnicity, full-time or part-time status, participation in a free or reduced lunch program), one learning environment characteristic (number of teacher comments in the course itself), and LMS activity (number of times logged in and amount of time spent logged in). He found a very mixed picture: although time spent in the system was the factor that had a significant effect for more courses than any other variable, it was not consistent for all courses, while other factors were significant for some courses but not others.

A more recent and more statistically sophisticated analysis comes from a study using LMS data from one statewide provider with between 3,000 and 4,000 students (Hung, Hsu, & Rice, 2012). The researchers had access to student demographic data, their course evaluation surveys, and an extensive set of LMS data that they used to measure student levels of engagement. These combined data sets allowed them to explore the differences in outcomes and engagement levels by subject and gender. A decision tree analysis then showed that level of engagement and gender had stronger effects on final grades than such environmental variables as age, school, or city. This, as well as a number of additional findings, allowed them to suggest that certain students were more likely to be successful in online courses and certain students were more likely to be at risk of failure--but again, this was not necessarily with a high degree of certainty.

These findings—or lack of clear-cut findings--suggest that using LMS data is far from simple. For example, it seems likely that instructional design issues are more important in online environments than in face-to-face classrooms, so that the type of activity when logged in may be more important than the time spent. In addition, the relationship between time and final results may not be linear, both because efficiency of time use may be a factor and because time spent in a course may become more or less important as the course evolves. Determining this may require much more sophisticated statistical analysis and/or the addition of extensive qualitative work.

Conclusions

The goal of this rapid tour through the existing approaches to research on online learning has been to show how different methodologies are used at different stages in the evolution of research in a field, but also to show how different methods can be used to address similar questions. For example, in a new area of research such as online learning was in the early 2000's, surveys that cast a wide net were needed in order to discover the varieties of practice. At the same time, small-scale case studies were also necessary to understand the deeper meaning of the practices that the surveys uncovered. Similarly, as data mining produces insights into teacher and student behavior inside a learning management system, we will need interviews with those same teachers and students to interpret the results. In terms of research methodologies, then, we can expect a continuation of the same combination of broad and narrow.

In addition, the more we know, the more we find there is to learn. As the body of research grows, the field attracts more researchers; and as these researchers take faculty positions, research on online teaching and learning becomes an increasingly acceptable academic pursuit for their graduate students. More and more academic journals now welcome this research, and journals and research centers dedicated to online learning contribute to this growth. We are just beginning to see the results of these changes and can expect a real blossoming of more sophisticated quantitative, qualitative, and, most particularly, mixed methods research on online teaching and learning in the near future.

References

Archambault, L.M. & Crippen, K.J. (2009). "K-12 Distance Educators at Work: Who's Teaching Online Across the United States," *Journal of Research on Technology in Education 41*(4): 363-391.

Belair, M. (2012). "An Investigation of Communication in Virtual High Schools," *The International Review of Research in Open and Distance Learning 13* (1): 105-123.

Barbour, M.K. (2008). "Secondary Students Perceptions of Web-Based Learning," *Quarterly Review of Distance Education* 4(9): 357-372.

Barbour, M. & Siko, J. (2012). "Virtual Schooling Through the Eyes of an At-Risk Student: A Case Study." *European Journal of Open, Distance, and E-Learning*, January.

Barbour, M., Siko, J., Sumara, J., & Simuel-Everage, K. (2012). "Narratives from the Online Frontier: A K-12 Student's Experience in an Online Learning Environment." *Qualitative Report 17*, Article 20: 1-19.

Bernard, R.M., Abrami, P., et al. (2004)). "How Does Distance Education Compare with Classroom Instructions? A Meta-Analysis of the Empirical Literature," *Review of Educational Research 74*(3): 379-439.

Borup, J., Graham, C., & Davies, R. (2013). "The Nature of Parental Interactions in an Online Charter School," *American Journal of Distance Education 24*: 40-55.

Buechner Institute for Governance. (2012). *A Study of Online Learning: Perspectives of Online Learners and Educators*, October.

Cavanaugh, C., Gillan, K.J., et al. (2004). *The Effects of Distance Education on K–12 Student Outcomes: A Meta-Analysis*. Naperville, IL: North Central Regional Educational Laboratory

Cavanaugh, C., Gillan, K.J., Bosnick, J., et al. (2008). "Effectiveness of Interactive Online Algebra Learning Tools." *Journal of Educational Computing Research 38* (1): 67-95.

Dickson, W. P. (2005). *Toward a deeper understanding of student performance in virtual high school courses: Using quantitative analyses and data visualization to inform decision making*. Lansing, MI: Michigan Virtual University.

Crippen, K. J., Archambault, L. M., & Kern, C. L. (2013). "The Nature of Laboratory Learn ing Experiences in Secondary Science Online," *Research in Science Education 43*: 1029-1050.

DiPietro, M. (2010). "Virtual School Pedagogy: The Instructional Practices of K-12 Virtual School Teachers," *Journal of Educational Computing Research 42* (3): 327-354.

Drysdale, J., Graham, C., & Borup, J. (2014). "An Online High School 'Shepherding' Program: Teacher Roles and Experiences Mentoring Online Students," *Journal of Technology* *and Teacher Education 22* (1): 9 – 32.

Edwards, C. & Rule, A. (2013). "Attitudes of Middle School Students: Learning Online Compared to Face-to-Face," *Journal of Computers in Mathematics and Science Teaching 32*(1): 49-66.

Edwards, C. M., Rule, A., & Boody, R.M. (2013). "Comparison of Face-to-face and Online Mathematics Learning of Sixth Graders," *Journal of Computers in Mathematics and Science Teaching 32* (1): 25-47.

Ferdig, R.E. (2010a). *Continuous Quality Improvement through Professional Development for Online K-12* Instructors. Lansing, MI: Michigan Virtual University, 2010.

Ferdig, R.E. (2010b). *Understanding the role and applicability of K-12 online learning to support student dropout recovery efforts.* Lansing, Michigan: Michigan Virtual University.

Ferdig, R.E. and Cavanaugh, C. (Eds.) (2011). *Lessons Learned from Virtual Schools: Experiences and Recommendations from the Field*. Vienna, VA: International Association for K-12 Online Learning.

Ferdig, R.E., Cavanaugh, C., DiPietro, M., Black, E., & Dawson, K. (2009). "Virtual Schooling Standards and Best Practices in Teacher Education," *Journal of Technology and Teacher Education 17*(4): 479-503.

Glass, G. & Welner, K. (2011). Online K-12 Schooling in the U.S.: Uncertain Private Ventures in *Need of Public Regulation*. Boulder, CO: National Education Policy Center, School of Education, University of Colorado.

Haavind, S. (2007). "An Interpretative Model of Key Heuristics That Promote Collaborative Dialogue Among Online Learners," *Journal of Asynchronous Learning Networks 11* (3): 39-68.

Hardy, C., Harley, B., & Phillips, N. (2004). "Discourse Analysis and Content Analysis: Two Solitudes?", Qualitative Methods Newsletter, Spring 2004:19-22.

Hughes, J., McLeod, S., et al. (2007). "Academic Achievement and Perceptions of the Learning Environment in Virtual and Traditional Secondary Mathematics Classrooms," . *The American Journal of Distance Education 21*(4): 199–214.

Hung, J-l., Hsu, Y-C., & Rice, K. (2012). "Integrating Data Mining in Program Evaluation on K-12 Online Education," *Educational Technology and Society 15*(3): 27-41.

Ingerham, L. (2012). "Interactivity in the Online Learning Environment: A Study of Users of the North Carolina Virtual Public School," *The Quarterly Review of Distance Education 13* (2): 65-75.

Kennedy, K. & Cavanaugh, C. (2010). "Development and Support of Online Teachers: The Role of Mentors in Virtual Schools," *Journal of Technology Integration in the Classroom 2*(3): 37-42.

Liu, F., & Cavanaugh, C. (2011a). "Success in Online High School Biology: Factors Influencing Student Academic Performance," *The Quarterly Review of Distance Education 12*(1): 37–54.

Liu, F., & Cavanaugh, C. (2011b). "High Enrollment Course Success Factors in Virtual School: Factors Influencing Student Academic Achievement," *International Journal on E-Learning 10* (4): 393-418.

Liu, F. & Cavanaugh, C. (2012). "Factors influencing student academic performance in online high school algebra," *Open Learning: The Journal of Open, Distance and e-Learning 27* (2): 149-167.

Lowes, S. (2007). "Trends in Professional Development for K-12 Virtual Schools." In C. Cavanaugh and R. Blomeyer, eds., *What Works in K-12 Online Learning?* Washington, DC: The International Society for Technology in Education (ISTE).

Lowes, S. (2010). "The Teacher as Migrant: How Teaching Online Can Change Classroom Practice," *Distance Learning 7*(2): 29-36.

Lowes, S. (2014). "How Much 'Group' Is There in Group Work?," *Journal of Asynchronous Learning Networks*, forthcoming.

Miron, G. & Urschel, J. (2012). *Understanding and Improving Full-Time Virtual Schools.* Boulder, CO: National Education Policy Center, School of Education, University of Colorado.

Office of the Legislative Auditor, State of Minnesota. (2011). *Evaluation Report: K-12 Online Learning.*

Oliver, K. M., Kellogg, S., Townsend, T., & Brady, K. (2010). "Needs of Elementary and Middle School Teachers Developing Online Courses for a Virtual School," *Distance Education 31* (1): 55-75.

Oliver, K. M., Kellogg, S., & Patel, R. (2010). "An Investigation into Reported Differences Between Online Math Instruction and Other Subject Areas in a Virtual School," *Journal of Computers in Mathematics and Science Teaching, 29*(4): 417-453.

Oliver, K. M., Kellogg, S., & Patel, R. (2012). "An Investigation into Reported Differences Between Online Foreign Language Instruction and Other Subject Areas in a Virtual School," *The Computer Assisted Language Instruction Consortium (CALICO) Journal 29*(2): 1-29.

Oliver, K. M., Osborne, J., & Brady, K. (2009). "What Are Secondary Students' Expectations for Teachers in Virtual School Environments? *Distance Education 30*(1): 23-45.

Rice, K. & Dawley, L. (2009). "The Status of Professional Development for K-12 Online Teachers: Insights and Implications." *Journal of Technology and Teacher Education 17* (4): 523-546.

Roblyer, M.D. (2006). "Virtually Successful: Defeating the Dropout Problem Through Online School Programs," *The Phi Delta Kappan 88* (1): 31-36.

Roblyer, M.D., Davis, L., Mills, S. C., Marshall, J., and Pape, L. (2008). "Toward Practical Procedures for Predicting and Promoting Success in Virtual School Students, "*American Journal of Distance Education 22*: 90-109.

Roblyer, M.D., Freeman, J., Donaldson, M.B., & Maddox, M. (2007). "A Comparison of the Outcomes of Virtual School Courses offered in Synchronous and Asynchronous Formats," *Internet and Higher Education 10* (4): 261-278.

Trujillo Commission on Online Education. (2007). *Findings and Recommendations*. Denver, CO: Donnell-Kay Foundation.

Waters, L.H. & Leong, P. (2014). "Who Is Teaching? New Roles for Teachers and Parents in Cyber Charter Schools," *Journal of Technology and Teacher Education 22* (1): 33-56.

Watson, J. & Ryan, J. (2006). *Keeping Pace with Online Learning: A Review of State-Level Policy and Practice.* Evergreen, CO: Evergreen Consulting Associates.

U.S. Department of Education. (2009). *Evaluation of Evidence-Based Practices in Online Learning: A Meta-Analysis and Review of Online Learning Studies*. Washington, DC.

II. Research on Learning and Learners

What's this section about? We have suggested that it is not as important to ask if K-12 online and blended learning works, but rather when and where K-12 online and blended learning works. Or, more broadly, *under what conditions does K-12 online and blended learning work?* Part of those conditions include the differences that exist from learner to learner. There are differences that exist in learners that impact understanding outcomes in K-12 online and blended learning environments. There are also differences in how we understand *learning* in K-12 online and blended contexts. This section contains chapters that attempt to further navigate learners and learning.

What's in this section? Repetto and Spitler offer insight into the reality of at-risk students and the potential for K-12 online and blended learning to provide a much-needed support structure for these struggling students. They offer research-based proof of how connection, climate, student control, engaging curriculum, and a caring community can play important roles in the support of at-risk students and all students, in general.

While there are a growing number of researchers working in the area of K-12 online and blended learning and students with disabilities, the field is still nascent according to Greer, Rice, and Dykman. The quantity and quality of data in this area is the most important piece in advancing the research, practice, and policy. The authors spend time identifying the existing research as well as places for new growth and development.

What's missing from this section? Future iterations of this book will provide chapters that continue to lay a framework for understanding learners and learning in K-12 online and blended environments. There are opportunities for new authors to add to this Handbook by writing about: exploring cognitive gains in these environments, understanding affect and affective outcomes, researching differences in grade and age levels of students in relation to learning in online and blended environments, and exploring accessibility as it relates to learning and learners.

Chapter 5

Research on At-Risk Learners in K-12 Online Learning

Jeanne B. Repetto, *University of Florida, jrepetto@coe.ufl.edu*
Carrie J. Spitler,
Spring Branch Independent School District, carrie.spitler@gmail.com

Abstract

Students who fail to graduate high school with a diploma or its equivalent set in motion a pattern of low wages, poor health, and risk of incarceration that will impact their future quality of life. This pattern negatively impacts society with fewer wage earners, lower taxes, and less spending, along with a strong potential of needing to support these students through some form of welfare. Due to its flexible scheduling, individual mentoring, safe communities in which to learn, and varied methods of teaching, online learning has shown promise as a conduit to engage at-risk students in learning so that they stay in school and earn a diploma. In this chapter, research along with essential strategies that allow online programs to meet the needs of at-risk learners to improve their educational outcomes are presented. Additionally, implications for policy, practice, and future research are discussed.

Introduction

Students who are able to remain in high school to earn a diploma significantly increase their quality of life. Financially, high school graduates will earn $260,000 more than high school dropouts (Statistic Brain, 2014). Data collected by the National Center for Education Statistics (NCES, 2014) showed that in 2011, young adults, 25 through 34 years of age, with a high school diploma or its equivalent, earned 24% more than youth who exited high school without a diploma. Not only will students without a high school diploma earn less, they also will have a harder time securing a job, as 90% of all jobs in the United States require, at the very least, a high school diploma (Statistic Brain, 2014).

The impact of not earning a high school diploma or its equivalent initiates a depressed economic pattern that continues to widen over time, as students who do not earn a high school diploma or its equivalent are not qualified to enter higher education to earn an advanced degree. This failure to complete school directly impacts future earning potential. Youth earning a bachelor's degree consistently have displayed a pattern of higher median incomes than those without a higher education degree (Aud, Fox, & KewalRamani, 2010; Aud & KewalRamani, 2013; NCES, 2014). Therefore, at a young age, students who do not complete school are making choices that ultimately will impact their futures.

Related factors contributing to a lower quality of life for dropouts are found in such areas as crime, poverty, and health. In fact, dropouts have committed 75% of the crimes in the United States, and subsequently, 60% of all dropouts who are black have spent time in the prison system (Statistic Brain, 2014). The rate of high school completers living in poverty is 24%, while the poverty rate for non-completers is 31% (Aud & KewalRamani, 2013). Finally, high school completers and youth with advanced degrees report an overall higher rate of good or excellent health than high school non-completers (Aud & KewalRamani).

Society also shoulders the impact of high dropout rates by fewer or lower wage earners who pay lower taxes and have less income to spend. Additionally, higher crime rates and time spent in the prison system mean that society must foot the bill to prevent the crimes and pay for the prisons. High poverty rates and poor health burden society with supporting potential welfare and Medicaid recipients. According to the Alliance for Excellent Education, non-completers experience higher unemployment, more government assistance, and greater time in the prison system than high school completers (Zvoch, 2006).

Profile of Students At-Risk of Exiting High School Prior to Graduation

Dropout rates can be studied in various ways, so it is important to look at patterns, not only the percentages. For the 2009-2010 school year, the Average Freshman Graduation Rate (AFGR) estimated that the number of 9th graders who graduated high school within four years was 78% (Stillwell & Sable, 2013). The status dropout rate representing the number of students, 16 through 24 years of age, who were not in school and had not earned a high school diploma or its equivalent, declined from 12% in 1990 to 7% in 2011. In 2011, the status dropout rates for students classified in the ethnic backgrounds of White, Black, and Hispanic were 5%, 7%, and 14%, respectively (NCES, 2014). Event dropout rates, showing the proportion of students leaving school in any given year, for grades 9 through 12 during the SY 2009-10 were less than 4%, indicating a pattern of increasing dropout as grade level increased

(Stillwell & Sable). As with status dropout rates, event dropout rates indicated that fewer White students dropped out than Black or Hispanic students (Stillwell & Sable). Additionally, during the SY 2010-11, the percentage of all students who left school who were served under IDEA, Part B was almost 20% (Annual Disability Statistics Compendium, 2014).

For the vast majority of students, high school, even with its typical challenges, can be navigated with the reward being a diploma. However, for some students the challenges to staying in school seemingly are too overwhelming to overcome. The National Dropout Prevention Center Network (2014) categorizes situations impacting student decisions to leave school early into four groups: (a) school related, (b) student related, (c) community related, and (d) family related. Specific examples of each type of situation are presented in Table 1. Additional risk factors that increase the likelihood of students leaving school have been identified by The Southwest Educational Development Laboratory, and include (a) being raised in a single-parent family, (b) identification as a second language learner, (c) having a disability, (d) having a teenage pregnancy, and (e) drug abuse (Tompkins & Deloney, 1994). When asked their reasons for leaving school, students with disabilities said they disliked school, did not get along with teachers, had poor work habits, and did not think school was preparing them for their future work (Dunn, Chambers, & Rabren, 2006; NLTS-2, 2005). For many students, it is often a combination of multiple risk factors occurring over time that cause them to leave school prior to graduation (Frymier & Gansneder, 1989).

Cyber learning environments appear to be a perfect venue to engage at-risk learners in school. Online learning has the potential to offer flexible scheduling, individual mentoring, safe communities in which to learn, and varied methods of teaching (Repetto, Cavanaugh, Wayer, & Liu, 2010; Rose & Blomeyer, 2007; Shore & Shore, 2009). The growth of online learning has become a standard component of K-12 schools with 75% or more of school districts having made online and blended learning options available to students for the SY 2013-14 (Watson, Murin, Vashaw, Gemin, & Rapp, 2013). In addition, many states have passed laws recommending or requiring that students must complete at least one online course prior to graduation (Kennedy & Archambault, 2012). This availability makes online and blended learning options a central component when planning dropout prevention programs.

The initial focus of online learning was on advanced placement students (Watson & Gemin, 2008). However, with a vast majority of school districts in the United States offering students online or blended courses (Picciano & Seaman, 2010), the focus has broadened to include opportunities for all students (Cavanaugh, Repetto, Wayer & Spitler, 2013). This expansion is the result of programs extending their mission to include credit recovery and closing the achievement gap, along with meeting the needs of specific groups of students, including at-risk populations (Liu & Cavanaugh, 2011; Rose & Blomeyer, 2007; Picciano & Seaman; Watson & Gemin; WestEd, 2008). Yet, foremost and fundamental to any work with at-risk students, must be their timely identification. Cyber school personnel have been able to identify at-risk learners in a variety of ways, including (a) assessment, (b) self-reported academic information, (c) attendance records, (d) demographic data, (e) home school referrals, and (f) teacher communication. Once identified, at-risk students may elect to enroll in online or blended courses, as they offer them the opportunity to (a) re-engage in school, (b) take state exams, and (c) meet graduation requirements (Watson & Gemin). To this end, cyber schools have begun to develop specific programs that incorporate strategies designed to support at-risk students to increase their rate of course completion, such as teacher mentors, individualized instruction, and specialized instructional strategies (Archambault et al., 2010).

The purpose of this chapter is to review the research on at-risk learners in online learning and discuss future directions needed to support at-risk learners in online learning. The following sections will review current research and evidence-based practices for students at-risk in online learning. Finally, implications for policy, practice, and future research will be discussed.

Table 1. Situations impacting student decisions to leave school early.

Type of Situation	Examples
School related	Disregard of student learning styles Ineffective school discipline system Low expectations Negative school climate Passive instructional strategies
Student related	Behavior problems Dislike of school Drug use Friends who have dropped out Identified disability Low ability level Poor attendance/truancy Poor peer relations Poor school attitude Poor work habits Pregnancy Second language learner
Community related	Lack of community-based support services Lack of school/community linkage
Family related	Dysfunctional home life High mobility Lack of parent involvement Low SES Single parent home

(Dunn, Chambers, & Rabren, 2006; National Dropout Prevention Center Network, 2014; NLTS-2, 2005; Tompkins & Deloney, 1994)
Note: SES = socioeconomic status

Research Synthesis

Including learners at-risk in online learning is in its infancy. For this reason, the research base is limited with studies just beginning to be conducted. The International Association for K–12 Online Learning (iNACOL) research committee on at-risk learners in online learning reached a similar conclusion addressing the lack of research in this area with recommendations for areas to be addressed by future researchers (Archambault et al., 2010). The limited research in this area is an indication of an emerging field of study.

At-Risk Learners in Cyber Settings

Distance education advocates have stressed the importance of data collection, analysis, and reporting on the educational experiences of specific populations of online learners (e.g., at-risk students, students with disabilities) (Cavanaugh et al., 2013; Repetto et al., 2010; Rhim & Kowal, 2008). Yet, limited empirical research studies have examined at-risk students in online and blended learning environments. These data are critical to the future success of online and blended learning programs for students at-risk of dropping out.

A search of refereed, research-based articles was carried out by entering combinations of the following terms: at-risk students, elementary and secondary schools, virtual and/or cyber classrooms, and online learning into multiple databases, including Academic Search Premier, PsycINFO, Sage Premier and ERIC. The aforementioned searches yielded limited results ranging from zero to 24 articles. Of the 24 articles, only one covered research directly related to at-risk learners in online learning. This article reported on a case study of an at-risk student in rural Newfoundland. Data were collected through student interview and video observations. Researchers concluded from the data analysis that the student understood the tasks needed to complete the online course and was able to prioritize these tasks. However, the student often did minimal work and was hindered by limited home-based technology. Since this is a single student case study, caution should be taken not to generalize the findings (Barbour & Siko, 2012).

As previously discussed, students identified as at-risk often include students with disabilities (Repetto et al., 2010; Spitler, Repetto, & Cavanaugh, 2013). Therefore, it is relevant to discuss the limited research related to students with disabilities in K-12 online programs. Spitler et al. (2013) conducted a utilization-focused evaluation in order to determine the presence of and application of evidence-based effective practices for at-risk learners in a special education program in a public cyber charter school. Results from the study indicated that the core values of the cyber charter school, as well as the specific design of the special education program, encompassed the evidenced-based practices as a means for increasing school completion for all students, especially students with disabilities.

The purposes of the study by Spitler (2013) were to determine (a) the characteristics of transition planning practices in public cyber charter schools by exploring the extent that the transition components of the IEPs reflected compliance with the transition mandates of IDEA 2004 and incorporation of evidence-based practices in transition; (b) the impact of individual demographic characteristics (i.e., disability category, racial/ethnic background, gender, and grade level) on the transition planning practices in public cyber charter schools; and (c) the relationship between compliance with the transition mandates of IDEA 2004 and incorporation of evidence-based practices in transition. The sample for the study included 236 IEPs of students with disabilities between 14 and 21 years of age, who had attended a public cyber charter school in Pennsylvania during the 2012-2013 school year. Results provided original findings related to educating and preparing students with disabilities in online environments for post-school activities. Although data showed that the public cyber charter schools were doing well with regard to some transition component requirements, the majority of IEPs did not meet the minimum standards, which are equivalent to full compliance. As such, Spitler recommended professional development to address specific areas of need, including but not limited to (a) writing measurable post-secondary goals, (b) describing the required transition services and how they can be provided to students, and (c) training in transition planning practices for students of culturally and linguistically diverse backgrounds, disability categories, and gender. Further findings indicated that evidence-based practices in transition have been incorporated into transition planning practices in public cyber charter schools at approximately the same level as they are in traditional school settings. Yet, some areas for special consideration emerged from the study including (a) paid/unpaid work experience; (b) functional, daily living skills training; (c) self-determination training; and (d) community/agency collaboration. A student's disability category, racial/ethnic background, gender, and grade level were found to be influencing factors that increased or decreased the probability of an IEP being compliant or incorporating evidence-based practices. A moderate correlation was found between the compliance and evidence-based practices composite scores, indicating that as the level of compliance increased, so did the level of incorporation of evidence-based practices.

Implications for Policy and Practice

Implications for policy and practice for at-risk learners in online learning will be discussed in this section. Although these topics are discussed separately they are very connected to each other. For example, expanded professional standards need to be developed before teacher education programs can include these additional competencies in their curricula.

Policy

Expansion of professional standards. The *National Standards for Quality Online Teaching* were created, and subsequently revised by the International Association for K-12 Online Learning (iNACOL). The standards were designed to provide states, districts, online programs, and other organizations with a set of guidelines that highlight the skills educators must possess in order to effectively teach in online environments (iNACOL, 2011). Likewise, the Council for Exceptional Children (CEC) also has developed standards to guide teacher preparation programs and certification. Theses professional standards include the requisite skills for special educators to work with students with various disabilities (e.g., learning disabilities, emotional and behavioral disorders) and across disabilities (e.g., content standards, transition specialists) (CEC, 2009; Repetto et al., 2010). However, the standards fail to mention the skills needed to develop or provide accommodations for students with disabilities in online or blended learning environments. Current Professional Standards from both iNACOL and CEC should be expanded to address the needs of at-risk learners in online learning. Additionally, these two professional organizations should collaborate to develop a set of coordinated professional standards.

Support for evidence-based practices. For students who receive special education services and supports, federal legislation has been amended to require "the use of scientifically based instructional practices, to the maximum extent possible" (IDEA, 2004, 20 U.S.C. § 1400 et seq.). In addition, given the current legislative focus on accountability, it is imperative that educators take advantage of the time they have with students with disabilities by incorporating evidence-based practices into all education activities and programs (Landmark, Ju, & Zhang, 2010). Unfortunately, because many evidence-based practices have not been mandated by legislation, research has indicated that evidence-based practices have not been implemented widely, and as a result, the majority of students exiting high school remain unprepared and unsuccessful at achieving positive post-school outcomes (Landmark & Zhang, 2012). As such, these findings can inform and encourage policy-makers to create policies that will guide administrators and educators toward full and uniform implementation of all identified evidence-based practices in activities and programs designed to support specific groups of students.

Practice

To meet the needs of at-risk students, online learning environments should be designed with evidence-based strategies geared toward meeting their unique needs. However, due to the lack of studies of at-risk students and online and blended learning programs, reviewed first in this section are practices that have been researched and considered evidence-based methods for engaging at-risk learners in traditional school settings, and subsequently in online settings. Reviewed next, are teacher preparation programs, professional development, and program and course design that will promote the inclusion of at-risk students in online and blended learning programs. Overall, this section of the chapter will discuss the practical implications of these topics as they relate to at-risk students.

The 5 Cs of Student Engagement Framework. Repetto et al. (2010) considered the factors that influence school completion rates for at-risk students and classified them into five broad themes. First, students need to be able to *connect* current learning in school to the knowledge and skills they will need post-school. Second, students need to be provided with a safe and supportive *climate* for learning. Third, students need to understand and learn how they are in *control* of their own learning and behaviors. Fourth, students need an engaging *curriculum* grounded in effective instructional strategies and evidence-based practices to support their learning. Fifth, students need to be part of a caring community that values them as learners, as well as individuals. Thus, *The 5 Cs of Student Engagement Framework* (5 Cs), depicted in Figure 1, was conceptualized as an active framework set forth to provide education personnel with a framework for determining and/or analyzing practices, grounded in research, that garners potential to improve the educational outcomes of at-risk students. These five broad themes interrelate and influence each other in order to provide a learning environment, be it face-to-face, blended, or online, equipped to support all students.

The initial conceptualization of the 5 Cs was completed through an analysis of evidence-based practices in special education literature (Repetto et al., 2010). Later, to ensure that the identified themes were supported across multiple disciplines, an analysis of the 5 Cs in general education and distance education literature was completed (Spitler et al., 2013). As a result, evidence that the 5 Cs impact practice and improve educational outcomes has been confirmed across the three literature bases. The following sections will discuss individually each of the 5 Cs in detail. Specifically, each section will include (a) a synthesis of the major findings from the special education, general education, and distance education literature, (b) a discussion of the application of the theme in an online learning environment, and (c) specific program examples.

Figure 1: The 5 Cs of Student Engagement Framework

Connect. Researchers in the field of education from both general and special education have attempted to define the goals of education (Phelps & Hanley-Maxwell, 1997). While one goal certainly is to ensure learning by all students, academic achievement is not the only measure of whether or not an education has been effective. The primary goal of education for all students is successful integration into the adult world. Therefore, researchers have determined that it is essential to the goals of education that students are able to see that there is a connection between their current concerns and/or learning objectives, as well as their post-school goals (Bradshaw, O'Brennan, & McNeely, 2008; Dunn et al., 2006; NLTS-2, 2005; Repetto et al., 2010; Cavanaugh et al., 2013; Spitler et al., 2013).

Special education literature has indicated that formal transition planning practices that incorporate "the use of scientifically based instructional practices, to the maximum extent possible" (IDEA, 2004, 20 U.S.C. § 1400 et seq.) might help students to achieve this connection through a process of evaluating future goals and developing a plan to achieve them (Kohler, 1993; Repetto, Webb, Neubert, & Curran, 2006). Likewise, general education literature has documented greater student engagement for students who perceived the future career relevance of school (Greene, 2003; Orthner et al., 2010; Perry, 2008). These findings directly link to those in distance education literature that have identified that, with higher perceived relevance, student satisfaction with school increases (Hannafin, Hill, Oliver, Glazer, & Sharma, 2003). Although it has been posited that students in any type of learning environment need to recognize why school is important, it is fundamental for the more independent task of learning online (Keller, 2008). The literature has indicated that students who believe in the relevance of school have higher motivation to remain in school (Keller).

It is feasible for instructional designers and online educators to apply the theme of connect to online learning environments. The relevance of learning can be enhanced for all students when connections are made between current interests, post-school goals, and the selected curriculum (Carpenter & Cavanaugh, 2012). In fact, recent research has found that public cyber charter schools have been forging connections for students to both post-school employment and education opportunities by implementing formal programs that address several of the identified evidence-based practices in transition (e.g., employment preparation program participation, general education inclusion, and self-determination training) (Spitler et al., 2013; Spitler, 2013).

Through a utilization-focused evaluation, Spitler et al. (2013) found that the theme of *connect* successfully was incorporated as part of the design of the special education program, including that current learning needs were connected with post-school needs related to transition goals. Spitler (2013) completed a document review in order to determine the characteristics of transition planning practices in public cyber charter schools. Results indicated the public cyber charter schools were providing students the opportunity to engage in employment preparation. In fact, 89% of the IEPs reviewed provided evidence that students had participated or planned to participate in a program. This finding was encouraging, as previous studies have found that students who participated in an employment preparation program had a higher probability of employment (Baer et al., 2003; Colley & Jamison; Hasazi, Johnson, Hasazi, Gordon, & Hull, 1989) or engagement in post-secondary education (Benz, Yovanoff, & Doren 1997; Wolff & Kelly, 2011). However, other results were not as positive. The results revealed a lack of annual goals that supported post-secondary goals. For the targeted outcome areas of education/training, employment, and independent living, 17%, 28%, and 48%, respectively, of IEPs did not have at least one annual goal to support the post-secondary goal. Therefore, it was concluded that the public cyber charter schools most likely have not realized the fundamental connection that needs to exist between these two types of goals, and subsequently, the connection that needs to exist between what students currently are learning and their post-school goals.

Climate. Students identified as at-risk are able to thrive in a learning environment that places emphasis on safety and support, as well as data-driven instruction. Thus, a caring climate at school might counteract a student's unstable life away from school (Repetto et al., 2010). In fact, special education literature has identified several protective factors that may reduce the individual, family, and community factors that might put students at-risk for dropping out that schools are able to provide, including (a) providing a positive learning environment, (b) setting high, yet achievable, academic and social expectations, and (c) facilitating opportunities for success (Christle, Jolivette, & Nelson, 2007). For students with disabilities, encouraging an inclusive learning environment is key, as students are allowed access to the general education context (i.e., the least restrictive environment), as well as the general curriculum (Test, Fowler, White, Richter, & Walker, 2009). Cavanaugh et al. (2013) have posited that a school climate accepting of a diverse student population fosters student motivation to remain in school. In addition, researchers in the field of general education have suggested that creating a positive social-emotional learning environment allows students to develop the confidence that they need to achieve academic success (Archambault, Janosz, Morizot, & Pagani, 2009; Steinberg & Allen, 2011).

For online learning environments, a safe and supportive climate can be facilitated by fairly and uniformly enforcing rules and procedures across courses and ensuring that they meet local, state, and/or national norms (Liu & Cavanaugh, 2011). In addition, it is imperative that online learning environments cultivate a sense of community by ensuring that the needs of school administrators, educators, staff, students, and their families are met (Christle et al., 2007; Menzies & Lane, 2011; Rovai, 2002). Spitler et al. (2013) found that this theme was represented in the special education program of a public cyber charter school through the accommodations and modifications provided to students based on their individual needs. In addition, online educators routinely considered the interests of students when designing their instruction and classroom activities.

Control. At-risk students need to receive instruction on targeted academic, social, and behavioral interventions that will afford them the knowledge to take control of their learning and behaviors (Cobb, Sample, Alwell, & Johns, 2006; Institute of Education Sciences, 2008). As such, thoughtful incorporation of evidence-based practices remains fundamental in allowing students to participate actively in controlling their learning and behaviors. Self-determination (Eisenman, 2007) and cognitive behavioral interventions (Cobb et al., 2006; Deshler & Schumaker, 2006) are useful practices promoted in both special education and general education literature that have been proven to be helpful to students in all aspects of their lives.

Although self-determination training has not been mandated by IDEA 2004 as a requirement in specialized programming, Spitler (2013) found that 53% of IEPs of students from the participating public cyber charter schools indicated that students were receiving self-determination training or had appropriate self-determination skills. During self-determination training, students receive explicit instruction on a variety of skills that might include (a) decision-making; (b) problem solving; (c) goal setting; (d) self observation, evaluation, and reinforcement; and (e) student-directed learning (Cobb et al., 2006; Deshler & Schumaker, 2006; Johnson, 1998; Wehmeyer, 2005; Wehmeyer & Field, 2007). Therefore, the theme of control can be applied to online learning environments by ensuring that all students are given access to self-determination training. With this type of training, students will develop a greater understanding of their role as online students (Ferdig, Cavanaugh, DiPietro, Black, & Dawson, 2010), as well as enhance their self-advocacy skills, allowing students the ability to take control of their learning and behaviors. However, it also is important that online educators develop their own understanding of self-determination. Online educators should receive professional development on self-determination with emphasis placed on how it can be incorporated into academic instruction.

Curriculum. Students experience improved engagement with the curriculum when courses are designed with student needs and interests in mind (Christle et al., 2007). In addition, learning opportunities are enhanced when knowledge and skills can be generalized across a variety of content areas and contexts (Bost & Riccomini, 2006; Margolis & McCabe, 2003). This is especially true for at-risk students who have an identified disability. Special education literature has indicated that students at-risk for dropping out require more frequent monitoring, as well as evidence-based interventions (Bost & Riccomini; Daniel et al., 2006).

Evidence-based instructional strategies and differentiated instruction designed to meet individual student needs must be built into the curriculum (Bost & Riccomini; Hoover & Patton, 2004; Repetto et al., 2010). The use of effective instructional strategies, including (a) increasing academic time on task, (b) supporting student learning, (c) teaching content, (d) employing varied student groupings, (e) scaffolding learning, and (f) assisting students in becoming independent learners has proven to produce a number of positive outcomes (Bost & Riccomini; Institute of Education Sciences, 2008). Aside from direct instruction, students also need to be challenged to connect, and remain connected, to current learning through inventive academic activities (Bost & Riccomini; Johnson, 1998).

Recent research has found that essential elements of instructional design, which directly impact course usability by students with disabilities, are present in the majority of contemporary online and blended courses (Keeler & Horney, 2007). Thus, online learning options might resolve past issues that could have prohibited participation and progress in the general curriculum for some students. For example, a curriculum that is offered on an "any pace" model will allow every student to build independence by supplying an ample amount of time to master specific learning objectives (Repetto et al., 2010). Aside from time, programs also should foster positive interaction and collaboration among students through cooperative learning opportunities incorporated into the curriculum (Beldarrain, 2007; Johnson, 1998).

In their evaluation of the presence of and application of the 5 Cs in a special education program in a public cyber charter school, Spitler et al. (2013) determined that accommodations and/or modifications to a comprehensive curriculum built around core subjects ensured the continuity of instruction for all students. Similarly, Spitler (2013) noted that the vast majority of students were provided access to the general education context and general curriculum. This is crucial to the success of at-risk students, especially those with an identified disability as previous research has shown that students served exclusively in inclusive educational settings, and who exited school with a standard diploma had higher levels of employment one year after school completion (Benz, Lindstrom, & Yovanoff, 2000; Rabren, Dunn, & Chambers, 2002; Test, Mazzotti, Mustain, Fowler, Kortering, & Kohler 2009; Williams-Diehm & Benz, 2008). Additionally, the likelihood of being enrolled full-time in post-secondary education also was greater (Flexer, Daviso, Baer, Queen, & Meindl, 2011). Students were more likely to live independently (Test, Mazzotti, et al.), and to have experienced increased community involvement (Colley & Jamison, 1998), including improved participation in recreation and leisure activities (Williams-Diehm & Benz).

Caring Community. The successful establishment of a caring community is achieved through a school-wide effort (Menzies & Lane, 2011). Research has indicated a strong correlation between learner interactions and engagement, a sense of community, and academic success (Sadera, Robertson, Song, & Midon, 2009). Special education and general education literature have stated that students learn best in an environment that acknowledges and values each student as an integral member of a community of learning (Christle et al., 2007; Repetto et al., 2010). Each student should be considered one of the most important team members, and as such, should always attend and/or contribute to the meetings during which an educational plan/program is developed in order to voice his/her individual needs and interests.

A small number of researchers have begun to examine the effect of parental involvement on student achievement in virtual schools. Distance education literature has acknowledged that students who engage in online learning not only require the support of their educators, but also their parents/family members (Black, 2009; Hasler Waters, & Leong, 2014; Kennedy & Cavanaugh, 2010; Liu, Black, Algina, Cavanaugh, & Dawson, 2010). Many fully online learning programs consider parents/family members to be instrumental in establishing a caring environment conducive to learning (Black), and rely a great deal on them as co-educators (Hasler Waters, & Leong). Recent investigations of the role of familial participation in student achievement in K-12 cyber schools have found that by assuming a shared responsibility of managing their own children that parents/family members interactions with their children have a positive predictive effect related to improved learning habits, increased motivation, and greater student achievement (Black; Liu et al.).

Spitler et al. (2013) found that the theme of a caring community was well established in the special education program of a public cyber charter school through the existence of a collaborative partnership between the educators, parents, and other school personnel. First, the behaviors of online educators were a significant aspect of creating such an environment. All three bodies of literature have provided examples and evidence of educator behaviors that encourage a constructive learning environment (Johnson, 1998). Second, a vast body of research supports parent/family involvement as an evidence-based practice in special education that impacts student academic achievement and post-school outcomes (Cobb & Alwell, 2009; Fourqurean, Meisgeier, Swank, & Williams, 1991; Lindstrom & Benz, 2002; Test, Fowler, et al., 2009; Test, Mazzotti, et al., 2009). Fourqurean et al. additionally has noted that students whose parents were involved actively in educational planning, as measured by the percentage of IEP meetings that were attended, experienced greater post-school employment stability. Parent/family involvement in educational planning additionally has shown better community adjustment for students with various disabilities (Sample, 1998). This was confirmed in the study conducted by Spitler (2013) who found that 99% of IEPs provided evidence that a parent/guardian had attended the IEP meeting during which transition was discussed. This finding indicates that more often than not, when a parent/guardian attended a meeting, the parent/guardian contributed to the meeting in a meaningful way. Therefore, it has been concluded that at-risk students might receive a great deal of support through interpersonal support from family.

Peer behaviors and interactions are also valuable. Students need to feel a sense of cohesion and awareness of their peers, both with and without disabilities (Abedin, Daneshgar, & D'Ambra, 2010). As such, distance education literature has advocated the use of student mentors for students in online courses (Croninger & Lee, 2001; Institute of Education Sciences, 2008). The importance of interpersonal support provided by peers should not be discounted, because as potential members of a natural support network, they have the potential to contribute greatly to student achievement of post-school activities. Students also benefit from ongoing access to academic and technical support (Borup, Graham, & Drysdale, 2013; Ferdig, 2010b). Online learning programs might provide this type of support to students through a multitude of means (e.g., academic tutors) that are available virtually, no matter the physical location of the student (Jakobsdóttir, 2008).

Teacher preparation programs. The exponential growth in K-12 online learning opportunities has necessitated teacher education programs to prepare future educators to teach in online and blended learning environments (Archambault, 2011; Dawley, Rice, & Hinck, 2010; Ferdig et al., 2010; Kennedy & Archambault, 2012; Repetto et al., 2010). In fact, a number of states with considerable public cyber school programs now require additional endorsements that qualify educators to teach online (Repetto et al.). It has been suggested that these endorsement programs include courses that address the national standards for quality online teaching, as well as practicum experiences with educators actively teaching in online and blended learning environments (Kennedy & Archambault; Repetto et al.). Thus, it has been concluded that teacher preparation for online and blended learning environments has a limited emphasis in the preparation of educators prepared to address the needs of students with various disabilities and other learning needs (e.g., at-risk). This lack of preparation has been evidenced in the disclosure of many online educators that have reported little or no experience working with special populations of students in online settings (Rice, Dawley, Gasell, & Flores, 2008). Therefore, it is foremost and fundamental for any future educator slated to work with at-risk students that adequate training in specialized instructional strategies designed to support at-risk students to increase their rate of course completion be provided prior to entry into the cyber classroom (Archambault et al., 2010). To this end, teacher preparation programs need to include in their programs the acquisition of competencies based on Professional Standards for teaching at-risk learners in cyber settings.

Professional development. Professional development is critical to the success of online and blended learning (Ferdig, 2010a), so much so, that it has been identified as a priority for K-12 distance education (Rice, 2009). Because state agencies and university programs have been unable to meet the growing demands of online educators, the majority of training has been provided by the program, school, or organization with which the educator is associated (Rice & Dawley, 2007). Yet, in order to maintain and expand the knowledge and skills required to effectively teach in online and blended learning environments, educators need continuing professional development while working in the field on topics such as (a) understanding different groups of students (e.g., students at-risk, students with disabilities), (b) identifying at-risk students, and (c) differentiating instruction, which typically have not been part of professional development programs for online educators (Repetto et al., 2010; Rice & Dawley; Rice et al.; 2008). Therefore, training to work with special populations might begin with a presentation and description of the 14 disability categories recognized under special education law. Next, online educators might be taught the specific skills necessary to understand the individual needs of students with different disabilities and students at-risk, along with how they are accommodated in a typical brick-and-mortar classroom setting, and how they could be accommodated in an online or blended learning classroom setting. It is imperative that this type of professional development is tailored specifically to the novelty of online learning environments because there are some basic accommodations and modifications not automatically provided to students in a brick-and-mortar environments that are characteristic of education provided in online learning environments (Keeler, Richter, Anderson-Inman, Horney, & Ditson, 2007). As a collective group, online educators have requested professional development in how to customize and/or modify learning objectives and activities, as well as in innovative techniques to supplement the curriculum, more so than brick-and-mortar educators (Rice et al.). The Center on Online Learning and Students with Disabilities currently is researching how online learning can be made more accessible, engaging, and effective for K-12 learners with disabilities, and offers a number of helpful resources for a variety of online and blended learning stakeholders.

Program and course design. Administrators responsible for online and blended learning programs need to initiate and enforce policies that foster a safe and supportive learning climate, as well as a caring community (Cavanaugh et al., 2013). Aside from the learning environment, online courses should be designed to be both accessible (i.e., that all students can access the information and learning resources) and supportive (i.e., that supports have been built into the course design, materials, and learning activities) (Keeler et al., 2007; Rose & Blomeyer, 2007). In fact, a lot of resources have touted best practices regarding accessibility issues and evidence-based practices for online courses (Fichten et al., 2009). Instead of designing for a specific group of students, instructional designers might opt to employ the principles of UDL (Cavanaugh et al.). The goal of an online course designed in this way is to be proactive in accommodating the learning needs of all students who might take the course. The strategic design would meet the needs of a broad range of student needs, abilities, instructional preferences, and learning styles. Further, multiple features would be presented as options from which students or educators might select from, allowing the course to be customized for a single learner or for a group of learners (Keeler et al.; Rhim & Kowal, 2008; Rose & Blomeyer). It would be worthwhile for online and blended learning programs to research and develop an instructional tutorial for students new to this context on how to navigate and succeed in online courses (Cavanaugh et al.).

Implications for Research

As a result of the implications placed on policy and practice, the subsequent section describes important topics for future research. As noted previously, limited evidenced-based research exists currently addressing at-risk learners in online learning. Thus, all researchers in the fields of special education and distance education are invited to collaborate on case studies to distinguish the unique experiences of key stakeholders (e.g., students and personnel) in online and blended learning environments and longitudinal research.

Case Studies

Students. Case studies that describe the educational experiences of at-risk students who have attended cyber schools or have participated in blended learning programs are needed. Specifically, how this population has been served and/or have functioned in online learning environments. This research might focus upon one or more educational aspects, including (a) curriculum, (b) instructional delivery/organization of learning environments, (c) student participation, (d) materials, and (e) assessment. For example, a qualitative analysis of the perspectives of at-risk students who were able to remain in school until graduation might evaluate which of the 5 Cs themes were most helpful to them and why. Additionally, research might focus specifically on peer interactions and relationships between students in online learning environments, and the impact of those relationships on educational and personal aspects of their lives at and away from school. The findings from these studies would extend the extant literature base by providing information regarding the most successful support strategies for at-risk students, some of which might be exclusive to online environments.

Personnel. Research might investigate the daily experiences and outlooks of administrators, educators, and other school personnel who work in online or blended learning environments with at-risk students. The findings from these studies might inform online learning programs of the types of policies they need to implement, and relevant professional development opportunities that they need to provide to online educators and other school personnel. Fourth, experts need to collaborate to analyze the professional standards and ethics for the fields of special education and distance education to ensure that educators are well-prepared to support the learning of a diverse group of students in online or blended learning environments. For example, experts could review the professional standards developed by iNACOL and CEC to determine how they align with the 5 Cs. These data will ensure that online programs, including individual courses, are designed to meet the needs and interests of special populations, including at-risk students.

Longitudinal Research

Longitudinal data are needed to examine the post-secondary outcomes of at-risk students who have attended cyber schools or participated in blended learning programs. More specifically, studies should address the characteristics of successful online programs to determine if students have achieved their post-secondary goals. Post-secondary data illustrating the outcomes of at-risk students as they move from secondary school into adult roles would contribute immensely to the fields of special education and distance education. Because the number of at-risk students enrolling in cyber schools has been projected to continue to increase in the coming years, these data are crucial to educating and preparing students effectively in online environments. Additionally, information about the similarities and/or differences between the post-school outcomes of different groups of students (e.g., itinerant students vs. at-risk students) might be useful to online programs. This type of data would highlight areas of need for online learning programs regarding particular groups of students.

Research Framework

The 5 Cs Framework has been offered as a critical way for researchers who want to conduct work in this area to consider cataloging their research. This framework pulls together the evidenced-based practices for at-risk learners in brick-and-mortar schools into one overarching framework. Using the 5Cs Framework allows future researchers to compare findings gathered specifically on at-risk students in online learning to all at-risk students. This comparison will help to identify unique needs based in online learning. In addition, the 5Cs Framework can be used to guide research covering at-risk learners in online settings by offering a comprehensive set of components to study.

Conclusion

An emerging body of research indicates that there are numerous benefits to online and blended learning for students who are at-risk of leaving school early (Means, Toyama, Murphy, Bakia, & Jones, 2009; Spitler, 2013). As the popularity of such programs as an alternative to traditional schooling continues to grow, proponents of distance education have begun to look for ways to address the needs of all students in online learning environments (Rose & Blomeyer, 2007). Therefore, the opportunity to build components into these programs that can foster student retention never has been more central to the discussion concerning dropout prevention.

Research has indicated that students who stay in school and graduate with a high school diploma or its equivalent have a greater likelihood of (a) earning higher wages, (b) paying higher taxes, and (c) contributing to the human capital of the country (Alliance for Excellent Education, 2009; Cataldi, Laird, KewalRamani, & Chapman, 2009; NLTS-2, 2005). However, to realize these outcomes, students must receive an education that recognizes their individual needs. Current and future programs need to incorporate practices and strategies that have been grounded in research. In order to do so, it is imperative that online educators are provided with the education and training that they require in order to teach and reach a diverse classroom. For example, professional development that teaches educators how to differentiate instruction for varying needs and interests by employing the principles of UDL has been recommended (Cavanaugh et al., 2013). More specifically, online educators who lack experience with special populations need training that will describe the nature of different disabilities, along with the specialized practices and strategies for instruction that have been proven effective for select students (Repetto et al., 2010).

Because the current literature base is modest, future research must investigate specific aspects concerning how at-risk students are served and are functioning in online and blended learning programs. Although several topics for research previously were suggested, it is imperative that research concerning the post-school outcomes of at-risk students is carried out. For these initiatives, it has been suggested that researchers employ the 5 Cs as a systematic way to organize data. Without longitudinal data, the fields of special education and distance education will have no way of knowing how or whether students are prepared through online or blended learning environments. These data will allow such programs to be equipped better to address the needs and interests of a diverse population of students, and students will be engaged in school, so that they stay until graduation.

References

Abedin, B., F. Daneshgar, and J. D'Ambra. (2010). Underlying factors of sense of community in asynchronous computer supported collaborative learning environments. *MERLOT-Journal of Online Learning and Teaching, 6*(3): 585–596.

Alliance for Excellent Education. (2009). *The nation's path to economic growth: The economic benefits of reducing the dropout rate.* Washington, DC: Author. Retrieved from http://www.all4ed.org/publication_iTiaterial/ EconMSA.

Archambault, L. M. (2011). The practitioner's perspective on teacher education: Preparing for the K-12 online classroom. *Journal of Technology and Teacher Education, 19*(1), 73-91.

Archambault, I., Diamond, D., Coffey, M., Foures-Aalbu, D., Richardson, J., Zygouris-Coe, V., Brown, R., & Cavanaugh, C. (2010). Research committee issues brief: An exploration of at-risk learners and online education, ed. D. Scribner and M. K. Barbour. Vienna, VA: International Association for K–12 Online Learning (iNACOL).

Archambault, I., Janosz, M., Morizot, J., & Pagani, L. (2009). Adolescent behavioral, affective, and cognitive engagement in school: Relationship to dropout. *Journal of School Health, 79*(9): 408–415.

Annual Disability Statistics Compendium. (2014). Table 11.7: Special Education—Dropout Rate[1] among Students Ages 14 to 21 Served under IDEA, Part B: 2010-2011, Retrieved February 21, 2014, from http://disabilitycompendium.org.

Aud, S., Fox, M., & KewalRamani, A. (2010). *Status and Trends in the Education of Racial and Ethnic Groups* (NCES 2010-015). U.S. Department of Education, National Center for Education Statistics. Washington, DC: U.S. Government Printing Office.

Aud, S., & KewalRamani, A. (2013). *America's youth: Transition to adulthood* (NCES 2012-2013). U.S. Department of Education, National Center for Education Statistics. Washington, DC: U.S. Government Printing Office.

Baer, R. M., Flexer, R.W., Beck, S., Amstutz, N., Hoffman, L., Brothers, J., Stelzer, D., & Zechman, C. (2003). A collaborative followup study on transition service utilization and post-school outcomes. *Career Development for Exceptional Individuals, 26*(1), 7-25.

Barbour, M., & Siko, J. (2012). Virtual schooling through the eyes of an at-risk student: A case study. *European Journal of Open, Distance and E-Learning*. Retrieved from http://www.eurodl.org/?p=archives&year=2012&halfyear=1

Beldarrain, Y. (2007). Distance education trends: Integrating new technologies to foster student interaction and collaboration. *Distance Education 27* (2): 139–153.

Benz, M. R., Lindstrom, L., & Yovanoff, P. (2000). Improving graduation and employmentoutcomes of students with disabilities: Predictive factors and student perspectives. *Exceptional Children, 66*, 509-529.

Benz, M. R., Yovanoff, P., & Doren, B. (1997). School-to-work components that predictpost-school success for students with and without disabilities. *Exceptional Children, 63,* 151-165.

Black, E. W. (2009). *An evaluation of family involvements' influence on student achievement in K-12 virtual schooling*. Ph.D. diss., University of Florida, Gainesville,FL. http://etd.fcla.edu/UF/UFE0024208/black_e.pdf

Borup, J., Graham, C. R., & Drysdale, J. S. (2013). The nature of teacher engagement at an online high school. *British Journal of Educational Technology*. doi: 10.1111/bjet.12089

Bost, L., & Riccomini, P. (2006). Effective instruction: An incon- spicuous strategy for drop-out prevention. *Remedial and Special Education, 27*, 301–311.

Bradshaw, C., O'Brennan, L., & McNeely, C. (2008). Core competen- cies and the prevention of school failure and early school leaving. New Directions for Child and Adolescent Development, 122, 19–32.

Carpenter, J., & Cavanaugh, C. (2012). Increasing student motivation through mentoring-practices. In L. Archambault & K. Kennedy (Eds.), Lessons learned in teacher mentoring: Supporting educators in K–12 online learning environments (pp. 103–114). Vienna, VA: International Association for K–12 Online Learning.

Cataldi, E., Laird, J., KewalRamani, A., & Chapman, C. (2009). *High school dropout andcompletion rates in the United States: 2007 compendium report.* Washington, DC: Institute of Education Sciences, National Center for Education Statistics (NCES 209-064). Retrieved from http://www.dropoutprevention.org/stats/default.htm.

Cavanaugh, C., Repetto, J., Wayer, N., & Spitler, C. (2013). Online learning for students with disabilities: A framework for success. Journal of Special Education Technology, 28 (1),1 – 8.

Christle, C., Jolivette, K., & Nelson, M. (2007). School characteristics related to high school-dropout rates. Remedial and Special Education, 28, 325–339.

Cobb, R. B., & Alwell, M. (2009). Transition planning/coordinating interventions for youth with disabilities: A systematic review. *Career Development for Exceptional Individuals, 32*, 70-81.

Cobb, B., Sample, P., Alwell, M., & Johns, N. (2006). Cognitive- behavioral interventions,dropout, and youth with disabilities: A systematic review. *Remedial and Special Education, 27*, 259–275.

Colley, D., & Jamison, D. (1998). Post school results for youth with disabilities: Key indicators and policy implications. *Career Development for Exceptional Individuals, 21*, 145–160.

Council for Exceptional Children. (2009). What every special educator must know: Ethics,-standards, and guidelines (6th ed.). Arlington, VA: Author.

Croninger, R. G., & Lee, V. E. (2001). Social capital and dropping out of school: Benefits to at-risk students of teachers' support and guidance. Teachers College Record, 103(4), 548–581.

Daniel, S., Walsh, A., Goldston, D., Arnold, E., Reboussin, B., & Wood, F. (2006). Suicidality, school dropout, and reading problems among adolescents. *Journal of Learning Disabilities, 39*(6), 507–514.

Dawley, L., Rice, K. & Hinck, G. (2010). *Going virtual! 2010: the status of professional development and unique needs of K-12 online teachers*. Retrieved April 24, 2014, from http://edtech.boisestate.edu/goingvirtual/goingvirtual1.pdf.

Deshler, D., & Schumaker, J. (2006). Teaching adolescents with disabilities: Accessing the general education curriculum. Thousands Oaks, CA: Corwin Press.

Dunn, C., Chambers, D., & Rabren, K. (2006). Variables affecting students' decision to drop out of school. *Remedial and Special Education, 27*(5): 314–323.

Eisenman, L. T. (2007). Self-determination interventions: Building a foundation for school-completion. *Remedial and Special Education, 28,* 2–8.

Ferdig, R. E. (2010a). *Continuous quality improvement through professional development for online K–12 instructors,* Lansing: Michigan Virtual University.

Ferdig, R. E. (2010b). *Understanding the role and applicability of K–12 online learning to support student dropout recovery efforts*. Lansing, MI: Michigan Virtual University.

Ferdig, R. E., Cavanaugh, C., DiPietro, M., Black, E. W., & Dawson, K. (2010). Virtual-schooling standards and best practices for teacher education. *Journal of Technology and Teacher Education, 17*(4), 479–503.

Fichten, C. S., Ferraro, V., Asuncion, J. V., Chwojka, C., Barile, M., Nguyen, M. N., et al. (2009). Disabilities and e-learning problems and solutions: An exploratory study. *Educational Technology & Society, 12*(4), 241-256.

Flexer, R. W., Daviso, A. W., Baer, R. M., Queen, R. M., & Meindl, R. S. (2011). An epidemiological model of transition and postschool outcomes. *Career Development forExceptional Individuals, 34*, 83-94.

Fourqurean, J. M., Meisgeier, C., Swank, P. R., & Williams, R. E. (1991). Correlates of post-secondary employment outcomes for young adults with learning disabilities. *Journal of Learning Disabilities, 24*, 400-405.

Frymier, J., & Gansneder, B. (1989). The Phi Delta Kappa study of students at risk. *Phi Delta Kappan, 71*, 142 - 146.

Greene, G. (2003). Best practices in transition. In G. Greene & C. A. Kochhar-Bryant (Eds.). *Pathways to successful transition for youth with disabilities* (pp. 154-196). Upper Saddle River, NJ: Pearson Education, Inc.

Hannafin, M., Hill, J. R., Oliver, K., Glazer, E. & Sharma, P. (2003). Cognitive and learning factors in Web-based distance learning environments. In *Handbook of distance education,* ed. M. G. Moore and W. G. Anderson, 245–260. Mahwah, NJ: Erlbaum.

Hasazi, S. B., Johnson, R. E., Hasazi, J. E., Gordon, L. R., & Hull, M. (1989). Employment of youth with and without handicaps following high school: Outcomes and correlates. *The Journal of Special Education, 23*, 243-255.

Hasler Waters, L., & Leong, P. (2014). Who is teaching? New roles for teachers and parents in cyber charter schools. *Journal of Technology and Teacher Education, 22*(1), 33-56. Chesapeake, VA: SITE.

Hoover, J. J., & Patton, J. R. (2004). Differentiating standards-based education for students with diverse needs. *Remedial and Special Education, 25*, 74–78.

International Association for K-12 Online Learning. (2011). *National standards for qualityonline teaching. Vienna*, VA: Author.

Individuals with Disabilities Education Act of 2004, 20 U.S.C. § 1400 et seq.

Institute of Education Sciences. (2008). IES practice guide: Dropout prevention (NCEE 2008-4025). Washington, DC: U.S. Department of Education.

Jakobsdóttir, S. (2008). The role of campus-sessions and face-to-face meetings in distance education. European Journal of Open, Distance and E-Learning, 2008(II). Retrieved from http://www.eurodl.or g/?p=archives&year=2008&halfyear=2&article=348.

Johnson, G. M., (1998). Principles of instruction for at-risk learners. *Preventing School Failure, 42*(4), 167–174.

Keeler, C. G., & Horney, M. (2007). Online course designs: Are special needs being met? *The American Journal of Distance Education*, 21(2): 61–75.

Keeler, C. G., Richter, J., Anderson-Inman, L., Horney, M. A., Ditson, M. (2007). Exceptional Learners: Differentiated Instruction Online. In C. Cavanaugh & R. Blomeyer (Eds.), What works in *K-12 online learning* (pp. 125–178). Eugene, OR: International Society for Technology in Education.

Keller, J. M. (2008). First principles of motivation to learn and e- Learning. *Distance Education, 29*(2), 175–185.

Kennedy, K. & Archambault, L. (2012). Offering preservice teachers field experiences in K-12 online learning: A national survey of teacher education programs. *Journal of Teacher Edu-*

cation, 63(3), 185–200. doi:10.1177/0022487111433651.

Kennedy, K., & Cavanaugh, C. (2010). Development and support of online teachers: The roles of mentors in virtual schools. *Journal of Technology in the Classroom, 2*(3), 37–42.

Kohler, P. D. (1993). Best practices in transition: Substantiated or implied? *Career Development for Exceptional Individuals, 16*(2), 107-121.

Landmark, L. J., Ju, Zhang, D. (2010). Substantiated best practices in transition: Fifteen plusyears later. *Career Development for Exceptional Individuals, 33,* 165-176. doi:10.1177/0885728810376410

Landmark, L. J. & Zhang, D. (2012). Compliance and practices in transition planning: A review of individualized education program documents. *Remedial and Special Education, 34,* 1-13. doi:10.1177/0741932511431831

Lindstrom, L., & Benz, M. (2002). Phases of career development: Case studies of young women with learning disabilities. *Exceptional Children, 69*, 67-83.

Liu, F., Black, E., Algina, J., Cavanaugh, C., & Dawson, K. (2010). The validation of oneparental involvement measurement in virtual schooling. *Journal of Interactive Online Learning, 9*(2), 105-132.

Liu, F., & Cavanaugh, C. (2011). Online core course success factors in virtual schools: Factors influencing student academic achievement. *International Journal of E-Learning, 12*(4): 43–65.

Margolis, H., & McCabe, P. P. (2003). Self-efficacy: A key to improving the motivation of struggling learners. *Preventing School Failure: Alternative Education for Children and Youth, 47*(4): 162–169.

Means, B., Toyama, Y., Murphy, R., Bakia, M., & Jones, K. (2009). Evaluation of evidenced-based practices in online learning: A meta- analysis and review of online learning studies. Washington, DC:, Office of Planning, Evaluation, and Policy Development, U.S. Department of Education.

Menzies, H. M., & Lane, K. L. (2011). Using self-regulation strategies and functional assessment-based interventions to provide academic and behavioral support to students at risk within three-tiered models of preventions. *Preventing School Failure: Alternative Education for Children and Youth 55* (4): 181–191.

National Center for Educational Statistics. (2014). Dropout Rates Fast Facts. Retrieved February 21, 2014, from https://nces.ed.gov/fastfacts/display.asp?id=16.

National Center for Education Statistics. (2014). Income of Young Adults Fast Facts. Retrieved February 21, 2014, from http://nces.ed.gov/fastfacts/display.asp?id=77.

National Dropout Prevention Center Network. (2014). Situations That Put Youth At Risk.

Retrieved February 16, 2014, from http://www.dropoutprevention.org/statistics/situations-that-put-youth-at-risk.

National Longitudinal Transition Study-2. (2005). Facts from NLTS2: *High school completion by students with disabilities*. Menlo Park, CA: SRI International. Retrieved February 21, 2014, from www.nlts2.org/fact_ sheet_2005_11.pdf.

Orthner, D. K., Akos, P., Rose, R. , Jones-Sanpe, H., Mercado, H., & Woolley, M. E. (2010). Career start: A middle school student engagement and academic achievement program. *Children & Schools, 32*(4): 223–234.

Perry, J. C. (2008). School engagement among urban youth of color: Criterion pattern effects of vocational exploration and racial identity. *Journal of Career Development, 34*(4): 397–422.

Phelps, L. A., & Hanely-Maxwell, C. (1997). School-to-work transitions for youth with disabilities: A review of outcomes and practices. *Review of Educational Research, 67*, 197-226.

Picciano, A.G. & Seaman, J. (2010). Class connections: High school reform and the role of online learning. Boston: Babson College Survey Research Group.

Rabren, K., Dunn, C., & Chambers, D. (2002). Predictors of post-high school employment among young adults with disabilities. *Career Development for Exceptional Individuals, 25*, 25-40. doi:10.1177/088572880202500103

Repetto, J., Cavanaugh, C., Wayer, N., and Liu, F. (2010). Virtual high schools: Improving outcomes for students with disabilities. *Quarterly Review of Distance Education, 11* (20): 91–104.

Repetto, J., Webb, K., Neubert, D., & Curran, C. (2006). *The middle school experience:Successful teaching and transition planning for diverse learners.* Austin, TX: PRO-ED.

Rhim, L., & Kowal, J. (2008). *Demystifying Special Education in Virtual Charter Schools.* Alexandria, V A: Special Education Technical Assistance for Charter Schools Project.

Rice, K. (2009). Priorities in K-12 distance education: A delphi study examining multiple perspectives on policy, practice, and research. *Educational Technology & Society, 12*(3), 163–177.

Rice, K., & Dawley, L. (2007). Going virtual! The status of professional development for K-12 online teachers. Research report presented at the Virtual School Symposium. Louisville, KY. Retrieved April 22,2014, from http://edtech.boisestate.edu/goingvirtual/goingvirtual1.pdf

Rice, K., Dawley, L., Gasell, C., & Flores, C. (2008). *Going virtual! Unique needs and challenges of K–12 online teachers*. Washington, DC: North American Council for Online Learning.

Rose, R. M., & Blomeyer, R. L. (2007). Access and equity in online classes and virtual schools. North American Council for Online Learning. Vienna, VA: International Association for K–12 Online (iNACOL). Available online at http://www.nacol.org/docs/NACOL_EquityAccess.pdf.

Rovai, A. P. (2002). Development of an instrument to measure class- room community. *Internet and Higher Education, 5*(3), 197–211.

Sadera, W. A., Robertson, J., Song, L., & Midon, M. M. (2009). The role of community in online learning success. *Journal of Online Learning and Teaching 5* (2): 277–284.

Sample, P. L. (1998). Postschool outcomes for students with significant emotional disturbance following best-practice transition services. *Behavioral Disorders, 23*(4), 231-242.

Shore, R., & Shore, B. (2009). Reducing the high school dropout rate. Baltimore, MD: Annie E. Casey Foundation.

Spitler, C. (2013). Transition compliance and evidence-based practices in public cyber charter-schools: Effects of student demographics. (Doctoral dissertation, University of Florida, 2013).

Spitler, C., Repetto, J., & Cavanaugh, C. (2013). Investigation of a special education program in a public cyber charter school. *The American Journal of Distance Education, 27*, 4-15. doi: 10.1080/08923647.2013.754182

Statistic Brain. (2014). High School Dropout Statistics. Retrieved February 20, 2014, from http://www.statisticbrain.com/high-school-dropout-statistics/.

Steinberg, A., & Allen, L. (2011). Putting off-track youths back on track to college. *Phi Delta Kappan 92* (5): 21–26.

Stillwell, R., & Sable, J., (2013). Public School Graduates and Dropouts from the Common Core of Data: School Year 2009–10 First Look (Provisional Data). National Center for Educational Statistics.

Test, D. W., Fowler, C. H., White, J., Richter, S., & Walker, A. (2009). Evidence-based secondary transition practices for enhancing school completion. *Exceptionality, 17*, 16-29. doi: 10.1080/09362830802590144

Test, D. W., Mazzotti, V. L., Mustain, A. L., Fowler, C. H., Kortering, L., & Kohler, P. (2009). Evidence-based secondary transition predictors for improving postschool outcomes for students with disabilities. *Career Development for Exceptional Individuals, 32*, 160-181. doi:10.1177/0885728809346960

Tompkins, R., & Deloney, P. (1994). Rural students at risk in Arkansas, Louisiana, New Mexico, Oklahoma and Texas. Austin, TX: Southwest Educational Development Laboratory. Retrieved February 20, 2014, from http://www.sedl.org/rural/atrisk/.

Watson, J., & Germin, B. (2008). Promising practices in online learning: Using online learning for at-risk students and credit recovery. Vienna, VA: International Association for K–12 Online Learning.

Watson, J., Murin, A., Vashaw, L., Gemin, B. & Rapp, C. (2013). Keeping pace with K–12 online learning: An annual review of policy and practice. Available online at http://kpk12.com/.

Wehmeyer, M. L. (2005). Self-determination and individuals with severe disabilities: Re-examining meanings and misinterpretations. *Research and Practice for Persons with Severe Disabilities, 30*(3), 113-120.

Wehmeyer, M., & Field, S. (2007). Self-determination: Instructional and assessment strategies. Thousand Oaks, CA: Corwin Press.

WestEd. (2008). Evaluating online learning: Challenges and strategies for success. Washington, DC: U.S. Department of Education.

Williams-Diehm, K. L., & Benz, M. R. (2008). Where are they now? Lessons from a single district follow-up study. *The Journal for Vocational Special Needs Education, 30*(2), 4-15.

Wolff, K., & Kelly, S. M. (2011). Instruction in areas of the expanded core curriculum linked to transition outcomes for students with visual impairments. *Journal of Visual Impairment & Blindness, 105*(6), 340-349.

Zvoch, K. (2006). Freshmen year dropouts: Interactions between student and school characteristics and student dropout status. *Journal of Education for Students Placed At Risk, 11*, 97-117. doi:10.1207/s15327671espr1101_6

Chapter 6

Reviewing a decade (2004-2014) of published, peer-reviewed research on online learning and students with disabilities

Diana Greer,
Center on Online Learning and Students with Disabilities, University of Kansas dgreer@ku.edu,
Mary Rice,
Center on Online Learning and Students with Disabilities, University of Kansas mary.rice@ku.edu
Bryan Dykman,
Center on Online Learning and Students with Disabilities, University of Kansas, bdykman@ku.edu

Abstract

This chapter reviews published, peer-reviewed research from the most recent decade at the nexus or intersection of K12 online learning and students with disabilities. Previous reviews of research on this topic are summarized. These reviews assert that there is not enough research on the topic. The authors of this chapter employed a multifaceted coding process on articles that were located for review. This process included reading for broad topics, multiple readings by each author, and a negotiated process for final designations. Research in online learning for students with disabilities in K12 settings in the last decade focuses on (1) curriculum evaluation, (2) student achievement (as broadly defined) (3) stake holder perceptions and (4) policy structures presently in place for online learning for this special population. Blended learning studies that fit the goals of this review were practically non-existent. Several tables capture the major findings of these studies from which implications are drawn about the ever-present need for more research in this area, but also for research that is more rigorous, and is made available in published, peer-reviewed journals. Implications are also offered for practitioners and policy makers.

Introduction

According to the National Center for Education Statistics (U.S. Department of Education 2012), approximately 6.5 million students ages 3-21 are in federally supported programs because of a disability. This is approximately 12 percent of the total K-12 population. These students with disabilities are a heterogeneous group that includes students with learning disabilities, cognitive impairments, speech or language impairments, intellectual disabilities, emotional disturbances, hearing impairments, orthopedic impairments, visual impairments, deafness, blindness, autism, traumatic brain injuries, developmental delays, and other health impairments that interfere with their ability to participate in educational curriculum. The NCES names several major categories of these other health impairments as heart conditions, tuberculosis, rheumatic fever, nephritis, asthma, sickle cell anemia, hemophilia, epilepsy, lead poisoning, leukemia, and diabetes. The large number of potentially overlapping conditions, disabilities, disorders, and impairments makes the term *students with disabilities* a broad one indeed. These students are also heterogeneous in that they could come from anywhere on the socioeconomic strata, have any racial/ethnic background, speak any number of languages in addition to or instead of English, claim any number of possible gender/sexual identities, and live anywhere in the United States.

What these students have in common is an achievement record that consistently fails to match that of their peers who do not have disabilities (Nelson, Benner, Lane, & Smith, 2004). Students with disabilities and their families also have a history of having to struggle for educational services that enable them to participate with their peers and access the curriculum (Hardman & Dawson, 2008). This struggle is ongoing, even though research demonstrates that increasing accessibility improves curricular engagement, which is a necessary precursor to improving learning outcomes (Lee, Wehmeyer, Soukup, & Palmer, 2010). As increasing numbers of students with disabilities participate in entire courses or series of courses where instruction is delivered mostly via Internet sources, the struggle for access to curriculum has moved online as well (Repetto, Cavanaugh, Wayer, & Liu, 2010).

The purpose of this chapter is to report on a comprehensive review of original peer-reviewed empirical research that attends to K-12 students with disabilities that are taking coursework (blended or fully online) in virtual settings. These settings may include online courses through public schools for credit recovery or as a regular course option, charter schools—including cyber charter schools for credit recovery or as a regular course option, or as home schooled students. This review will begin with an overview of findings from previous reviews of research about K-12 students with disabilities taking courses online. It will then highlight search strategies for this current review of literature. Next, findings from following the search strategies will be shared. Finally, this review will offer a research synthesis and recommendations to teachers and researchers that might serve as goals for the next decade of research in online learning and K-12 students with disabilities.

Previous Reviews of Research on Online Learning and Disability

Three reviews about on online learning and disability were conducted prior to 2004 and focused on postsecondary rather than K-12 education. In descending order by year, these reviews were conducted by Kinash, Crichton, and Kim-Rupnow (2004), Cook and Gladhart (2002), and Kim-Rupnow, Dowrick, and Burke (2001). In addition, two other reviews were published fairly recently. Vasquez and Serianni (2012) conducted one review, and Vasquez and Straub (2012) conducted the other. While the earlier reviews sought to be comprehensive, the latest two are focused on online learning and students with disabilities in rural settings and online learning and students with disabilities in terms of achievement only. However, these two latter reviews of literature do address K-12 students with disabilities. Despite the constraints of these reviews' focus (rural settings and achievement), they do contribute to the topic of K-12 students with disabilities and online learning.

Reviews Conducted Before 2004

Reviews of research looking at articles published prior to 2004 canvassed concerns about access to online K-12 education for students with disabilities. In a review of studies conducted from 2000-2003, Kinash, Crichton, and Kim-Rupnow (2004) found that improving accessibility for students with disabilities who are taking courses online was a major theme. They also found that there was a concern for best practices in online settings in regards to assisting students with disabilities. These researchers cited two previous reviews of literature: one by Cook and Gladhart (2002) and the other by Kim-Rupnow, Dowrick, and Burke (2001). Both of these previous reviews included research published on the topic of disability from the inception of online learning in higher education settings in the 1980s until the time of their publication. The Cook and Gladhart review found that there was little original research being conducted at the intersection of online learning and disabilities. They also concluded that much of the work being published was didactic—offering explanations of what online learning was—or in the form of training manuals for general pedagogy or specific pieces of technology.

Kim-Rupnow, Dowrick, and Burke (2001) restricted their search to original research articles, and therefore, they found only a handful of studies to review. By looking at 10 studies, they determined that using advanced technology did help students with disabilities, but they were cautious in making this claim because of the scarcity of articles and because many of the articles they did find were written from the perspective of post-secondary institutions and did not have a particular focus on students with disabilities. In addition, this review was based on distance education programs in general and focused on higher education.

Reviews Conducted After 2004

Reviews of literature that focus on K-12 students with disabilities and online learning did not appear until fairly recently. One review by Vasquez and Serianni (2012) looked at seven research studies and concluded that there was a lack of empirical work on students with disabilities in online settings. They also found evidence for a concern with effectiveness studies at the expense of other important elements, such as how to translate effective practices from brick-and-mortar settings to online ones, or looking for ways to leverage technology as a mode of instruction for rural children.

The other review by Vasquez and Straub (2012) reviewed research from peer-reviewed journals in addition to research from conference presentations, dissertations, and other sources. Including these non-peer reviewed, unpublished studies enlarged the cannon (43 studies), but these researchers arrived at the same conclusions as Vasquez and Serianni (2012): that there was not enough research, and that the research that had been conducted was not focused on answering questions that would be truly beneficial to the target population of K-12 students with disabilities and the target setting of online coursework.

Methods for Reviewing Literature

Locating articles for this review of literature was a multifaceted process that began by deciding what terms to search and determining what databases might yield the most comprehensive search results. A final element involved deciding how the articles fit together as a conversation about the focus topics.

Identifying Search Strategies

Strategies for conducting the present review included techniques for searching databases for articles about online learning, disabilities, and K-12 students. Each of these words has a broad range of concomitant terms in research literature. A list of keywords associated with online learning and special education formed the initial search terms. These terms were searched within database thesauri and indices for further refinement of terminology and to generate synonyms. Search terms appear in Table 1. The first three columns represent initial search terms.

Table 1: Key Search Terms and Derivatives

Disability	Online learning	K-12 schooling	Other terms
Special education, students with disabilities, students with special needs, students with exceptional needs, disability, impairment, IEP	Virtual schools, web-based instruction, virtual classrooms, virtual learning, cyber school, e-learning, distance education, blended learning, online coursework, cyber charter school, online credit recovery, Internet coursework	K-12, elementary, secondary, public school, charter school, private school, homeschool, grade school, adolescent	Achievement, attrition, effectiveness, performance, engagement, grades, satisfaction, involvement, accommodations, curriculum, pedagogy, policies, legalities, technology

Terms were entered into the databases with the advance search function, toggling search fields ranging from "subject headings" to "keywords" to "all text." Some databases were more flexibly searched using Boolean Operators, though often these functions were employed automatically by the database's advanced search function. A research librarian at the University of Kansas assisted with the optimization of search queries. As the findings are reported later in this article, the original terms from the studies themselves have been retained as much as possible. Elsewhere in the article the terms *online learning* and *students with disabilities* have been used to refer to the topic under review generally.

The purpose of this review was to locate peer-reviewed empirical articles on K-12 students with disabilities and online learning. Therefore, the search focused on databases with journal articles. Table 2 provides an overview of the research databases searched. The databases accessed during the search for articles were chosen because of their availability through the University of Kansas libraries and its InterLibrary Loan partners. These databases included Academic Search Complete, Sage Journals Online, ERIC, PsycINFO, and Google Scholar. These databases are also listed in Table 2.

Table 2: Types and Names of Databases Searched

Government databases	Journal databases	Public databases	Private databases
ERIC, EBSCO	*The New Review of Hypermedia & Multimedia, The American Journal of Distance Education, The Journal of Special Education Technology, The Journal of Special Education, and The Journal of Computer Assisted Learning.*	Google Scholar Research Gate	Academic Search Complete, Sage Journals online, Psych INFO

Additional constraints were applied to all returned search results. These constraints included a restriction by year (2004 to 2014) and by article type (published in peer-reviewed academic journals). When databases allowed it, a constraint regarding the ages of children involved in the study were selected. For example, the ERIC database allowed results to be filtered by grade-level, which for this study included primary- and secondary-aged school children. When this filter was not available, results were screened by looking at the age of the participants in the abstract and/or methods section or by adding additional search phrasing (i.e., K-12, secondary students, primary students).

Although government reports were not included in the review, reports published within the last decade containing reference sections were searched for potentially relevant articles.

Additionally, the quest for empirical, peer-reviewed, published work meant that conference presentations, master's theses, and doctoral dissertations were not included. Also not included in the review were government or agency sponsored pamphlets/research syntheses. Finally, articles in peer-reviewed journals that were not empirical in nature (i.e., not driven by a research question, methods/strategies, and findings) were not reviewed. We did, however, locate as many of these types of text as possible so that we could search their bibliographies and reference sections. We also searched the bibliography and reference section of each peer-reviewed empirical journal article that was located. Finally, we excluded a number of articles that focused on technology-enriched instruction/learning since our focus was on online coursework rather than technological interventions or enhancements.

Making Sense of Findings

This review of literature employed thematic analysis as its principal technique for organizing the data. According to Daly, Kellehear, and Glicksman (1997), a simple thematic analysis involves a search for themes as they emerge in their importance to describing a particular phenomenon. Themes are identified by conducting a "careful reading and re-reading of the data" (Rice & Ezzy, 1999, p. 258). This method relies heavily on the subjective ability of researchers to recognize patterns in a data set. As a result of naming these patterns as themes, categories become visible to the researchers and those who read their work.

In this particular theme analysis, data-driven inductive approaches advocated by Boyatzis (1998) were used as opposed to *a priori* codes (Crabtree & Miller, 1999) that are sometimes used. The inductive approach was important to use because of the lack of a firm research base on the topic of K-12 students with disabilities in online/blended learning settings. The coding process involves both seeing something important in the research data and seeing it as important before interpreting it (Boyatzis, 1998). With this in mind, a useful code is able to capture the richness of a phenomenon rather than merely the essence. Focusing on richness rather than essence leads researchers away from merely organizing the data and toward interpreting it in ways that are insightful but resonate as common sense to those who read the report of a coded research project.

Whenever a suitable study was identified it was mined for the following information: author, year, purpose of study, context, participant description, major research strategies, and major findings. This information was gathered onto a table, checked, and rechecked by all members of the team that conducted the review. When the tables were complete and the double and triple checking had been completed, the team met to determine the major themes. This process was completed as a group in one sitting. After the themes were determined, the research review team looked back at the articles and themes away from each other to determine if they still agreed until final themes and assignments of themes were made.

Research Synthesis

A total of 15 empirical peer-reviewed, published studies were located on the topic of online learning and K-12 students with disabilities. The findings of this review will discuss several themes that emerged in the order of their prominence. The first theme centers on evaluating the curriculum of the online or blended courses for their suitability for students with disabilities (six studies). The second theme is that of achievement—as broadly defined—for students with disabilities in these online/blended courses (four studies). The third theme focuses on the perceptions and experiences of stakeholders in online/blended learning when K-12 students with disabilities are the clients (four studies). The last theme deals with policies for blended/online environments that are inclusive and supportive of students with disabilities (one study).

Curriculum Evaluation

Table 3 summarizes the findings for the studies that fell into the curriculum evaluation theme. This was the largest group of studies reviewed. The most-often-used research design for these studies was experimental (Izzo, Yurick, Nagaraja, & Novak, 2010; Okolo, Englert, Bouck, & Heutsche, 2007; Okolo, Englert, Bouck, Heutsche, & Wang, 2011). In the experimental studies, the purpose was to determine whether a particular curriculum promoted a learning outcome. These studies were separated from another theme of achievement studies by looking carefully at the purposes of the studies to determine if the achievement outcomes were being used to test a curriculum, rather than a specific strategy, if they were being used as evidence of the general effectiveness of online learning, or if they were being used to test some kind of support that was outside the content of the course. Thus, although the notion of curriculum was used broadly, it was constrained by the requirement that the studies' demonstrated concern for content and subject matter knowledge.

There was one quasi-experimental study (Stichter, Laffey, Galyen, & Herzog, 2014). This study focused not only on the quality of the content, but also whether its implementation was conducted with fidelity. There was one content analysis (Keeler & Horney, 2007). Content analysis was used as a means to hold curriculum up to existing standards to see if there was alignment. There was also one formal interview (Spitler, Repetto, & Cavanaugh, 2013). This study captured the perspective, not of online learning, but of a broad curriculum's potential for school-wide improvement. Instead of a curriculum for the students to learn, it is a curriculum for educators within an online learning organization to learn and adhere to in their work with students and parents. This study was excluded from stakeholder experiences as a theme because of the emphasis on the 5Cs as an overarching organizational premise. Additionally, it was excluded from the policy theme because of its use as a conceptual framework or guiding tool rather than a carefully outlined legal or legal-sounding set of protocols or procedures.

The findings of these studies generally assert that carefully designed curriculum has the potential to help students with and without disabilities learn content as well as satisfy the demands of existing standards. The limitations to the experimental and quasi-experimental studies are that they are not generalizable based on their relatively small number of participants. Moreover, in terms of research on students with disabilities, these studies did not report findings for specific types of disabilities. The content analysis (Keeler & Horney, 2007) had practical limitations in that the authors were not specific about how they matched the standards to the curriculum.

Table 3: Summary of findings for studies focused on curriculum evaluation

Author(s)/ Year	Purpose	Participants/ Data	Study Design	Major Findings
Izzo, Yurik, Nagaraja, & Novak (2010)	To evaluate EnvisionIT, a 10-unit web-based curriculum designed to teach secondary students with disabilities transition skills.	278 students (119 with disabilities) in a blended high school setting	Experimental	Experimental group made significantly greater gains in information technology literacy than the control group including the students with disabilities; however, students who were better readers (regardless of disability status) gained the most from the curriculum.
Keeler & Horney (2007)	To compare courses in online learning environments to the Instructional Design Elements of High School Online Courses	No human participants 156 design elements and 600 data points	Content analysis	Online high school courses generally met the basic needs of SWD when held against this set of standards.
Okolo, Englert, Bouck, & Heutsche (2007)	To evaluate the effectiveness of the Virtual History Museum as a curriculum for students with and without disabilities for practitioners.	39 students in 3 classes with the same teacher. 14 students had disabilities	Experimental	When post-test scores were adjusted to account for pre-test scores, all students demonstrated improvement; SWD demonstrated improvement equal to peers without disabilities, except in the long written assignment.
Okolo, Englert, Bouck, Heutsche, & Wang (2011)	To evaluate the effectiveness of the Virtual History Museum as a curriculum for students with and without disabilities for researchers.	39 students in 3 classes with the same teacher. 14 students had disabilities	Experimental	When post-test scores were adjusted to account for pre-test scores, all students demonstrated improvement in factual knowledge and history reasoning ability; SWD demonstrated improvement equal to peers without disabilities, except in the long written assignment. Students without disabilities wrote more words and offered more reasons in writing assignments.
Spitler, Repetto, & Cavanaugh (2013)	To hear the perspective of an administrator about the implementation of 5Cs (Connect, Climate, Control, Curriculum, Caring Community) in a cyber charter school.	CEO of 1 cyber school	Formal interview	The CEO of the cyber school reported on the benefits of online learning in an online learning provider including the removal of time and space constraints. In addition, the CEO reported that online learning allows for differentiated instruction tailored to the goals of the student. The CEO also noted the school's pattern of success with students diagnosed with autism spectrum disorders through providing life skill instruction in addition to general high completion rates for SWD. A program design called 5 Cs received acclaim.
Stichter, Laffey, Galyen, & Herzog (2013)	To evaluate 31 social competence lessons delivered in a 3D virtual environment.	11 students with disabilities from 3 different school districts	Quasi-experimental and Survey	The social competence curriculum was delivered with fidelity in the 3D virtual learning environment. Students were able to use the equipment successfully.

Achievement

The next largest theme that emerged from the review was achievement. Table 4 summarizes these studies. As previously discussed, achievement studies were separated from curriculum evaluations based on how much the studies relied on content and subject matter knowledge to assert findings. In these studies, there was no dominant research design. These studies have the largest numbers of participants and other data points.

The overall finding of these achievement studies is that although students with disabilities and their peers have much in common in how they approach online learning (Allday & Allday, 2011), they do not achieve at the same rate (Carnahan & Fulton, 2013). These studies also offer insight into potential types of support such as strategy instruction/coaching (Fitzgerald, Miller, Higgins, Pierce, & Tandy, 2012), encouragement, and feedback that promote engagement (Liu & Cavanaugh, 2012). The limitations of these studies include the fact that despite the generally large numbers of participants, these studies were confined to one school or one state. As in the curriculum evaluation studies, data were not disaggregated by different types except in the 2012 article by Fitzgerald, Miller, Higgins, Pierce, and Tandy, where there were only a handful of participants.

Table 4: Summary of findings for studies focused on achievement

Author(s)/ Year	Purpose	Participants/ Data	Study Design	Major Findings
Allday & Allday (2011)	To compare the pace requests and final grades of students with and without IEPs in online courses.	345,422 students in 934,080 courses over 7 years in 1 state	Chi-square, ANOVA, t-test	Students with and without disabilities make similar pace requests and complete the courses in the same amount of time; final grades decreased with increased time to complete the course.
Carnahan & Fulton (2013)	To determine participation and achievement patterns in cyber charter schools for students with disabilities and compare learning outcomes with those of traditional schools.	No human participants Data from 2600 students with disabilities in 1 state over 4 years	Descriptive	Students with a wide range of disabilities participated in online learning in this state. The rate of enrollment growth for students with disabilities over a 4-year span was 114% while the general education population grew 83%. However, students with disabilities in cyber schools in this state have lower achievement than students with disabilities in traditional schools and lower reading levels (it was noted that there was gradual growth in academic performance through the 4 years).
Fitzgerald, Miller, Higgins, Pierce, & Tandy (2012)	To investigate the effect of using online modules to teach the Word Identification Strategy.	5 students with disabilities between the ages of 10 and 13 in a fully online charter school	Quasi-experimental	All five students made oral reading improvements related to oral reading, comprehension, and use of the strategy as confirmed by pre-/post- and maintenance tests.
Liu & Cavanaugh (2012)	To investigate the factors that can influence student mathematic achievement in K-12 virtual learning environments.	547 students (32 with disabilities) in 4 online algebra I and II classes at state sponsored virtual school	Hierarchical linear modelling	Teacher comments had a positive and significant effect on students' final score for Algebra 1 (first and second half). Time students logged into the system was found to significantly predict achievement for Algebra 1 (second half) and Algebra II (first and second half). Full time students did better than part time students in Algebra II (first and second half).

Stakeholder Perceptions and Experiences

Table 5 summarizes the findings for four studies that examined perceptions, opinions, and experiences of students and parents involved in online courses. All four studies used a self-report survey method. The findings from the studies indicate that students with disabilities and their parents were more educated than students in traditional settings and students with disabilities' grades in online courses are not significantly different (Thompson, Ferdig, & Black, 2012). Further, these parents are generally satisfied with their online school experiences (Beck, Egalite, & Maranto, 2014; Harvey, Greer, Basham & Hu, 2014). Moreover, it is perceived that online learning environments can empower students with disabilities by reducing stigmas often associated with disabilities (Hipsky & Adams, 2006). Additionally, online environments are perceived to provide modifications and adaptations necessary to meet the unique needs of students with disabilities (Beck, Egalite, & Maranto (2014); Hipsky & Adams, 2006). In general, parents and students reported satisfaction with the levels of communication and involvement with teachers.

The limitations of these studies include the fact that all of the information gathered in the studies used a self-report survey format that often relied on limited response formats such as multiple-choice. In all four studies, response rates were low and purposeful sampling was used. The sampling techniques and low response rates may result in bias as perspectives were only obtained from those who completed the survey; thus, one must be careful to not generalize results to a larger population. Further limiting the generalizability of findings within the four studies is the fact that three of the four studies obtained survey responses primarily from adolescents which limits what is currently known about the perceptions, opinions, experiences, and satisfaction of students enrolled in K-6 online courses.

Table 5: Summary of findings for studies focused on stakeholder experiences and perceptions

Author(s)/ Year	Purpose	Participants/ Data	Study Design	Major Findings
Beck, Egalite, & Maranto (2014)	To determine the student/parent satisfaction with cyber educational services in a particular cyber school.	269 students and 232 parents total	Survey	Special education students (who made up 26 percent of the school's population) and their parents report greater satisfaction with their cyber charter school compared to their general education counterparts. They also reported behavioral issues as a major reason for choosing cyber charter school.
Harvey, Greer, Basham, & Hu (2014)	To learn about student involvement in online settings, special education services, extracurricular activities, actual and preferred interaction patterns with teachers and online peers, bullying on and offline, and overall opinions of online learning.	140 students; 29 students with disabilities	Survey	For the most part, participants indicated they liked online classes, seemed satisfied with their interaction with and support from their teachers, and enjoyed the autonomy and flexibility offered by online lessons. However, participants disclosed missing social opportunities and extracurricular activities provided in a traditional school setting.
Hipsky, Morris, & Adams (2006)	To solicit parent and student opinions about their experiences at a particular cyber school.	Number of respondents not reported in the article	Survey	Themes that emerged from a qualitative analysis of survey data were: communication, interests, focus, and lessened stigma for students with disabilities, educational differences and shortcomings.
Thompson, Ferdig, & Black (2012)	To solicit parent perceptions of enrolled children with disabilities' achievement in a particular cyber school.	1,971 parents	Survey	Parents in online settings were more likely to have a bachelor's degree or higher as compared to parents in traditional settings nationally. Most children enrolled in the online courses at that school were White females. There were no differences in the distribution of reported grades between students' online grade and grades in from their traditional schools. Reasons for taking online classes included: their traditional schools did not offer the class, they wanted to augment their education, or they had scheduling difficulties. Only 16% took classes due to disciplinary concerns or credit recovery, and 8% for health or significant social concerns. Children with reported medical concerns and Black children were more likely to have lower grades in online courses as compared to traditional courses.

Policy
Little empirical research was found regarding policy and online learning for students with disabilities (see table 6). In total, one empirical study examining the perceptions and practices of providing policy guidance was found.

Findings from this sole study indicate that the amount of policy and guidance provided varies considerably from state to state, potentially because each state is in a slightly different stage of online learning adoption (Burdette, Greer, & Woods, 2013). Twenty-seven states reported that they provided publically available guidance in online learning; 19 indicated that they did not supply guidance to the public; and 26 indicated that they provided web links to guidance. Of those states that supplied web links, only 17 links mentioned provisions of special education services in online learning environments. In short, states varied in the amount of guidance they supplied to practitioners, students, and parents, if they provided guidance at all.

The limitations of this study include only obtaining information from state directors of special education, the use of self-reporting for data collection, and a limited response rate (not all states responded to survey requests).

Table 6: Summary of findings for studies focused on policy

Author(s)/ Year	Purpose	Participants/ Data	Study Design	Major Findings
Burdette, Greer, & Woods (2013)	To learn how states are attending to and framing policies around special education students in the gamut of online learning contexts.	61 state and non-state jurisdiction directors of special education	Survey	The number of states offering online learning to students with disabilities is steadily increasing. In addition, tremendous ambiguity and variability exist in state policies about online learning for students with disabilities in terms of quality of services, accommodation, and coordination across agencies.

Implications for Policy and Practice

Although there were few studies on online learning and students with disabilities, it is possible to draw some implications that might guide future work. These implications are in two domains: policy and practice.

Policy

During the literature review, we found several articles, book chapters, and editorial discussions about online learning policies and practices (Bernstein, 2013; Brady, Umpstead, & Eckes, 2010). These writings were tied to cyber charter schools and when students with disabilities were briefly mentioned, the discussion revolved around who and how to address issues of Free Appropriate Public Education (FAPE) and Least Restrictive Environment (LRE) online. However, there remains little empirical research examining K-12 state, district, or school policies and practices in online learning for students with disabilities. Some researchers have suggested looking at policies and practices in post-secondary settings. Caution must be used in the influence post-secondary online learning policy and practices have as the uniqueness of K-12 online learning requires careful thought and even formal inquiry into how policies affect students who are very young, who have disabilities, and who are obligated to be in an educational setting.

The results of this review of literature located only one study that broadly discussed the guidance that states supplied to practitioners, parents, and students. Other studies briefly mentioned or hinted at policy considerations, yet again, comments were broad and sweeping.

Based on the literature reviewed in this chapter, we are careful to draw conclusions or provide implications for policy or regulations. Instead, we advocate for more empirical research before responsibly having this discussion. We recommend research that considers (a) how students are accessing online environments, (b) what online practices are challenging and effective for students with disabilities, and (c) what accommodations and modifications are necessary or possible in an online environment for students with disabilities. This research needs to look at the achievement of students with disabilities within online environments and not rely solely on self-reporting or perception-based research methods.

Practice

Although the studies conducted thus far on online learning and students with disabilities have limited generalizability across educational settings, there are possible highly practical applications for several of the studies. This section of the paper will focus on drawing practical implications from work in online strategy instruction, academic performance in a specific content area, content-based e-learning, as well as general and specific social skills instruction for students with disabilities learning in online settings.

Online Strategy Instruction.

In 2012, Fitzgerald, Miller, Higgins, Pierce, and Tandy used online modules to teach the Word Identification Strategy to elementary and middle school students with learning disabilities. This research showed that particular students can improve comprehension, decoding, and comprehension grade equivalent scores by learning the Word Identification Strategy through online instruction.

This study suggests that teachers, parents, and administrators should look for curriculum with simple designs. The design of the online lesson in this study involved a Power Point slide that was converted to a multimedia slideshow with overlaying audio of the text. PowerPoint is available to most educators via Microsoft Office on their computers. Software to record audio and convert PowerPoint to video can run from freeware to intro level software, but some educators may need to seek outside help to learn these programs. Another element of simplicity was the worksheets that were used to practice various aspects of the Word Identification Strategy. This is a familiar and easily adaptable strategy, especially for blended instruction.

This study also suggests some cautions for online strategy instruction with students with disabilities. The authors of the study noted that teaching participants' parents how to use the technology was difficult. Teachers, parents, or learning coaches who use similar curriculum will want to ensure that they have access to all the necessary technology. Finally, teachers, parents, and learning coaches should be aware that timelines for mastery can extend just as easily as decrease when working with online curriculum.

Academic Performance in a Specific Content Area.

Liu and Cavanaugh (2012) investigated what factors can influence student mathematics achievement in K-12 virtual environments. The factors investigated were (a) the utilization of the learning management system, (b) comments made by the teacher, and (c) student demographic factors. Their work suggests that administrators who are creating an online program should strive to find a platform that maximizes teacher-student interaction and encourages students to stay logged into the system to continue their studies. It also suggests that parents, teachers, and other learning coaches should support students in spending optimal amounts of time on the system.

There are also some interesting implications for online learning systems in this work. One of these implications is that online learning systems should be designed for students to immediately access teacher feedback when they log in, so that students can apply the feedback in a timely manner to their work. Another implication is that online learning systems should be equipped with the capability to quickly indicate to teachers which students are spending the most and least amount of time in an online environment.

Content Based e-learning Environments.
In the work of Okolo and various colleagues (2007; 2011), students participated in the Virtual History Museum (VHM) and learned from an exhibit on Andrew Jackson's presidency. This study suggests that teachers, parents, or other learning coaches can become curators of content-related artifacts and present exhibits to students. This highly participatory learning style (along with video, audio, text-to-speech, pictures slides, etc.) is available within VHM where it was not in a traditional textbook.

Additionally, teachers were able to use VHM to teach basic research skills. Specifically, students conducted searches within VHM to select specific visuals and documents when putting together their exhibits. This study documents an example of how it is possible to take full advantage of all of the affordances of the Internet in terms of information access, while also ensuring that students are directed to specific documents to support their thinking.

Finally, this study demonstrated that while students with disabilities all made improvements in a well-designed learning environment, the students that made the most improvement in their thinking were the honors students in the class (apparently there were no students with disabilities who were also in honors, although that is theoretically possible). The study of students using the VHM suggests that students with a variety of aptitudes can succeed using the same curriculum supports, but that there is still a lot of work to be done to help students with disabilities take better advantage of these supports.

Information Technology and Transition Skills.
The study by Izzo, Yurick, Nagaraja, and Novak (2010) evaluated EnvisionIT, a curriculum for teaching IT literacy skills alongside reading and writing. In this study, students with disabilities utilized their newfound IT literacy in information retrieval and application (i.e., the heart of IT), showing progress in goal-setting for post-graduation, knowledge of finding jobs, and knowledge of finding colleges.

This study suggests that parents, teachers, and administrators should look for similar programs that focus on interdisciplinary skill building (such as information technology) and not just disciplinary content like math and reading. This study also demonstrated possible ways to integrate social skills and content knowledge to leverage the promise of learning as a truly democratic mode of schooling (Green, Ponder, & Donovan, 2014).

Social Competence Intervention for Adolescents with a Specific Disorder.
Stichter, Laffey, Galyen, and Herzog (2014) also addressed the issue of social skills, but their work garners particular interest because they focused on building social skills in a group of students with a particular disorder (autism) and in a particular setting (rural). Their study suggests that administrators in rural school districts or administrators of online programs who accept transfers from rural areas should consider supplementing their social skills curriculum with an online platform. In this case, a social skills platform (iSocial) built for specific disabilities increased the amount of social skill practice and supplemented the lessons that were first learned and practiced with a specialist.

Even more generally, virtual environments can have many advantages when learning social skills. Students can make mistakes in their training without suffering from a real world negative feedback. Within the virtual world, teachers, parents, and learning coaches can scaffold their support, eventually removing that support entirely. Scaffolding, including the provision of multiple choice answers for certain social situations, would be nearly impossible or infeasible in real world practice. As long as technology requirements in the home and at the school can be met for the virtual world, students can continuously work on developing their social skills with parents in one location, and learning coaches or teachers in another.

At the present moment, however, it should be noted that there is limited research on 3D virtual learning environments, and therefore administrators should only adopt them after considerable investigation and trial periods. Nonetheless, in this particular study the online social skills platform was positively accepted by students, parents, and teachers. Additionally, it demonstrated promise in the development of social skills.

Implications for Research

The lack of empirical, peer-reviewed, published studies in online learning for students with disabilities represents a significant gap within online learning research and disability studies. Although our search criteria included blended learning and related topics, there were only a few studies that investigated blended learning and students with disabilities that were published in peer-reviewed journals from 2004-2014. Clearly, further study of blended learning in all its facets should be taken up in the coming years.

As this review was conducted, became increasingly apparent that research on blended learning was not a lone lacuna in this field. There were virtually no articles about online learning and students with disabilities in general, and the research that has been done has significant limitations to generalizability. This section will describe some of those limitations as a way to look at how the next generation of work done in this area could be performed to drastically improve the educational experiences of K-12 students with disabilities in online learning settings. Those limitations lie in the quantity of data, the quality of data, and the ways in which the data are reported in written form.

Quantity of Data

Many of the studies in this review suffered from very low numbers of participants and data. When studies were large in scope, they were focused on one state—or even less helpful for generalizability—one specific school. There was only one study in this review that was longitudinal in scope (Allday & Allday, 2011). Future research should focus on study designs that plan for generalizability by taking advantage of technologies that enable large-scale data collection over longer periods of time and that involve more schools in more places.

This review of literature also highlights the lack of data from qualitative studies. Although qualitative research by nature focuses on particularities and phenomenological richness rather than generalizability, this type of work is empirical because it is driven by questions and systematic protocols and it stands to make contributions to the more nuanced aspects of the intersections of online learning and K-12 students with disabilities. More qualitative work is needed, especially work that offers thick description (Geertz, 1994) of how students with disabilities and their families experience online learning, how teachers negotiate accommodations for students with disabilities in online settings, and how administrators and course developers plan and enact curricular supports with students with disabilities who are also children in specific online environments. This work needs to be designed just as rigorously as a quantitative study and also ought to be triangulated with multiple data sources, rather than relying on just one strategy, such as interview or observation (Anfara, Brown, & Mangione, 2002). Finally, since there were no mixed methods (Tashakkori & Teddlie, 2003) studies located in the review, such studies might be an option for investigating certain research questions, especially those about achievement, access, and accommodation.

Quality of Data

There were serious questions about the quality of the data in many of the studies reviewed. In studies where Individual Education Plans (IEPs) were used, it was often difficult to tell how and whether gifted students were properly sorted out. Another limitation arose from the studies that used self-reported data. In these studies, there was often little information about how the participants were recruited, response rates were not always reported, little evidence existed on the validation of surveys used, and data was not sufficiently disaggregated to make concrete interpretations for many of the findings.

The most problematic issue with the quality of data lay in the fact that there was little attention paid to the specific types of disabilities of the students in the studies. As noted in the introduction to this chapter, there is a host of disability classifications and much possibility for overlap. In addition, there are a number of factors other than disability that influence student-learning experiences. Future research, therefore, should plan for using IEP data in legitimate ways, locating or piloting validated survey instruments, disaggregating data based on specific types of disabilities, and attending to other demographic factors besides disability status.

Written Reports of Research

During this review there were significant concerns with the written reports of many research studies. Specifically, there were problems with reporting precise information about study design. However, there were also a number of troubling issues with citation patterns. Among these patterns were the tendencies to (a) cite statements made in the introduction of an article rather than actual findings, (b) cite government/organizational pamphlets rather than the research studies themselves, and (c) extrapolate from research on disability in general or for online learning in higher education and not be explicit about such simplification. Given the lack of empirical work on this topic, it is necessary to build on closely related work, but it is also important to be explicit when a thesis for an argument comes from some other line of research, however closely related.

It was also striking that although there seems to be research based on the specific topic for this review circulating in master's theses, doctoral dissertations, academic and general interest books, and conference presentations, little of this research was making it into peer-reviewed, indexed sources. This present review of literature invites all individuals to bring the potential wealth of information about K-12 students with disabilities in online settings into the formal academic forum by publishing work in journals that are easily accessible and have scholarly reputations.

Conclusion

This chapter reported on a systematic review of literature at the intersection of online learning, and students with disabilities in K12 settings. The authors found only a small number of studies published in peer-reviewed journals. Those studies provided several interesting insights into the curriculum evaluation, achievement, perceptions, and policies in online learning that are affecting K12 students with disabilities, their families, and the educational entities trying to support them, yet much work is left to be done on this topic. The quantity and quality of research that emerged for the review may be indicative of this field as a relatively new area of study—many important variables and processes are yet to be developed—but that is also in constant flux due to its dependence on rapidly emerging technologies. Nevertheless, with the plethora of new online courses and products targeted to K12 students and the substantial number of children with disabilities that have been and will continue to be identified, it is imperative for researchers to continue their inquiries. This chapter should assist researchers as they engage in the difficult task of planning and executing studies that build epistemologies and provide practical educative learning experiences for K12 students who desperately need access to curriculum in a milieu of support that is both targeted and universal. It is in the examination of this tension, perhaps, that fruitful inquiry into this topic may reside.

References

Allday, C. M., & Allday, R. A. (2011). Effects of pacing options on final grades of students with disabilities in virtual high school. *Quarterly Review of Distance Education, 12*(4), 223-234.

Anfara, V. A., Brown, K. M., & Mangione, T. L. (2002). Qualitative analysis on stage: Making the research process more public. *Educational Researcher, 31*(7), 28-38.

Bernstein, M. (2013). Whose choice are we talking about: The exclusion of students with disabilities from for-profit online charter schools. *Richmond Journal of Law in the Public Interest, 16*(3), 487.

Beck, D.E., Eagalite, A., & Maranto, R. (2014). What they choose and how it goes: Comparing special education and general education cyber student perceptions. *Computers and Education 76*, 70-79.

Boyatzis, R. (1998). *Transforming qualitative information: Thematic analysis and code development.* Thousand Oaks, CA: Sage.

Brady, K. P., Umpstead, R. R., & Eckes, S. E. (2010). Unchartered territory: The current legal landscape of public cyber charter schools. *Brigham Young University Education and Law Journal, 2010*, 191.

Burdette, P. J., Greer, D., & Woods, K. L. (2013). K-12 online learning and students with disabilities: Perspectives from state special education directors. *Journal of Asynchronous Learning Networks, 17*(3), 1-7.

Carnahan, C., & Fulton, L. (2013). Virtually forgotten: Special education students in cyber schools. *TechTrends, 57*(4), 46-52.

Cook, R. A., & Gladhart, M. A. (2002). A survey of online instructional issues and strategies for postsecondary students with learning disabilities. *Information Technology and Disabilities, 8*(1).

Crabtree, B., & Miller, W. (1999). A template approach to text analysis: Developing and using cookbooks. In B. Crabtree & W. Miller (Eds.), *Doing qualitative research* (pp. 163-177). Newbury Park, CA: Sage.

Daly, J., Keelehear, A., & Gliksman, M. (1997). *The public health researcher: A methodological approach*. Melbourne, Australia: Oxford University Press.

Fitzgerald, N. S., Miller, S. P., Higgins, K., Pierce, T., & Tandy, D. (2012). Exploring the efficacy of online strategy instruction for improving the reading abilities of students with learning disabilities. *Journal of Special Education Technology, 27*(1), 33-47.

Geertz, C. (1994). Thick description: Toward an interpretive theory of culture. In M. Martin & L.C. McIntyre (Eds.) *Readings in the philosophy of social science* (pp. 213-231). Cambridge, MA: Massachusetts Institute of Technology.

Green, T., Ponder, J., & Donovan, L. (2014). Educational technology in social studies education. In J. M. Spector, M. D. Merrill, J. Elen, & M. J. Bishop (Eds.) *Handbook of Research on Educational Communications and Technology* (pp. 573-582). New York, NY: Springer.

Hardman, M. L., & Dawson, S. (2008). The impact of federal public policy on curriculum and instruction for students with disabilities in the general classroom. *Preventing School Failure: Alternative Education for Children and Youth, 52*(2), 5-11.

Harvey, D., Greer, D., Basham, J., & Hu, B. (2014). From the Student Perspective: Experiences of Middle and High School Students in Online Learning. *American Journal of Distance Education, 28*(1), 14-26.

Hipsky, S., & Adams, L. (2006). Strategies for teaching students with exceptional needs in cyber schools. *International Journal of Information and Communication Technology Education, 2*(4), 1-14.

Izzo, M. V., Yurick, A., Nagaraja, H. N., & Novak, J. A. (2010). Effects of a 21st-century curriculum on students' information technology and transition skills. *Career Development for Exceptional Individuals, 33*(2), 95-105.

Keeler, C. G., & Horney, M. (2007). Online course designs: Are special needs being met? *The American Journal of Distance Education, 21*(2), 61-75.

Kim-Rupnow, W. S., Dowrick, P. W., & Burke, L. S. (2001). Implications for improving access and outcomes for individuals with disabilities in postsecondary distance education. *American Journal of Distance Education, 15*(1), 25-40.

Kinash, S., Crichton, S., & Kim-Rupnow, W. S. (2004). A Review of 2000-2003 literature at the intersection of online learning and disability. *American Journal of Distance Education, 18*(1), 5-19.

Lee, S. H., Wehmeyer, M. L., Soukup, J. H., & Palmer, S. B. (2010). Impact of curriculum modifications on access to the general education curriculum for students with disabilities. *Exceptional Children, 76*(2), 213-233.

Liu, F., & Cavanaugh, C. (2012). Factors influencing student academic performance in online high school algebra. *Open Learning: The Journal of Open, Distance and e-Learning, 27*(2), 149-167.

Nelson, J. R., Benner, G. J., Lane, K., & Smith, B. W. (2004). Academic achievement of K-12 students with emotional and behavioral disorders. *Exceptional Children, 71*(1), 59-73.

Okolo, C. M., Englert, C. S., Bouck, E. C., & Heutsche, A. M. (2007). Web-based history learning environments helping all students learn and like history. *Intervention in School and Clinic, 43*(1), 3-11.

Okolo, C. M., Englert, C. S., Bouck, E. C., Heutsche, A., & Wang, H. (2011). The Virtual History Museum: Learning US history in diverse eighth grade classrooms. *Remedial and Special Education, 32*(5), 417-428.

Repetto, J., Cavanaugh, C., Wayer, N., & Liu, F. (2010). Virtual schools: Improving outcomes for students with disabilities. *Quarterly Review of Distance Education, 11*(2), 91-104.

Rice, P., & Ezzy, D. (1999). *Qualitative research methods: A health focus*. Melbourne: Oxford University Press.

Spitler, C., Repetto, J., & Cavanaugh, C. (2013). Investigation of a Special Education Program in a Public Cyber Charter School. *American Journal of Distance Education, 27*(1), 4-15.

Stichter, J. P., Laffey, J., Galyen, K., & Herzog, M. (2014). iSocial: Delivering the social competence intervention for adolescents (SCI-A) in a 3D virtual learning environment for youth with high functioning autism. *Journal of Autism and Developmental Disorders, 44*(2), 417-430.

Tashakkori, A., & Teddlie, C. (Eds.). (2003). *Handbook of mixed methods in social & behavioral research*. Thousand Oaks, CA: Sage.

Vasquez III, E., & Serianni, B. A. (2012). Research and practice in distance education for K-12 students with disabilities. *Rural Special Education Quarterly, 31*(4).

Vasquez III, E., & Straub, C. (2012). Online instruction for K-12 special education: A review of the empirical literature. *Journal of Special Education Technology, 27*(3).

Thompson, L. A., Ferdig, R., & Black, E. (2012). Online schools and children with special health and educational needs: Comparison with performance in traditional schools. *Journal of Medical Internet research, 14*(2). Retrieved March 25, 2014 from http://www.ncbi.nlm.nih.gov/pmc/articles/PMC3384422/.

U.S. Department of Education, National Center for Education Statistics (2012). *Digest of Education Statistics, 2011* (NCES 2012-001), Chapter 2. Retrieved on March 14, 2014 from http://nces.ed.gov/fastfacts/display.asp?id=64.

III.
K-12 Learning in Content Domains

What's this section about? Our past research efforts have provided evidence that teaching content is different than knowing content, and both are different than teaching that content using technology. The argument also applies to teaching content in K-12 online and blended learning environments. Arguably there are some design principles and teaching strategies that might be useful across domains. However, there are some small nuances and some large differences about teaching science vs. teaching social studies. The chapters in this section provide a deeper exploration of research on K-12 online and blended instruction within specific content areas.

What's in this section? Kosko, McMahon, and Amiruzzaman discuss mathematics teaching and learning in K-12 online and blended learning. They share that although there is scarcity in the literature, the literature that does exist also provides contradictory findings. They describe an abundance of innovative practices, including virtual manipulatives that are used mostly at the secondary level.

Pytash and O'Byrne found the literature on literacy education lacking; however, they capitalized on the abundance of research literature from literacy education in general. They suggest the field pay closer attention to elementary-aged children and their learning to read and write in online spaces.

The idea of physical education in K-12 online learning tends to be considered an oxymoron by most in the field; however, Daum and Buschner share data on a growing number of students choosing this avenue of learning for their physical education requirements. They urge practitioners and those who prepare physical education teachers and coordinators to stay true to the standards as curriculum for physical education moves to the online environment.

What's missing from this section? Future iterations of this book will provide chapters that continue to lay a framework for understanding differences in content areas as it relates to K-12 online and blended environments. There are opportunities for new authors to add to this Handbook by writing about content areas not covered by this book, not limited to but including: science, social studies, art, music, computer science, history, geography, engineering, and school-to-work and vocational programs.

Chapter 7

Few in Number: Research on Mathematical Teaching and Learning in the Online Setting

Karl W. Kosko, *Kent State University, kkosko1@kent.edu*
Lauren Sobolewski-McMahon, *Kent State University, lmcmahon@kent.edu*
Md Amiruzzaman, *Kent State University, mamiruzz@kent.edu*

Abstract

In this chapter, we describe how research focusing on online and blended mathematics learning (OBML) has generally focused on OBML as a treatment for learning rather than a context for it. Within this focus, research has generally suggested a mix of positive, negative, and no significant differences in mathematical learning outcomes for OBML and traditional face-to-face learning environments. Further, the majority of OBML research, and practice, resides in secondary mathematics. We discuss reasons for the current focus on OBML research, recommendations for building upon this literature base, and implications for practice.

Introduction

Variations in online and blended learning (hereafter OBML) in K-12 mathematics are becoming more and more prevalent. As of the 2002-2003 school year, 36% of all school districts had students enrolled in some variation of online learning and 15% of all of those students were enrolled in an online mathematics course (Setzer & Lewis, 2005). However, a more recent report by Watson et al. (2013) found that most U.S. states have some version of virtual or blended K-12 schooling. Mathematics online course offerings are typically focused on middle and secondary topics, with a heavy emphasis on Algebra readiness (Archambault & Crippen, 2009), but online mathematics coursework is available as early as pre-K and throughout the school years (Archambault & Crippen, 2009; Setzer & Lewis, 2005; Watson et al., 2011). One of the primary reasons for the large growth in online and blended mathematics coursework is the availability of face-to-face mathematics coursework (Heissel, 2012; Sloan & Olive, 2005). As noted by Sloan and Olive (2005), many rural schools lack access to qualified mathematics teachers, or lack the resources to offer a diversity of coursework to their students. Heissel (2012) states that this trend has led to a large virtual presence of middle school students taking online Algebra I courses in North Carolina, and others provide confirmatory evidence for this claim (Archambault & Crippen, 2009; Setzer & Lewis, 2005). Yet, Heissel (2012) also found that a large percentage of students in urban settings are enrolled in online mathematics courses, mainly as an accommodation to keep these students on track for graduation. Cavanaugh (2009) reported that online classes added credit recovery and closed achievement gaps. Essentially, Heissel (2012) found two demographics prevalent in online mathematics learning: rural students with successful backgrounds in mathematics taking Algebra I coursework in the middle grades and urban students with less-than-successful backgrounds in mathematics. Those students with the successful backgrounds tend to have higher mathematics achievement than their grade-level peers in face-to-face classrooms, while the latter group tends to have lower mathematics achievement (Heissel, 2012; Oliver, Kellogg, & Patel, 2010). Although the case of the North Carolina Virtual Public School is but one example of how online mathematics learning is manifested, it suggests that online and blended mathematics learning in K-12 works for some students and not for others. Various literatures on online and blended mathematics learning comes to the same general conclusion, but often with different descriptions of promising practices in mathematical learning.

This chapter provides a general overview of research on online and blended learning for K-12 mathematics. Much of this literature is limited both in scope and in magnitude. Further, such research often seems contradictory as various studies find positive, negative, or no relationships between online and blended mathematical learning with achievement outcomes. Although seemingly contradictory, in our review of the literature, we discuss potential reasons for differences in research findings, current trends in research for online and blended learning in mathematics, and conclude with a discussion of recommendations for future research.

Research Synthesis

Mathematics Education and Technology Before the Internet

Beginning around 1980, the National Council of Teachers of Mathematics (NCTM) began encouraging the incorporation of computer and calculator technology in mathematics teaching (Johnson, Anderson, Hansen, & Klassen, 1980). As the popularity and fascination with computers and calculators increased both in research and in schools (Milner, 1980; Shumway, 1990; Hunter, 1993), NCTM (1989) released recommendations for technology in mathematics instruction in their seminal *Curriculum and Evaluation Standards for School Mathematics.* While NCTM (1989) generally advocated access to and use of computer and calculator technology in mathematics instruction, they suggested that "access to this technology is no guarantee that any student will become mathematically literate. Calculators and computers for users of mathematics, like word processors for writers, are tools that simplify, but do not accomplish, the work at hand," but also that "contrary to the fears of many, the availability of calculators and computers has expanded students' capability of performing calculations" (p. 8). In their later vision of mathematics standards, NCTM (2000) articulated a technology principle to guide the professional identities of mathematics teachers suggesting, among other things, that "electronic technologies – calculators and computers – are essential tools for teaching, learning, and doing mathematics" (p. 24), and that such technologies provide tools for the doing of mathematics. This vision of technology use in mathematics teaching and learning included the use of virtual manipulatives, dynamic geometry software, and access to resources available on the World Wide Web. Despite the advocacy of technology use, specific discussion of how the Internet can be used within mathematics, by mathematics educators, has been relatively limited. NCTM's (Masalski & Elliott, 2005) sixty-seventh yearbook, *Technology-Supported Mathematics Learning Environments*, was devoted to how various technologies could be used to support mathematics learning. This included recommendations and examples of how to use calculators, virtual manipulatives, dynamic geometry software, spreadsheets, and the Internet. In the various chapters that discussed it, it is clear that many mathematics educators viewed the Internet as a means of sharing or using specific resources, including virtual manipulative experiences (Galindo, 2005; Hart, Keller, Martin, Midgett, & Gorski, 2005; McCoy, 2005). Only in the closing chapter does Heid (2005), in her discussion of future directions for technology in mathematics education, discuss the uses of OBML:

> "That universities are headed toward delivering complete undergraduate programs on the Web is inevitable…Is instruction online 'as good' as it is face-to-face? Will students be able to afford the necessary software and hardware to pursue online mathematics courses? Will online courses adequately address the problems of teaching mathematics in home-school settings or in very small school districts? Will Web-based courses lead to reliance on online quizzes and low-level testing?"

Though research on all aforementioned technology-related aspects continues in the field of mathematics education, the topic of online mathematics learning has received relatively little attention, but is gaining popularity in various conference presentations (Joubert, 2013). The focus on mathematics education research regarding OBML, as it has been with most technologies, focuses on how mathematics exists and is created in such environments, as well as how teachers and learners engage in the content itself.

Differences Across the Grades

There is currently little to no research examining how online and blended mathematics learning differs across grade levels. However, the focus of research at these varying levels is somewhat telling. The few studies that examine OBML in the elementary grades focus on how mathematics applications, applets, and games can be used either in class or at home (Garcia & Pacheco, 2013; Kiger, Herro, & Prunty, 2012). OBML research in middle grades includes a myriad of comparisons, including examination of social interaction within OBML (Edwards & Rule, 2013; Hossain & Wiest, 2013; Li, 2002), gender differences (Li, 2002; Nguyen, Hsich, & Allen, 2006), and motivation factors (Edwards & Rule, 2013). While mathematics achievement is often examined (Nguyen, 2006; Ross & Bruce, 2009; Wang, 2013), it is not necessarily the dominant focus of research.

Research on secondary OBML, however, is dominated by examinations of mathematics achievement as an indicator of the effectiveness of OBML as a policy initiative (Bruce & Ross, 2009; Heissel, 2012; Heppen et al., 2011; Hughes, McLeod, Brown, Maeda, & Choi, 2007; Kim, Park, & Cozart, 2014; O'Dwyer, Carey, & Kleiman, 2007; Paadre, 2011; Shirvani, 2010; Stone, 2013). Most of these studies examine the effectiveness of online Algebra I courses, a consequence of the growing demand based on the Algebra for All movement (Cavanaugh, Gillan, Bosnick, Hess, & Scott, 2005; Link & Heckman, 2013), and the lack of supply of mathematics teachers or resources for rural schools to offer specialized mathematics courses at various grade levels (Heppen et al., 2011; Sloan & Olive, 2005). In other words, OBML appears to fill a need in a supply-and-demand scenario where students and parents seek specific mathematics courses, particularly Algebra I, but their schools are unable to offer the course due to various resource deficits. Additionally, the reported online mathematics course offerings are predominantly upper-middle school and high school mathematics courses (Archambault & Crippen, 2009). These trends suggest that while there is a gap in research focusing on elementary OBML, there may not be a strong need for such research. In the sections that follow, we describe additional trends in research on OBML, culminating in a discussion of how such research informs practice, and areas in need of further inquiry.

Factors Affecting Mathematics Learning and Achievement

Present literature has mixed findings regarding the effect of OBML in K-12. Some have found that face-to-face courses have a more positive effect on mathematics achievement than OBML courses (Hughes et al., 2007; Nguyen et al., 2006; Shirvani, 2010). Some have suggested that OBML has a more positive effect than face-to-face courses (Heissel, 2012; Oliver et al., 2010). However, most research results indicate that differences between OBML and face-to-face courses' math achievement outcomes are negligible (Heissel, 2012; Heppen et al., 2011; Nguyen et al., 2006; O'Dwyer et al., 2007; Paadre, 2011; Shirvani, 2010; Stone, 2013). The primary reason for such seemingly varying results is due to the variance in research design from study to study, and sometimes within the same study.

O'Dwyer et al. (2007) provide a useful example for characterizing variance in study design, both within and between studies, in their examination of Louisiana's Algebra I CBML course. In describing their sample and study conditions, O'Dwyer et al. (2007) state "the online teachers were selected on the basis of their outstanding teaching credentials and were identified by the Louisiana Department of Education to be at the level of mentor teachers" (p. 294), while teachers in face-to-face classrooms were not selected on a similar basis for the study. Further, the online course integrated Java applets, video, graphing calculators, and tablets. Although students enrolled in the face-to-face classrooms reported frequent use of graphing calculators, access to the other materials was less prevalent. Even with the differences in comparison groups, O'Dwyer et al. (2007) found that both groups had statistically similar mathematics achievement gains. However, the main limitation with studies such as O'Dwyer et al.'s (2007), and the majority are of this nature, is not in the sample differences but in how instruction is assessed. Specifically, online and blended learning are often considered as the treatment in such studies, rather than the context of student learning. As such, pedagogical decisions incorporated, including course design, in face-to-face and OBML courses are often either superficially included or neglected altogether. This may account for the variation in significant differences between OBML and face-to-face courses (Heissel, 2012; Heppen et al., 2011; Nguyen et al., 2006; O'Dwyer et al., 2007; Paadre, 2011; Shirvani, 2010; Stone, 2013). Yet, various studies have begun to investigate pedagogical features and student learning differences in OBML, and the remainder of this section is devoted to describing them.

There are three features of OBML that have been found to influence mathematics achievement: student control or pacing of their own instruction (Edwards & Rule, 2013; Heissel, 2012; Ross & Bruce, 2009; Shirvani, 2010), available mathematical scaffolds and feedback (Bruce & Ross, 2009; Heissel, 2012; Nguyen et al., 2006; Oliver et al., 2010; Wang, 2013), and social interaction with others (Hossain & Wiest, 2013; Li, 2002). These factors, each relate to various aspects of motivation theory, which Kim et al. (2014) have recently begun to investigate regarding OBML.

Student Control and Self-Pacing

Student control and self-pacing has been found to be a positive feature for many students taking OBML courses (Edwards & Rule, 2013; Bruce, 2009; Corey & Bower, 2005; Shirvani, 2010). However, this is not always a positive feature. Heissel (2012) found that younger students (sixth and seventh grade) did not self-pace well in comparison to their older, eighth grade, peers. Yet, this may be more a consequence of not having enough support, which Heissel (2012) also found to be a critical factor in the success of online Algebra I success. Similar to the findings of Heissel (2012), Kopcha and Sullivan (2008) found that students with lower mathematical ability tended to score lower when given the opportunity to choose their own pace as they often do not receive essential instruction. This is primarily due to skipping examples and soliciting additional instruction, even if such students recognize they need it.

Feedback and Scaffolding

Scaffolding and support can come in a variety of formats for OBML. Studying the blended learning of a computer-based learning sequence, Bruce and Ross (2009) found that when the classroom teachers' lessons were more aligned with the specific activities done online, it correlated with higher mathematical gains. Various studies have also found that when adaptive and immediate feedback in OBML environments is available, students have higher perceived and measured mathematical competence than when such feedback is not available (Nguyen et al., 2006; Wang, 2013). Nguyen et al. (2006) compared seventh graders' perceived mathematical competence under two conditions: completion of homework problems from the text via paper-and-pencil and completion of the same homework problems via an online-based version that included instant feedback. Although no statistical differences were found between both groups regarding measured mathematics achievement, male students reported higher perceived mathematical competence using the web-based assessment and practice (WP)." . However, various studies have shown that immediate and personalized feedback from automated systems is beneficial to students' mathematical learning (Freeman & Crawford, 2008; Ku, Harter, Liu, Thompson, & Cheng, 2007; Wang, 2013), particularly for students with lower prior mathematics ability. Yet, Kopcha and Sullivan (2008) found that several students with lower prior mathematics ability in their study did not use the feedback and examples system, and thus did not perform as well as students who did use it.

While OBML provides the potential for more immediate and automated feedback, individual feedback from teachers is also helpful. Specifically, when such feedback is seldom provided, mathematical gains suffer (Oliver et al., 2010). Yet, another source of feedback in OBML comes from the various representations of mathematics. Specifically, OBML courses have the potential for including virtual manipulatives, and students' interaction with these virtual manipulatives provides immediate feedback as they engage dynamically with the content (Cavanaugh et al., 2005). Various studies have reported on the use and benefits of virtual manipulatives in mathematics education (e.g., Reimer & Moyer, 2005; Sarma, Clements, & Henry, 1998; Zengin, Furkan, & Kutluca, 2012), however there is relatively little research on how to incorporate them in K-12 OBML. Papadopoulos and Dagdilelis (2006) examined how students used three different dynamic computer-based geometry software programs and found that differences in how geometric diagrams were constructed through the program interface, how such diagrams were labeled and measured, and how various properties of the diagrams were conveyed interacted with the way students came to understand relevant mathematics content. Thus, use of virtual manipulatives in OBML is not a simple decision of to include or not to include, but should take into account how mathematics is constructed through a particular program or applet. Research at the college level indicates similar issues for consideration. Comparing various e-learning programs, Smith and Ferguson (2004) found that many such programs are limited to whether and how they incorporate mathematical notation and diagrams. This adds a layer of complexity for individuals to write and draw mathematically. The mathematical representations (diagrams, symbols, writing) embedded in OBML effectively act as one means of feedback for students (Cavanaugh et al., 2005), which interacts with their understanding of mathematical content (Papadopoulos & Dagdilelis, 2006). Yet, these forms of feedback are also present in face-to-face classrooms. Therefore, it is important to consider how the context of OBML alters how such representations are incorporated into mathematics teaching and learning.

Social Interaction

Little research has been conducted regarding social interaction in OBML. However, the little research that exists is informative. Hossain and Wiest (2013) studied the blended learning application of blogs with sixth grade students learning geometry. Hossain and Wiest suggest that use of such social interaction features for blended learning allows for more in depth discussion of relevant topics that may not occur during face-to-face classroom sessions. Li (2002) found supporting evidence of such interaction in studying sixth grade students' interactions in an online mathematics forum. However, Li also found that there were differences in how male and female students interacted in online discussions. Specifically, male students tended to posit explanations more frequently, while female students solicited additional detail more frequently. It is clear from the two studies described that there is potential for incorporating social interaction opportunities for OBML. Yet, such incorporation should be mindful of the mathematical representations that are included, and how they are included (Hossain & Wiest, 2013), as well as how individual students interact (Li, 2002).

A Context for Discussing OBML

Much of the current research on OBML is centered on the question of whether OBML is effective or not, which essentially amounts to a value-based judgment of the goodness of OBML. Absent from much of this research are evaluations of our recommendations for effective (i.e., good) OBMLs. Put another way, the grain size of focus has been much too general, providing seemingly contradictory findings in the literature and little practical guidance for teachers and administrators. In a previous section, we suggested one central reason for the discordant findings regarding the effectiveness of OBML was due to the consideration of OBML as a treatment rather than a context for mathematical learning. However, this particular form of confusion (viewing a context as a treatment) is not particular to OBML. In fact, studies on the differences between public schools and magnet or private schools (Archbald & Kaplan, 2004; Braun, Jenkins, & Grigg, 2006a; Braun, Jenkins, & Grigg, 2006b; Lubienski & Lubienski, 2006) have found that, when considering all student and school level factors, there are no statistically significant differences in the mathematics achievement between these contexts. Similarly, in K-12 online and blended learning, there is a collection of studies that is labeled the No Significant Difference Phenomenon, so the results are similar.[1] Furthermore, it is not surprising to find many studies comparing OBML and face-to-face courses have found no statistically significant differences in mathematics achievement gains (Heissel, 2012; Heppen et al., 2011; Nguyen et al., 2006; O'Dwyer et al., 2007; Paadre, 2011; Shirvani, 2010; Stone, 2013). However, where charter and private schools generally serve as an alternative to available public schools, OBML courses and schools often serve as the only viable option for students to have access to certain mathematics (Sloan & Olive, 2005), or as a needed supplement to already available schooling. Further, the specific nature of the OBML context presents certain affordances and limitations that are unique. Given these considerations, we consider it of fundamental importance for future research on OBML to consider it as a context, with various pedagogical treatments that associate with student mathematical learning, and potentially interact with this context.

Implications for Practice

In the context of mathematical learning, practical implications for online and blended in-

1 http://www.nosignificantdifference.org/

struction are currently limited to two primary recommendations. First, students learning in both online and blended settings need several opportunities for feedback from the computer systems, their assigned teacher, their fellow students, and the representation of mathematics. Recommendations from prior (NCTM, 2000) and current (CCSSI, 2010) mathematics policy documents recommend students engage in mathematical communication to analyze and evaluate the mathematical thinking and strategies of others. The Common Core State Standards for Mathematics describes proficient students as those who are able to justify their mathematical conclusions and engage in mathematical argumentation with others. Thus, opportunities for students to be able to communicate must be built into both online and blended settings. Second, the manner in which mathematics is represented is critically important and should be a central consideration for any OBML implementation. Numerous studies have reported on the benefits of virtual manipulatives for students' understanding of mathematics (Reimer & Moyer, 2005; Sarma et al., 1998; Zengin et al., 2012). Coupled with the recommendation that multiple representations be used by students in learning mathematics (NCTM, 2000), OBML courses would benefit from further attention to how virtual manipulatives, and other mathematical representations, are used by students to develop deeper understandings of the content. However, because the specific nature of these representations influence what content is learned (Papadopoulos & Dagdilelis, 2006; Smith & Ferguson, 2004), attention must be paid to how these representations align with learning objectives.

Implications for Research

Future research on feedback systems in OBML can, and should, take many approaches. First, there is too limited of an amount of research examining how teachers in online mathematics settings best provide feedback to students. Such feedback could potentially be provided in online forums, individual chat, annotations to students' digital work, individual, or group webcam conferencing, etc. Second, while automated feedback systems appear to be helpful to mathematical learning, further research needs to be conducted regarding features of such systems that are more helpful than others. For example, is it significantly more helpful for students to have dynamic demonstrations or text-only descriptions of a mathematical principle when they are completing online homework? Should such feedback be interactive to the point of requiring students to engage with it, or should such feedback be passively received? Integrated with both teacher and automated feedback is a need to examine how students with varying mathematical backgrounds respond to different forms of feedback. Specifically, different studies suggest students with weaker mathematical backgrounds interact with OBML differently (Heissel, 2012; Shirvani, 2010). Therefore, future study of feedback systems that are

more supportive of such students is highly needed.
The few studies on the mathematical representation in OBML are informative and point to important avenues of future research. Papadopoulos and Dagdilelis's (2006) comparison of how different dynamic geometry software conveys mathematical concepts differently suggests that such considerations should be taken into account with other virtual manipulatives and applets used in online and blended learning. For example, virtual manipulatives used to help develop an understanding of fractions can incorporate area models, linear models, or set models. Rau, Aleven, and Rummel (2009) found that when students used virtual manipulatives with all three models, they learned more than if they had used any single fraction model. However, a critical feature of the success of this approach to OBML was in soliciting descriptions from students on how the representations related (Rau et al., 2009; Rau, Aleven, Rummel, & Rohrbach, 2012). Such an approach mirrors much of the recommendations for face-to-face instruction with physical manipulatives and representations. Therefore, a useful question for any researcher to ask, when seeking to study mathematical representations in OBML, is how such representations and manipulatives are effectively used in face-to-face classrooms, and how such usage is applied to the OBML setting.

The last evident area currently in most need of future research is an investigation of social interaction in OBML contexts. There is surprisingly little research in this area, given the Web 2.0 culture and the prevalence of literature focusing on mathematical discussions (e.g., Herbel-Eisenmann, Drake, & Cirillo, 2008; Kosko, Rougee, & Herbst, in press; Walshaw & Anthony, 2008). As with mathematical representations, a useful question for interested researchers to ask is how effective practices for facilitating mathematical discussions can be applied to OBML settings.

Conclusion

The research base on mathematical teaching and learning in the online and blended setting are few in number. The information provided by this limited research base, however, is useful in pointing to new areas of needed research. Specifically, future research should have a more direct focus on mathematical pedagogy and students' mathematical learning in a manner similar to current research in face-to-face settings. Certain studies do incorporate such a connection (e.g., Cavanaugh, 2005; Rau et al., 2009), but they appear to be in the minority. Rather, much of the research base on OBML has treated OBML as a treatment for educational outcomes rather than as a unique context for mathematical learning to occur. If online and blended learning is considered a treatment, then features of mathematical pedagogy and learning are automatically placed as secondary considerations, or are not considered at all. Considering OBML as a context where mathematical learning can occur is, therefore, a much more useful conception for researchers and practitioners to consider. There is a great need for future study with this conception in a multitude of areas. We have provided some recommendations, but acknowledge other critical areas may not be discussed here. Rather, we reiterate our central recommendation for all researchers and practitioners to consider OBML as a context for learning. We believe to do otherwise is to open the door for focusing on technological aspects without a meaningful attendance to the mathematics. Only when the mathematics is considered as central in how technology is incorporated in online and blended learning can the promise of such learning environments be fulfilled.

References

Archambault, L., & Crippen, K. (2009). K-12 distance educators at work: Who's teaching online across the United States. *Journal of Research on Technology in Education, 41*(4).

Archbald, D. A. (1995). A longitudinal cohort analysis of achievement among elementary magnet students, neighborhood school students, and transfer students. *Journal of Research and Development in Education, 28*(3), 161-168.

Braun, H., Jenkins, F., & Grigg, W. (2006a). *A closer look at charter schools using hierarchical linear modeling* (research report). Washington, D.C.: National Center for Education Statistics.

Braun, H., Jenkins, F., & Grigg, W. (2006b). *Comparing private schools and public schools using hierarchical linear modeling* (research report). Washington, D.C.: National Center for Education Statistics.

Bruce, C. D., & Ross, J. (2009). Conditions for effective use of interactive on-line learning objects: The case of a fractions computer-based learning sequence. *Electronic Journal of Mathematics and Technology, 3*(1), 12-29.

Cavanaugh, C. (2009). Effectiveness of cyber charter schools: A review of research on learnings. *TechTrends, 53*(4), 28-31. DOI: 10.1007/s11528-009-0302-x

Cavanaugh, C., Gillan, K. J., Bosnick, J., Hess, M., & Scott, H. (2005). Succeeding at the gateway: Secondary algebra learning in the virtual school. *Unpublished manuscript.*

Common Core State Standards Initiative [CCSSI]. (2010). Common core state standards for mathematics. Retrieved from: http://www.corestandards.org/wp-content/uploads/Math_Standards.pdf

Corey, D. L., & Bower, B. L. (2005). The experiences of an African American male learning mathematics in the traditional and the online classroom: A case study. *Journal of Negro*

Education, 74(4), 321-331.

Edwards, C., & Rule, A. (2013). Attitudes of middle school students: Learning online compared to face to face. *Journal of Computers in Mathematics and Science Teaching, 32*(1), 49-66.

Freeman, B., & Crawford, L. (2008). Creating a middle school mathematics curriculum for English-language learners. *Remedial and Special Education, 29*(1), 9-19.

Galindo, E. (2005). Mathematics teaching and learning supported by the internet. In W. J. Masalski & P. C. Elliott (Eds.), *Technology-supported mathematics learning environments: Sixty-seventh yearbook* (pp. 241-262). Reston, VA: National Council of Teachers of Mathematics.

Garcia, I., & Pacheco, C. (2013). A constructivist computational platform to support mathematics education in elementary school. *Computers & Education, 66*, 25-39.

Hart, E. W., Keller, S., Martin, W. G., Midgett, C., & Gorski, S. T. (2005). Using the internet to illuminate NCTM's *Principles and Standards for School Mathematics.* In W. J. Masalski & P. C. Elliott (Eds.), *Technology-supported mathematics learning environments: Sixty-seventh yearbook* (pp. 221-240). Reston, VA: National Council of Teachers of Mathematics.

Heid, M. K. (2005). Technology in mathematics education: Tapping into visions of the future. In W. J. Masalski & P. C. Elliott (Eds.), *Technology-supported mathematics learning environments: Sixty-seventh yearbook* (pp. 345-366). Reston, VA: National Council of Teachers of Mathematics.

Heissel, J. A. (2012). *Virtual success: Examining the effectiveness of the North Carolina Virtual Public School* (Master's thesis). Durham, NC: Duke University.

Heppen, J. B., Walters, K., Clements, M., Faria, A., Tobey, C., Sorensen, N., & Culp, K. (2011). *Access to Algebra I: The effects of online mathematics for grade 8 students (research report)*. Washington, D.C.: Institute of Educational Sciences.

Herbel-Eisenmann, B., Drake, C., & Cirillo, M. (2008). "Muddying the clear waters": Teachers' take-up of the linguistic idea of revoicing. *Teaching and Teacher Education, 25*, 269-277.

Hossain, M. M., & Wiest, L. R. (2013). Collaborative middle school geometry through blocks and other web 2.0 technologies. *Journal of Computers in Mathematics and Science Teaching, 32*(3), 337-352.

Hughes, J. E., McLeod, S., Brown, R., Maeda, Y., & Choi, J. (2007). Academic achievement and perceptions of the learning environment in virtual and traditional secondary mathematics classrooms. *The American Journal of Distance Education, 21*(4), 199-214.

Johnson, D. C., Anderson, R. E., Hansen, T. P., & Klassen, D. L. (1980). Computer literacy—

what is it? *The Mathematics Teacher, 73*(2), 91-96.

Joubert, M. (2013). Using digital technologies in mathematics teaching: Developing an understanding of the landscape using three "grand challenge" themes. *Educational Studies in Mathematics, 82*(3), 341-359.

Kiger, D., Herro, D., & Prunty, D. (2012). Examining the influence of a mobile learning intervention on third grade math achievement. *Journal of Research on Technology in Education, 45*(1), 61-82.

Kim, C., Park, S. W., & Cozart, J. (2014). Affective and motivational factors of learning in online mathematics courses. *British Journal of Educational Technology, 45*(1), 171-185.

Kopcha, T. J., & Sullivan, H. (2008). Learner preferences and prior knowledge in learner-controlled computer-based instruction. *Educational Technology Research and Development, 56*(3), 265-286.

Kosko, K. W., Rougee, A., & Herbst, P. G. (in press). What actions do teachers envision when asked to facilitate mathematical argumentation in the classroom? *Mathematics Education Research Journal.*

Ku, H., Harter, C. A., Liu, P., Thompson, L., & Cheng, Y. (2007). The effects of individually personalized computer-based instructional program on solving mathematics problems. *Computers in Human Behavior, 23*, 1115-1210.

Li, Q. (2002). Gender and computer-mediated communication: An exploration of elementary students' mathematics and science learning. *Journal of Computers in Mathematics and Science Teaching, 21*(4), 341-359.

Liang, J., & Heckman, P. E. (2013). An examination of Algebra for All through historic context and statewide assessment data. *Journal of Transformative Leadership and Policy Studies, 3*(1), 3-18.

Liu, Y. (2013). A comparative study of integrating multimedia into the third grade math curriculum to improve math learning. *Journal of Computers in Mathematics and Science Teaching, 32*(3), 321-336.

Lubienski, S. T., & Lubienski, C. (2006). School sector and academic achievement: A multilevel analysis of NAEP mathematics data. *American Educational Research Journal, 43*(4), 651-698.

Masalski, W. J., & Elliott, P. (2005). *Technology-supported mathematics learning enviornments: Sixty-seventh yearbook*. Reston, VA: National Council of Teachers of Mathematics.

McCoy, L. P. (2005). Internet WebQuest: A context for mathematics process skills. In W. J. Masalski & P. C. Elliott (Eds.), *Technology-supported mathematics learning environments: Sixty-seventh yearbook* (pp. 189-202). Reston, VA: National Council of Teachers of Mathematics.

Milner, S. D. (1980). Teaching teachers about computers: A necessity for education. *The Phi Delta Kappan, 61*(8), 544-546.

National Council of Teachers of Mathematics [NCTM]. (1989). *Curriculum and evaluation standards for school mathematics*. Reston, VA: Author.

National Council of Teachers of Mathematics [NCTM]. (2000). *Principles and standards for school mathematics*. Reston, VA: Author.

Nguyen, D. M., Hsieh, Y. J., & Allen, G. D. (2006). The impact of web-based assessment and practices on students' mathematics learning attitudes. *Journal of Computers in Mathematics and Science Teaching, 25*(3), 251-279.

O'Dwyer, L. M., Carey, R., & Kleiman, G. (2007). A study of the effectiveness of the Louisiana Algebra I online course. *Journal of Research on Technology in Education, 39*(3), 289-306.

Oliver, K., Kellogg, S., & Patel, R. (2010). An investigation into reported differences between online math instruction and other subject areas in a virtual school. *Journal of Computers in Mathematics and Science Teaching, 29*(4), 417-453.

Paadre, T. H. (2011). *Did learning mathematics online increase students' math proficiency?: An outcome study of a vocational high school's use of an online mathematics program* (doctoral dissertation). Boston, MA: Northeastern University.

Rau, M. A., Aleven, V., & Rummel, N. (2009). Intelligent tutoring systems with multiple representations and self-explanation prompts support learning of fractions. In V. Dimitrova, R. Mizoguchi, & B. du Boulay (Eds.), *Proceedings of the 14th international conference on artificial intelligence in education* (pp. 441-448). Amsterdam, the Netherlands: IOS Press.

Rau, M. A., Aleven, V., Rummel, N., & Rohrbach, S. (2012). Sense making alone doesn't do it: Fluency matters too? ITS support for robust learning with multiple representations. In *Intelligent tutoring systems* (pp. 174-184). Berlin: Springer.

Reimer, K., & Moyer, P. S. (2005). Third-graders learn about fractions using virtual manipulatives: A classroom study. *Journal of Computers in Mathematics and Science Teaching, 24*(1), 5-25.

Ross, J., & Bruce, C. D. (2009). Student achievement effects of technology-supported remediation of understanding of fractions. *International Journal of Mathematical Education in Science and Technology, 40*(6), 713-727.

Setzer, J. C., & Lewis, L. (2006). *Distance education courses for public elementary and secondary school students* (research report). Washington, D.C.: U.S. Department of Education.

Shirvani, H. (2010). The effects of using computer technology with lower-performing students: Technology and student mathematics achievement. *The International Journal of Learning, 17*(1), 143-154.

Shumway, R. (1990). Supercalculators and the curriculum. *For the Learning of Mathematics, 10*(2), 2-9.

Sloan, M., & Olive, J. (2005). Distance learning: Mathematical learning opportunities for rural schools in the United States. In *Proceedings of the Seventeenth Study Conference of the International Commission on Mathematical Instruction*. Hanoi Institute of Technology and Didirem Universite Paris.

Stone, C. M. B. (2013). South Carolina K-12 online schools: A framework for measuring success in teaching and learning (doctoral dissertation). Phoenix, AZ: Grand Canyon University.

Walshaw, M., & Anthony, G. (2008). The teacher's role in classroom discourse: A review of recent research into mathematics classrooms. *Review of Educational Research, 78*, 516-551.

Wang, T. (2013). Developing an assessment-centered e-Learning system for improving student learning effectiveness. *Computers and Education, 73*, 189-203.

Watson, J., Murin, A., Vashaw, L., Gemin, B., & Rapp, C. (2013). *Keeping pace with K-12 online learning: An annual review of policy and practice* (research report). Mountain View, CA: Evergreen Education Group.

Zengin, Y., Furkan, H., & Kutluca, T. (2012). The effect of dynamic mathematics software geogebra on student achievement in teaching of trigonometry. *Procedia-Social and Behavioral Sciences, 31*, 183-187.

Chapter 8

Research on Literacy Instruction and Learning in Virtual, Blended, and Hybrid Environments

Kristine E. Pytash, *Kent State University, kpytash@kent.edu*
W. Ian O'Byrne, *University of New Haven, wiobyrne@gmail.com*

Abstract

Drawing on current literacy research, the goals of this chapter are to examine and synthesize the relevant research and best practices associated with literacy learning and teaching in virtual, blended and hybrid environments in K-12 settings. While the research base for literacy education in virtual schools, blended, and hybrid learning environments is significantly limited, it is supported by research done in the field of literacy education investigating reading and writing in online spaces. This chapter provides specific recommendations and implications for writing instruction and reading instruction in online education spaces, and in addition, implications for future research are provided.

Introduction

The number of students enrolling in fully online virtual schools or participating in hybrid or blended learning environments is growing at a rapid pace as many states have opportunities for students to engage in some version of online learning (Watson et al., 2013). While research has examined the effectiveness of distance learning, instructional approaches, and the characteristics of successful students in online settings, missing from the research is an examination of the discipline-specific pedagogical practices necessary for literacy instruction (Barbour & Reeves, 2009; Cavanaugh, Gillian, Kromrey, Hess, & Blomeyer, 2004; DiPetro, Ferdig, Black, & Preston, 2008; Ferdig, Cavanaugh, Freidhoff, 2012).

Drawing on current literacy research, the goals of this chapter are to include the relevant research and best practices associated with synchronous and asynchronous computer mediated learning as defined by virtual, blended, and hybrid learning environments in K-12 settings. We provide specific recommendations and implications for writing instruction and reading instruction in virtual, hybrid, and blended environments. In addition, implications for future research are provided.

Research Synthesis

The goal for this literature synthesis was to develop a coherent picture of the research surrounding K-12 literacy education in online, blended, or hybrid settings. While there is substantial research about literacy education in traditional brick and mortar settings, there is the need for a close examination of research in online and blended settings. This literature synthesis was guided by the following question: *What are the pedagogical practices that foster K-12 students' literacy engagement, learning, and acquisition in virtual, blended, or hybrid school settings?*

While there are numerous definitions of *virtual schools*, for this synthesis virtual schools were defined as "an educational organization that offers K-12 courses through Internet or Web-based methods" (Clark, 2001, p. 8). Also included in this literature synthesis were learning environments considered *hybrid* or *blended* learning environments. Hybrid, or blended learning, indicates a pedagogical approach that includes a combination of face-to-face (F2F) instruction with computer-mediated instruction (Ferdig et al., 2012). The terms blended learning, hybrid learning, and mixed-mode learning are often used interchangeably in current research. In the United States the term *blended learning* is primarily used (Martyn, 2003). In this mix of instruction, learners and instructors work collaboratively to improve the quality of learning and instruction (Bonk & Graham, 2006). The Internet and other educational technologies are used to provide realistic, practical opportunities to make learning independent, useful, and sustainable (Graham, 2006; Heinze & Proctor, 2006). Research shows there is no one perfect method to balance out F2F and online instruction in a way that is not negative to each other, or perfect in every situation (Garrison & Kanuka, 2004).

Asynchronous and synchronous learning events have different discursive elements that may be exploited for different pedagogical purposes (Sotillo, 2000). Synchronous refers to *real-time* communication that mimics elements of a conversation or discussion (Mason, 1994; Riva, 2002). Using computer mediated communication (CMC) tools, synchronous learning is only possible using text, video, or audio chats. Asynchronous refers to communication of learning activities that occur outside of real-time (Warschauer, 1997; Curtis & Lawson, 2001). CMC tools that encourage asynchronous learning include videos, bulletin boards, readings, and writing or blogging activities. Advantages to asynchronous learning events include opportunities to build in elements of metacognitive delay, to allow learners to *press pause* on learning, or perhaps delay an immediate response. Challenges of asynchronous learning include the problems that exist as this form of collaboration lacks a sense of urgency or immediacy. Learners and educators may be frustrated as they wait for hours, days, and perhaps weeks for feedback. And yet, Sotillo (2000) contends "in the hands of experienced teachers, both modes of computer mediated communication (CMC) can be used as novel tools to enhance the learning process by encouraging interaction among participants, collaborative text construction, and the formation of electronic communities of learners" (p. 82).

At the far end of the continuum we will consider fully online, virtual K-12 classrooms and schools. At the beginning of this continuum we will consider and promote the usage of as close to a 50/50 mix of online and offline learning environments. This spectrum of complexity is important to consider as data shows that if current trends continue, 50% of all high school classes will be offered solely online by 2019 (Allen & Seaman, 2011), which is problematic considering that few teacher preparation programs address online or blended learning environments (Means, Toyama, Murphy, Bakia, & Jones, 2009; Kennedy & Archambault, 2012). Several additional parameters were set for this literature synthesis. Criteria for articles included a focus on K-12 students, literacy learning and acquisition, and English language arts classrooms. Specifically not included were studies looking to remediate or assist in special education or foreign language. In addition, the geographic regions included the United States, and did not extend to other regions of the world.

A series of electronic searches using the Education Research Complete databases were completed. Search terms associated with literacy education and online education were used in combinations, such as *language arts, literacy, reading, reading instruction, writing, writing instruction, virtual schools, online learning, hybrid learning and blended learning*. Various search term combinations were used until the same articles appeared repeatedly. Peer-reviewed literacy journals were reviewed, including *Reading Research Quarterly, The Journal of Adolescent and Adult Literacy, The Reading Teacher, English Journal,* and *Language Arts*, and a more general educational journal, *Distance Education*. The focus of this literature synthesis was to identify patterns and themes in the literature on literacy instruction in K-12 virtual schools, hybrid, and blended learning environments.

Virtual, Blended, and Hybrid Learning Environments

Research has focused on the effectiveness of distance education (Cavanaugh et al., 2004; Ferdig et al., 2012), characteristics of effective online students (Barbour & Reeves, 2009), and pedagogical approaches employed by effective online teachers (DiPetro et al., 2008). While this research has implications for teaching in virtual school settings, or hybrid or blended learning environments, these studies have examined instruction in a *content free* manner, without investigating the practices specific to particular disciplines (DiPetro et al., 2008). For example, in a study of 16 virtual school teachers, DiPetro et al., (2008) found specific pedagogical strategies contributed to students' engagement and content learning. Interacting using communication tools, monitoring progress and providing feedback, and making content relevant and meaningful, were found to be effective in a virtual school setting.

Research has also highlighted three basic elements that need to be considered while facilitating a blended or hybrid learning course: the online and F2F learning activities; the role of students; and role of the instructor (Waston, 2007). Within this context, there are generally six goals of blended learning: pedagogical richness, access to knowledge, social interaction, personal agency, cost effectiveness, and ease of revision (Osguthorpe & Graham, 2003). To that end, teachers need to be trained in "how to motivate individual learners, enhance student interaction and understanding without visual cues, tailor instruction to particular learning styles, and develop or modify interactive lessons to meet student needs" (Watson, 2007, p. 13). At this point, there is a lack of resources identifying best practices crucial for addressing these elements in teacher training programs (Kennedy & Archambault, 2011).

Teachers need to be trained and given the pedagogical liberty to utilize traditional classroom methods, while engaging in enhanced training to develop skills targeted for online and blended learning environments (Kennedy & Archambault, 2011). There are several other skills needed by teachers as they prepare for an online or blended learning environment (Watson, 2007):

1. Enhanced communication skills: teachers can't rely on nonverbal or proximal cues with which to address misunderstandings. Teacher preparation programs will need to help teachers develop a clarity in their instructions not required by traditional classrooms (Darling-Hammond, 2012);
2. Time management (in asynchronous classes): students can be online at any time, so teachers can't predict when heavier work loads will occur (Ng, 2007);
3. Teacher planning (in synchronous classes): lessons need to have a multimedia component which requires more planning than a traditional classroom lesson (Palloff & Pratt, 2002);
4. Differentiation: if students have different learning styles or disabilities, teachers must be

able to adapt online content for them. Reaching students with physical or learning disabilities will be much different than in a traditional classroom (Moore & Kearsley, 2011).

This synthesis of research highlights some of the literature surrounding teaching in online, blended, and hybrid learning environments. Included in this research are the identified characteristics of effective virtual school teachers and the essential elements necessary when designing online instruction. While educators can draw conclusions from these studies, this does not provide an in-depth examination of pedagogical practices specific to literacy acquisition and learning in online learning environments. This is a significant gap in knowledge about teaching and learning in online settings. While little research has examined literacy instruction in virtual schools, there has been a tremendous amount of research examining pedagogical practices using technology to teach reading and writing in traditional K-12 settings.

Writing Research

Writing is a complex endeavor requiring both cognitive abilities (e.g. knowledge of content), conceptual knowledge of the writing process, and knowledge of strategies to assist writers during the process (Flower & Hayes, 1981). Social contexts, or learning environments, and the relevance of writing tasks, also influence writing outcomes (Hayes, 2000, 2006; Piazza & Siebert, 2008; Nystrand & Duffy, 2003; McClenny, 2010). Writing researchers have established that writing is not linear, rather a complex and recursive processes, in which the writer is constantly drafting, editing, and revising throughout the writing event. Much of the current research is exploring the affordances and constraints of using technology to teach writers. Specifically three inquiry strands have provided specific research about how technology can be used to facilitate the writing process: (1) technology provides students with a more thorough understanding of purpose and audience when writing, (2) technology becomes a means for receiving detailed feedback about writing, and (3) technology provides an impetus for reconceptualizing writing.

Purpose, context, and audience are intricately related, meaning students must know why they are writing and who the intended audience is that will read their work. Often writing in schools is seen as an isolated act with teacher as sole reader and evaluator of written work. Literacy researchers have found technologies, such as social media platforms, blogs, and digital portfolios, allow writers to write for a wider audience that can provide authentic feedback, leading to an increased awareness of purpose, context, and audience (Jaramillo, 2013; McGrail & Davis, 2011; McGrail & McGrail, 2013; Vasudevan & Reily, 2013; West, 2008; Witte, 2007). Although often associated with older students, research has found blogging to also be an effective practice for writing at the elementary level (McGrail & Davis, 2011; McGrail & McGrail, 2013). McGrail & Davis (2011) investigated the composition of blogs in a 5th grade classroom and found the blogs provided a connection to an audience of readers beyond the teacher. This led to an increase in not only better comprehending the concepts of audience, form, and purpose, but also engagement in the writing process. As this research suggests, digital environments can redefine the relationship between the student writer, teacher, and reader. This shift moves teachers from being the sole evaluator of student work, and also moves students to write with a reader-based stance, keeping in mind readers' perspectives while writing.

Online platforms can influence not only how writing is produced and disseminated, but also how students receive feedback about their work. While researchers have explored social networking sites, others have examined tools, such as Scholar and Eli Review, designed specifically to facilitate students' learning during the revision stage (Lammers, Scott-Curwood, Magnifico, 2013; McCarthey et al., 2013). McCarthey et al., (2013) examined Scholar, "a technology-enabled classroom writing tool," used to "support writing, peer review, annotation, and revision" (p. 153). McCarthey et al., found Scholar's online writing environment provided three major affordances: (1) increased access to peer responses, (2) motivated students to write for an audience, and (3) scaffolded and increased responses to other's writing. Online platforms designed specifically to engage students in revision can increase the amount of interaction by teachers and peers that surround a student's writing. This creates a shift from a traditional, teacher-led classroom, to a more collaborative writing community.

While there are many affordances of using technology, researchers have noted the constraints and challenges of using technology to teach writing. In a case study of a first grade classroom, Van Leeuwen & Gabriel (2007) found students had a preference for writing with computers and word processing programs; however, for some students, poor keyboarding skills slowed text production and for all students their handwritten pieces were longer in length than their computer composed pieces. Despite this, they also found students' conversations about writing, their collaboration while writing, and their support for peers' writing increased during times they used computers. These findings suggest the complexity of having elementary aged students use word processing computers during writing instruction. Theoretical perspectives and new research has emerged in which broadening notions of text and allowing elementary aged students to include visuals, audio, and video in their compositions, may provide new possibilities when teaching writing in an online context.

Language and literacy instruction is increasingly viewed as including multiple modes of information (Leu, Kinzer, Coiro, & Cammack, 2004; Proctor, Dalton, Grisham, 2007). In hybrid learning environments this involves writing using different modes of communication including language, image, audio, video, gesture, and other semiotic resources to make signs in explicit social contexts (Kress & Van Leeuwen, 2001). Stemming from a social semiotics theory (Halliday, 1978; Hodge & Kress, 1988), multimodality is the combination of modes, defined by Bezemer and Kress (2008) as a "socially and culturally shaped resource for making meaning" (p. 170), such as written words, speech, audio, visuals, and spatial representations (New London Group, 1996). Composing multimodal arguments and visual rhetoric is recognized as a sophisticated process that requires recontextualizing, reconceptualizing, and redesigning traditional print literacies (Bezemer & Kress, 2008; Newall, Beach, Smith & VanDerHeide, 2011). Multimodal compositions encourage students to "assess the potential rhetorical uptake of their uses of images, sounds, music, and editing based on their assumptions about audiences' semiotic and popular culture knowledge of the meanings of these images, sounds, music, and editing" (Newall et al., 2011, p. 296).

Additionally, the use of ICTs in writing of text empowers individuals to reconfigure or remix the mode or message into an entirely different mode or message (Kress, 2009). Students as producers of multimodal content, may choose to recreate, or remix an online text. In this process a student can recreate or re-write the text, change the mode (e.g., transform from text to image or video), or change the message entirely using a critical literacy lens. This in turn sets the stage for elements of critical multiliteracies in hybrid learning environments.

A multiliteracies perspective is based on critical literacy and new literacies to develop a pedagogical agenda of social change and empower students as "active designers of social futures" (Cope & Kalantzis, 2000). Multiliteracies includes elements of critical literacy by encouraging students to *read the word and read the world* (Friere & Macedo, 1987) while integrating the teaching of writing (Cope & Kalantzis, 2000) and ICTs. Multiliteracies pedagogy is influenced by elements of multimodal design, which build aspects of critical engagement between students and text to promote social justice in both learning process and product. This learning tool can assist students to think critically about online information while also focusing on the skills necessary in multimodal design (Cope & Kalantzis, 2000).

Literacy researchers have examined students' complex cognitive processes when creating compositions that include sound, image, graphics, and video, and findings suggest that creating multimodal compositions motivates student writers and scaffolds their writing skills (Chisholm & Trent, 2013; Dalton, 2013; Foley, Guzzetti, Angello, & Lesley, 2013; Hicks, 2013; Smith, 2013; Sylvester & Greenidge, 2009). In addition, digital writing and digital tools can also be used to support learners as they engage in vocabulary and verbal language development (Dalton & Grisham, 2011).

Reading Research

Research shows that reading comprehension is an active, constructive, meaning-making process in which the reader, the text, and the activity play a central role (RAND Reading Study Group, 2002). In this context, reading of informational text often proves to be a bit more challenging for students (Duke & Pearson, 2002) as they read and learn about the natural or social world (Duke & Purcell-Gates, 2003; Weaver & Kintsch, 1991). The majority of online reading in school and academic settings focuses on informational texts. Adding to this complexity, informational texts include abstract concepts, special vocabulary, and text structures that impact a reader's ability to locate, understand, and use the contained information (Cox, Shanahan, & Tinzmann, 1991; Weaver & Kintsch, 1991).

Research highlights that the combination of these elements proves problematic for teachers and students using online informational text in the classroom. First, students are often allowed to connect and collaborate, and they work with peers to search, synthesize, and comprehend online texts with peers (Wade & Moje, 2000; Coiro, 2003). Second, use of online informational text requires educators to permit students to use information and learning materials that may not have been vetted and may be unreliable (Metzger, 2007). There is a degree of risk and trust between the teacher and students to read and work collaboratively in hybrid learning environments.

There are other aspects that may affect comprehension of online informational text for some students. Young children are provided with far too few formal experiences with learning how to read informational texts in F2F elementary settings (Duke, 2000; Duke, Bennett-Armistead, & Roberts, 2003). Research shows that elementary students need to be provided with more instructional opportunities to engage with informational text (e.g., Chall, Jacobs, & Baldwin, 1990; Duke, 2000; Smolkin & Donovan, 2001; Gregg & Sekeres, 2006). To address this concern, there are research-based instructional strategies available to guide instruction (e.g., Biancarosa & Snow, 2004; Davis, Spraker, & Kushman, 2005). Despite this focus, many students are unable to comprehend the informational texts that have become so prevalent on the Internet (Duke, 2000; Leach, Scarborough, & Rescorla, 2003; Biancarosa & Snow, 2004; Duke, 2004). It is clear that students need to be provided with multiple opportunities to work with online informational text (Proctor, Dalton, & Grisham, 2007; Proctor, Dalton, Uccelli, Biancarosa, Mo, Snow, & Neugebauer, 2011).

As the Internet and hybrid learning environments become more prevalent in schools and society, it is important to build the knowledge, skills, and dispositions students will need as they read online in a global classroom. This is challenging as teaching and learning in the Internet era can be totally different from the way most teachers were educated. The Internet and other communication technologies (ICTs) require that we continue to define and redefine what literacy is and how individuals learn. Outside of an academic context, students regularly read, write, and collaborate with others online. In traditional and online learning and academic environments, educators sometimes view this as a distraction rather than an opportunity to educate children using social practices they are accustomed to using. Through the intentional use of online informational text in the hybrid classroom, instructors can help students recognize text structure and features and use them to effectively communicate to multiple audiences in school and in personal communications.

As researchers study and embed digital literacies in hybrid learning classrooms, it is important to consider that the nature of literacy is rapidly evolving as ICTs emerge (Coiro, Knobel, Lankshear & Leu, 2008). This consideration must include an expanded view of text to include visual, digital and other multimodal formats (Rose & Meyer, 2002; New London Group, 2000; Alvermann, 2002). Important in this expanded view of text as it relates to hybrid instruction is an opportunity to create a way to communicate with others while situated in the codes and conventions of society (Robinson & Robinson, 2003). In essence, the hybrid classroom needs to be able to consider the cultural, societal, and situated elements involved in literacy-based practices (Black, 2009).

Critical Readers of Online Information. Informational texts may include complex concepts, specialized vocabulary, and unfamiliar text structures that significantly impact a reader's ability to locate, synthesize, and act on the information contained therein (Cox, Shanahan, & Tinzman, 1991; Weaver & Kintsch, 1991). The intersection of these two areas proves problematic for teachers and students reading online text in blended learning environments. Critical literacy may provide new opportunities when incorporated into a blended learning classroom that effectively uses digital texts and tools for instructional purposes. As these texts and ICTs constantly change (Leu & Kinzer, 2000), learners must reflect these changes in our classrooms (Reinking, 1997; Cuban & Cuban, 2009; Zhao, Pugh, Sheldon, & Byers, 2002). Researchers have noted that teachers should work to authentically and effectively integrate online informational texts into the classroom (Torres & Mercado, 2006) as the use of the Internet as a text in the classroom allows the teacher and students to build reading comprehension skills while engaging in literacy practices.

Web literate, English Learners in digital spaces. It is necessary to identify opportunities to empower students using digital literacies (Henry, Castek, O'Byrne, & Zawilinski, 2012). The ability to read and write using digital tools has been shown in hybrid learning contexts to construct spaces for learning and sharing of interests (Lam, 2000).

To address these concerns and support educators and students as they authentically and effectively use online informational text in the classroom, the Online Research and Media Skills (ORMS) model was developed and tested. The purpose of the ORMS model is to prepare students for a digital and global economy while also reinforcing reading, writing, speaking, listening, and viewing of subject area content. This instructional model uses a multiple theoretical perspective approach (Labbo & Reinking, 1999), incorporating several theoretical perspectives, including those from reading research, critical literacy, and new literacies to frame the cornerstones.

There are three cornerstones in the ORMS model which support lifelong reflective learning which in turn empowers students through online inquiry, composition, and comprehension with the use of learning environments that utilize authentic, productive, and ethical use of applications required in today's global economy:

- Online Collaborative Inquiry-A group of local or global learners who arrive at a common outcome via multiple pathways of knowledge
- Online Reading Comprehension- The skills, strategies, practices, and dispositions students need to locate, evaluate, and synthesize information during problem based inquiry tasks
- Online Content Construction- A process by which students construct and redesign knowledge by actively encoding and decoding meaning through the use of ever shifting multimodal tools

To better understand the three cornerstones of the ORMS model, an open, online educational resource was developed to help explicate the intricacies of each cornerstone (https://sites.google.com/site/ormsmodel/). More information on the ORMS model is included below in the Implications for Practice section.

Readers and Writers of Online Information.

Given the changes and shifts that are occurring to literacy as a result of technology, it can be a challenge to thoughtfully and routinely embed digital texts and tools. As detailed throughout this chapter, this integration of ICTs should be viewed as a literacy, and as a result is a social imperative for all classrooms, not just F2F or fully online. ICTs provide challenges and opportunities for development of hybrid learning environments with the visual and aural stimulation necessary to render new concepts more accessible (De Freitas, 2006; Borgman, 2011). This draws on Vygotsky's (1978) sociocultural theory that indicates that learning is facilitated through interaction with the social environment (e.g., interpersonal learning) as opposed to intrapersonal learning. Strengths of the inclusion of ICTs in instruction include the ability to scaffold students as they construct meaning in a digital reading and writing environment (Healey & Klinghammer, 2002).

With these challenges, there is a rich opportunity and a need for innovative instructional research uses that explore the various permutations of virtual, blended, and hybrid learning environments. Challenges associated with the inclusion of ICTs into instruction mostly focus on the access and training associated with use of digital texts and tools. With the use of technology in any setting, especially the classroom, there is the likelihood that computers will crash, hardware fails, or software is non-existent (Cuban & Cuban, 2009; Bingimlas, 2009). The key component in the successful use of educational technologies in a classroom setting involves the proper training and support the individual teachers need to use the digital texts and tools (Higgins, Smith, Wall, & Miller, 2005). For the most part, all challenges may be averted through the strategic training and empowerment of educators and the logical distribution of educational technologies (Hefzallah, 2004; Brown, & Warschauer, 2006).

Implications for Practice

While it is important to note that "virtual schools have a complexity that distinguishes them" from other learning contexts (DiPetro et al., 2008), research from literacy instruction using technology can be a source for recommendations in virtual, hybrid, or blended settings.

Writing Instruction

The integration of technology for writing instruction is a goal for many literacy educators as technology is changing the way writing is produced and disseminated. The National Council of Teachers of English (2004) position statement asserts "the use of basic word processing to support drafting, revision, and editing to the use of hypertext and the infusion of visual components in writing, the definition of what writing instruction includes must evolve to embrace new requirements" (¶ 42). There are various ways that technological tools can help facilitate the writing process; however, based on literacy research this section details three main implications for writing pedagogies in virtual schools, and blended and hybrid learning environments.

One of the affordances of technology is students' writing can reach a wide audience of readers so that teachers are no longer the sole readers and evaluators of student writing. Similar to teachers in traditional schools, teachers in virtual, blended, or hybrid learning environments could enhance their writing instruction by using tools, such as blogs, wikis, and social media sites, that might provide students with opportunities to write for authentic audiences and to receive a wider range of feedback on their writing. In addition, using these tools might also foster social interactions between teachers and students, which DiPietro et al., (2008) found to be a positive characteristic of virtual school teachers.

Technology provides teachers with multiple ways to give students feedback on their writing. Teachers can consider using platforms that readily engage students in the act of revision during the writing process. Using either a program similar to Scholar, such as Eli Review, or class wikis or websites, teachers could use learning platforms as a way to engage students in the writing and revision process. As the research highlights, these tools become a way to not only support student writers, but also a way to foster collaborative writing.

Research has highlighted that for many elementary aged students, keyboarding can be a skill that creates challenges; however, evolving perspectives on what it means to be literate considers the ways students compose using multiple modes. This broadening notion of text provides new pedagogical practices when engaging students in the writing process. Technologies, such as iPads, Twitter, Blogger, YouTube, and iMovie are transforming how educators conceptualize writing and composition (Albers & Harste, 2007; Dalton, 2013; Hicks, 2013; Kist, 2005; Smith, 2013; Sylvester & Greenidge, 2009).

Reading Instruction

Students in virtual, blended, or hybrid learning environments have the opportunity of being exposed to informational texts from online sources on a consistent basis. Online reading comprehension (Leu et al., 2009) is framed as a process of problem-based inquiry that takes place as students use the Internet to search and sift for answers to problems. This cornerstone is viewed as reading of online information. While the complex concepts, specialized vocabulary, and unfamiliar text structures can create challenges for students, online collaborative inquiry is framed as collaboration and co-construction of a body of information by a group of local, or global connected learners. This cornerstone is viewed as collaboration by learners as they search, sift, and synthesize online informational text. Online content construction (O'Byrne,

2013) is framed as the skills, strategies, and dispositions necessary as students construct, re-design, or re-invent online texts by actively encoding and decoding meaning through the use of digital texts and tools. This cornerstone is viewed as including the process and product of writing using digital texts and tools.

As these skills are propelled by technological advances, teachers can begin to explore instructional strategies to engage students in this learning. For example, teachers can use digital tools to facilitate classroom discussions about the thinking process used when reading informational texts. Allowing students to collaborate in deconstructing informational texts can provide insight into the text structures and particular features, as well as the understanding of specialized disciplinary knowledge needed for comprehension.

Implications for Research

Future research should be conducted to examine the affordances and constraints of literacy instruction in virtual, hybrid, and blended school settings. While there is research about general pedagogical practices that are effective in virtual, hybrid, and blended settings, there is currently a lack of empirical research studies in the area of literacy teaching, learning, and acquisition. And, while there are numerous research studies focused on technology in the field of literacy, there is little information about specific pedagogical practices in virtual school settings. As researchers explore literacy instruction in virtual, blended, and hybrid settings, there are a number of avenues to be explored.

Technological tools provide ubiquitous learning. While there is much conversation about the ways students read and write in various contexts and spaces, often highlighted is the binary between those literacy practices considered school sanctioned practices and those considered unsanctioned literacy practices. As more students are learning formally and informally in online spaces, these practices are becoming blurred. Researchers should be examining how these practices overlap and inform each other, with a critical eye examining the privileging of text and form in school settings. Notions of literacy have broadened as researchers and educators explore how students learn to read and write using images, video, audio, and other multimodal formats. As definitions of texts and of what it means to be literate are continually defined and redefined, researchers should explore how this influences the ways we teach literacy, particularly in virtual, hybrid, or blended learning spaces.

While online opportunities provide specific affordances, there are still constraints to consider when working with students in online settings. Researchers can pay more attention to the particular challenges elementary aged students may face when learning to read and write in online spaces. With specific challenges, such as lack of keyboarding skills, young readers and writers potentially face numerous challenges while learning in virtual, hybrid, or blended learning settings. In addition, the types of texts students are expected to read are changing, particularly as there is a current emphasis on informational texts. As noted, informational texts can be particularly difficult to comprehend, especially for young learners. Therefore, more research is needed on instructional practices that support young students reading of informational texts. In addition, much of literacy and English language arts classrooms revolve around involving students in discussions about writing, literature, and informational texts. As students work together to write collaboratively or to work with peers to search and comprehend online texts, researchers should be examining the best ways to scaffold students' abilities to work in interactive and collaborative learning environments (Coiro, 2003; Kanuka & Anderson, 2007).

In addition, the affordances and constraints of learning in online environments requires strategic and empowering professional development specific for instruction in these settings. As more teachers are expected to teach in online contexts, what professional development opportunities are needed to facilitate teachers' learning about effective instructional approaches for online educational spaces? In addition, what discipline-specific pedagogical approaches are most effective practices in online, hybrid, or blended learning environments? Researchers should also explore preservice teachers' learning about how to teach in online, hybrid, and blended learning spaces.

Conclusion

Educational institutions from Pre-K through higher education are experimenting with the effect that different chronotopes have on teaching and learning. In this context, chronotope refers to configurations of time and space in which educators manipulate pedagogical opportunities across hybrid learning spaces. Yet, with these experimental forays into hybrid learning environments, there is very little known about the challenges and opportunities that exist while supporting student learning. This is even more disconcerting as we consider the paucity of research and identified best practices developed for K-12 educational settings.

While the research base for literacy education in virtual schools, and hybrid and blended learning environments is significantly limited, it is supported by research done in the field of literacy education investigating reading and writing in online spaces. The first step may be to simply view the use of ICTs and digital content as another form of text in the classroom. This analogy allows educators to consider opportunities such as the ones discussed in this chapter to support content learning with literacy-based activities. This still does not account for issues with interpersonal and intrapersonal, or dispositional attitudes that make up the glue that holds together learners in a classroom. Advances in educational technologies such as videoconferencing may bring this functionality to the classroom and support all learners, but it still will require further examination and research.

Educators interested in developing and facilitating blended learning experiences can refer to the guidance detailed in this chapter. There are also tremendous online learning experiences, or open educational resources available online supporting educators from Pre-K through higher education as they consider blended learning experiences that are effective and rigorous. One such example is the Blended Learning Toolkit open online class that is facilitated by Kelvin Thompson every year (the website for the course is http://blended.online.ucf.edu/blendkit-course/). The Blended Learning Toolkit, and other guidance on best practices in blended, or hybrid learning environments can also be reviewed in academic journals like Hybrid Pedagogy (www.hybridpedagogy.com) and online through using personal learning networks.

As detailed in this chapter, it should be understood that the research and identified best practices as they relate to hybrid instruction are very much fluid and not well informed. This fluidity and constant change will most likely continue to be a constant identifying characteristic as technologies, and the literacies associated with these digital texts and tools continue to change. As the only constant in educational technologies is change itself, it seems necessary that constant meta analysis and research are conducted to define current trends, test instructional methods, and reflect before repeating this iterative cycle. As the number of students enrolling in fully online virtual schools or participating in hybrid or blended learning environments grows exponentially, we need to continuously develop a coherent picture of the literacy-based practices used in the interstices between online and offline educational spaces.

References

Albers, P. & Harste, J. C. (2007). The arts, new literacies, and multi-modality. *English Education, 40*(1), 6-20.

Allen, I. E., & Seaman, J. (2011). *Going the distance: Online education in the United States, 2011*. Newburyport, MA: Sloan Consortium.

Alvermann, D. E. (2002). Effective literacy instruction for adolescents. *Journal of literacy Re-*

search, 34(2), 189-208.

Barbour, M. & Reeves, T. (2009). The reality of virtual schools: A review of the literature. *Computers and Education, 52*, 402-416.

Bezemer, J. & Kress, G. (2008). Writing in multimodal texts: A social semiotic account of designs for learning. *Written Communication, 25*(2), 166-195.

Biancarosa, C., & Snow, C. E. (2006). Reading next—A vision for action and research in middle and high school literacy:A report to Carnegie Corporation of New York (2nd ed.).Washington, DC:Alliance for Excellent Education.

Bingimlas, K. A. (2009). Barriers to the successful integration of ICT in teaching and learning environments: A review of the literature. *Eurasia Journal of Mathematics, Science & Technology Education, 5*(3), 235-245.

Black, R. W. (2009). Online fan fiction, global identities, and imagination. *Research in the Teaching of English*, 397-425.

Bonk, C. J. and Graham, C. R. (2006). *Handbook of blended learning: Global perspectives, local designs*. San Francisco, CA: Pfeiffer Publishing.

Borgman, C. L. (Ed.). (2011). *Fostering learning in the networked world: The cyberlearning opportunity and challenge*. Darby, PA: DIANE Publishing.

Brown, D., & Warschauer, M. (2006). From the university to the elementary classroom: Students' experiences in learning to integrate technology in instruction. *Journal of Technology and Teacher Education, 14*(3), 599-621.

Castek, J., Zawilinski, L., McVerry, J. G., O'Byrne, W. I., & Leu, D. J. (2011). The new literacies of online reading comprehension: New opportunities and challenges for students with learning difficulties. In *Multiple perspectives on difficulties in learning literacy and numeracy* (pp. 91-110). Netherlands: Springer.

Cavanaugh, C., Gillian, K., Kromrey, J., Hess, M., & Blomeyer, R. (2004). *The effects of distance education on K–12 student outcomes: A meta-analysis*. Naperville, IL: Learning Point.

Chall, J., Jacobs, V., & Baldwin, L. (1990). *The reading crisis: Why poor children fall behind.* Cambridge, MA: Harvard University Press

Chisholm, J. & Trent, B. (2013). Digital storytelling in a place-based composition course. *Journal of Adolescent and Adult Literacy, 57*(4), 307-318.

Clark, T. (2001). *Virtual schools: Trends and issues - A study of virtual schools in the United States.* San Francisco, CA: Western Regional Educational Laboratories

Coiro, J. (2003). Reading Comprehension on the Internet: Expanding our understanding of reading comprehension to encompass new literacies. *The Reading Teacher, 56,* 458-464.

Coiro, J., Knobel, M., Lankshear, C., & Leu, D.J. (Eds). (2008). *Handbook of research on new literacies*. Mahwah, NJ: Lawrence Erlbaum

Cope, B., & Kalantzis, M. (Eds). (2000). *Multiliteracies: Literacy learning and the design of social futures*. London: Routledge.

Cox, B. E., Shanahan, T., & Tinzmann, M. B. (1991). Children's knowledge of organization, cohesion, and voice in written exposition. *Research in the Teaching of English,* 179-218.

Cuban, L., & Cuban, L. (2009). *Oversold and underused: Computers in the classroom*. Cambridge, MA: Harvard University Press.

Curtis, D. D., & Lawson, M. J. (2001). Exploring collaborative online learning. *Journal of Asynchronous learning networks, 5*(1), 21-34.

Dalton, B. (2012/2013). Multimodal composition and the Common Core Standards. *The Reading Teacher, 66*(4), 333-339.

Dalton, B., & Grisham, D. L. (2011). eVoc strategies: 10 ways to use technology to build vocabulary. The Reading Teacher, 64(5), 306-317.

Darling-Hammond, L. (2012). *Powerful teacher education: Lessons from exemplary programs.* New York, NY: John Wiley & Sons.

Davis, D., Spraker, J. & Kushman, J. (2005). *Improving adolescent reading: Findings from research.* Portland, Oregon: Northwest Regional Education Laboratory.

De Freitas, S. (2006). *Learning in immersive worlds.* London: Joint Information Systems Committee.

DiPetro, M., Ferdig, R., Black, E., & Preston, M. (2008). Best practices in teaching K-12 online: Lessons learned from Michigan Virtual School teachers. *Journal of Interactive Online Learning, 7*(1), 10-35.

Duke, N. K. (2000). 3.6 minutes per day: The scarcity of informational texts in first grade. *Reading Research Quarterly, 35*(2), 202-224.

Duke, N. K. (2004). The case for informational text. *Educational Leadership,61*(6), 40-45.

Duke, N. K., Bennett-Armistead, V. S., & Roberts, E. M. (2003). Bridging the gap between learning to read and reading to learn. In D. M. Barone & L. M. Morrow (Eds.), *Literacy and young children: Research-based practices* (pp. 226-242). New York: Guilford Press.

Duke, N. K., & Pearson, P. D. (2002). Effective practices for developing reading comprehension. In A. E. Farstrup & S. J. Samuels (Eds.), *What research has to say about reading instruction* (3rd ed., pp. 205–242). Newark, DE: International Reading Association.

Duke, N. K., & Purcell-Gates, V. (2003). Genres at home and at school: Bridging the known to the new. *The Reading Teacher, 57*, 30–37.

Ferdig, R., Cavanaugh, C., Freidhoff, J. (2012). *Lessons learned from blended programs: Experiences and recommendations from the field.* Vienna, VA: iNACOL.

Flower, L., & Hayes, J. R. (1980). The cognition of discovery: Defining a rhetorical problem. *College Composition and Communication, 1*, 21–32.

Foley, L., Guzzetti, B., Angello, M., & Lesley, M. (2013). Teaching writing in the "Techno-Zone": Exploring new literacies in a first-grade classroom. In R.E. Ferdig & K.E. Pytash (Eds). *Exploring multimodal composition and digital writing*. Hershey, PA: IGI Global. 152-168.

Freire, P., & Macedo, D. P. (1987). *Literacy: Reading the word & the world*. South Hadley, Mass.: Bergin & Garvey Publishers

Garrison, D. R. & Vaughan, N. D. (2008). *Blended learning in higher education: Framework, principles, and guidelines*. Hoboken, NJ: Jossey-Bass Publishing.

Graham, C. R. (2006). Blended learning systems: Definition, current trends, and future directions. In Bonk, C. J. & Graham, C. R. (Eds.). *Handbook of blended learning: Global perspectives, local designs.* San Francisco, CA: Pfeiffer Publishing.

Gregg, M., & Sekeres, D. C. (2006). Supporting children's reading of expository text in the geography classroom. *The Reading Teacher, 60*(2), 102-110.

Halliday, M.A.K. (1978). *Language as social semiotic: The social interpretation of language and meaning*. London: Edward Arnold

Hayes, J. R. (2000). A new framework for understanding cognition and affect in writing. In R. Indrisano & J. R. Squire (Eds.), *Perspectives on writing: Research, theory, and practice* (pp. 6–44). Newark, DE: International Reading Association.

Hayes, J. R. (2006). New directions in writing theory. In C. A. MacArthur, S. Graham, & J. Fitzgerald (Eds.), *Handbook of writing research* (pp. 28–40). New York: Guilford.

Healey, D., & Klinghammer, S. J. (2002). Constructing meaning with computers. *Tesol Journal, 11*(3), 3-3.

Hefzallah, I. M. (2004). *The new educational technologies and learning: Empowering teachers to teach and students to learn in the information age.* Charles C Thomas Publisher.

Heinze, A., & Procter, C. (2006). Online communication and information technology education. *Journal of Information Technology Education: Research,5*(1), 235-249.

Hicks, T. (2013). *Crafting digital writing*. Portsmouth, NH: Heinemann.

Higgins, S., Smith, H., Wall, K., & Miller, J. (2005). Interactive whiteboards: Boon or bandwagon? A critical review of the literature. *Journal of Computer Assisted Learning, 21*(2), 91-101.

Hodge, R. & Kress, G. (1998). Social semiotics. Cambridge: Polity Press.

Jaramillo, J. (2013). Chicana bloggers: Creating diversity online via participation. *Journal of Adolescent and Adult Literacy, 56(*5), 361-367.

Kanuka, H., & Anderson, T. (2007). Online social interchange, discord, and knowledge construction. *International Journal of E-Learning & Distance Education, 13*(1), 57-74.

Kennedy, K., & Archambault, L. (2012). Offering preservice teachers field experiences in K-12 online learning: A national survey of teacher education programs. *Journal of Teacher* Edu*cation, 63(*3), 185-200.

Kist, W. (2005). *New literacies in action: Teaching and learning in multiple media* (Vol. 75). New York, NY: Teachers College Press.

Kress, G. (2009). Multimodality: A social semiotic approach to contemporary communication. London: Routledge.

Kress, G., & Van Leeuwen, T. V. (2001). *Multimodal discourse: The modes and media of contemporary communication*. London: Bloomsbury Academic.

Labbo, L.D., & Reinking, D. (1999). Negotiating the multiple reali-ties of technology in literacy research and instruction. *Reading Research Quarterly, 34*(4), 478–492.

Lam, W. S. E. (2000). L2 literacy and the design of the self: A case study of a teenager writing on the Internet. *Tesol Quarterly, 34*(3), 457-482.

Lammers, J.C., Magnifico, A.M., & Curwood, J.S. (2014). Exploring tools, places, and ways of being: Audience matters for developing writers. In K.E. Pytash & R.E. Ferdig (Eds.), *Exploring technology for writing and writing instruction* (pp. 186-201). Hershey, PA: IGI Global.

Leach, J. M., Scarborough, H. S., & Rescorla, L. (2003). Late-emerging reading disabilities. *Journal of Educational Psychology, 95*(2), 211.

Leu, D. J., & Kinzer, C. K. (2000). The convergence of literacy instruction with networked technologies for information and communication. *Reading Research Quarterly, 35*(1), 108-127.

Leu, D. J., Kinzer, C. K., Coiro, J. L., & Cammack, D. W. (2004). Toward a theory of new literacies emerging from the Internet and other information and communication technologies. *Theoretical models and processes of reading, 5*(1), 1570-1613.

Leu, D., Reinking, D., Hutchison, A., McVerry, G., O'Byrne, I., & Zawilinski, L. (2009, May). *Internet reciprocal teaching (IRT): A research-based model for teaching the new literacies of online reading comprehension.* Symposium presented at the annual meeting of the International Reading Association, Minneapolis, MN.

Martyn, M. (2003). The hybrid online model: Good practice. *Educause Quarterly, 18-* 23.

Mason, R. (1994). *Using communications media in open and flexible learning*. New York, NY: Psychology Press.

McCarthey, S., Magnifico, A., Woodard, R. & Kline, S. (2013). Situating technology-facilitated feedback and revision: The case of Tom. In K.E. Pytash & R.E. Ferdig (Eds.), *Exploring technology for writing and writing instruction* (pp. 152-170). Hershey, PA: IGI Global.

McClenny, C. (2010). *A Disposition to write: Relationships with writing performance.* Electronic Theses, Treatises and Dissertations. Paper 2607.

McGrail, E. & Davis, A. (2011). The influence of classroom blogging on elementary student writing. Journal of Research in Childhood Education, 25(4), 415-437.

McGrail, E. & McGrail, J. (2013). Preparing young writers for invoking and addressing today's interactive digital audiences In K.E. Pytash & R.E. Ferdig (Eds.), Exploring technology for writing and writing instruction (pp. 186-201). Hershey, PA: IGI Global.

Means, B., Toyama, Y., Murphy, R., Bakia, M., & Jones, K. (2009). Evaluation of evidence-based practices in online learning: A meta-analysis and review of online learning studies. Washington D.C.: US Department of Education.

Metzger, M. (2007). Making sense of credibility on the Web: Models for evaluating online information and recommendations for future research. Journal of the American Society for Information Science and Technology, 53(13), 2078-2091.

Moore, M. G., & Kearsley, G. (2011). *Distance education: A systems view of online learning.* Stamford, CT: Cengage Learning.

Mosenthal, P., Barr, R., & Pearson, P. D. (Eds.), *The handbook of research on reading.* (Volume III, pp. 609-627). Mahwah , NJ : Lawrence Erlbaum Associates.

Newell, G., Beach, R., Smith, J., & VanDerHeide, J. (2011). Teaching and learning argumentative reading and writing: A review of research. *Reading Research Quarterly, 46*(3), 273-304. The New London Group. (1996). A Pedagogy of multiliteracies: Designing social futures. *Harvard Educational Review, 66*(1), 60-92.

Ng, K. C. (2007). Replacing face-to-face tutorials by synchronous online technologies: Challenges and pedagogical implications. *The International Review of Research in Open and Distance Learning, 8*(1). Available online: http://www.irrodl.org/index.php/irrodl/article/view/335/764

Nystrand, M., & Duffy, J. (2003). *Towards a rhetoric of everyday life: New directions in research on writing, text, and discourse*. Madison: University of Wisconsin Press.

O'Byrne, W. I. (2013). Online content construction: Empowering students as readers and writers of online information. In K. Pytash, & R. Ferdig (Eds.) *Exploring technology or writing and writing instruction* (pp. 276-297). Hershey, PA: Information Science.

Osguthorpe, R. T. & Graham, C. R. (2003). Blended learning environments: Definitions and-directions. Quarterly Review of Distance Education, 4(3), 227-233.

Palloff, R. M., & Pratt, K. (2002). *Lessons from the cyberspace classroom: The realities of online teaching.* Hoboken, NJ: John Wiley & Sons.

Piazza, C. & Siebert, C. (2008). Development and validation of a writing dispositions scale for elementary and middle school students. *Journal of Educational Research, 101*(5), 275-286.

Proctor, C.P., Dalton, B., & Grisham, D. (2007). Scaffolding English language learners and struggling readers in a multimedia hypertext environment with embedded strategy instruction and vocabulary support. *Journal of Literacy Research, 39*(1), 71-93.

Proctor, C.P., Dalton, D., Uccelli, P., Biancarosa, G., Mo, E., Snow, C.E., & Neugebauer, S. (2011). Improving comprehension online (ICON): Effects of deep vocabulary instruction with bilingual and monolingual fifth graders. *Reading and Writing: An Interdisciplinary Journal, 24*(5), 517-544.

RAND Reading Study Group. (2002). *Reading for understanding: Toward an R&D program in reading comprehension.* Santa Monica, CA: Author.

Reinking, D. (1997). Me and my hypertext: A multiple digression analysis of technology and literacy (sic). *The Reading Teacher, 50*, 626-643.

Riva, G. (2002). The sociocognitive psychology of computer-mediated communication: The present and future of technology-based interactions.*Cyberpsychology & behavior, 5*(6), 581-598.

Robinson, E., & Robinson, S. (2003). *What does it mean? Discourse, text, culture: An introduction.* Sydney: McGraw-Hill.

Rose, D. & Meyer, A. (2002). *Teaching every student in the digital age*. Alexandria, VA: Association for Supervision and Curriculum Development.

Smith, B. (2013). Beyond words: A review of research on adolescents and multimodal composition. *In Exploring Multimodal Composition and Digital Writing.* R.E. Ferdig & K.E. Pytash (Eds). Hershey, PA.: IGI Global.

Smolkin, L. B., & Donovan, C. A. (2001). The contexts of comprehension: The information book read aloud, comprehension acquisition, and comprehension instruction in a first-grade classroom. *Elementary School Journal, 102*, 97-122.

Sotillo, S. M. (2000). Discourse functions and syntactic complexity in synchronous and asynchronous communication. *Language Learning & Technology, 4*(1), 82-119.

Sylvester, R. & Greenidge, W. (2009). Digital storytelling: Extending the potential for struggling writers. *The Reading Teacher, 63*(4), 284-295.

Torres, M., & Mercado, M. (2006). The need for critical media literacy in teacher education core curricula. *Educational Studies, 39*(3), 260-282.

Van Leeuwen, C. & Gabriel, M. (2007). Beginning to write with word processing: Integrating writing process and technology in a primary classroom. Reading Teacher, 60(5), 420-429.

Vasudevan, L. & Reily, M. (2013). In the middle of something: Reflections on multimodal inquiry as artful bricolage. *Journal of Adolescent and Adult Literacy, 56*(6), 455-459.

Vygotsky, L. (1978). *Mind in society.* Cambridge, MA: Harvard University Press.

Wade, S. E., & Moje, E. B. (2000). The role of text in classroom learning. *Reading Online, 5(*4).

Warschauer, M. (1997). Computer-mediated collaborative learning: theory and practice. *The Modern Language Journal, 81*(4), 470-481.

Watson, J. (2007). *A national primer on K-12 online learning*. Washington, DC: National Council on Online Learning.

Watson, J., Murin, A., Vashaw, L., Gemin, B., & Rapp, C. (2013). *Keeping pace with K-12 online learning: An annual review of policy and practice* (research report). Mountain View, CA: Evergreen Education Group.

Weaver, C. A. I., & Kintsch, W. (1991). Expository text. In R. Barr, M. L. Kamil, P. B. Mosenthal & P. D. Pearson (Eds.), *Handbook of reading research volume II* (pp. 230-245). Mahwah, NJ: Lawrence Erlbaum Associates Inc.

West, K. (2008). Weblogs and literary response: Socially situated identities and hybrid social languages in English class blogs. Journal of Adolescent and Adult Literacy, 51(7), 588-598.

Witte, S. (2007). "That's online writing, not boring school writing": Writing with blogs andthe talkback project. *Journal of Adolescent and Adult Literacy, 51*(2), 92-96.

Zhao, Y., Pugh, K., Sheldon, S., & Byers, J. (2002). Conditions for classroom technology innovations. *Teachers College Record, 104*(3), 482–515.

Chapter 9

Research on Teaching Blended and Online Physical Education

David N. Daum, *University of Southern Indiana,* ddaum@usi.edu
Craig Buschner, *California State University at Chico,* cbuschner@csuchico.edu

Abstract

Physical education is one of the many school subjects (K-12) undergoing changes due to advances in digital technology. Online physical education (OLPE) faces the same issues as other content areas taught online such as academic honesty, learner readiness and motivation, student retention, technology issues, etc. However, OLPE has unique challenges such as the teaching and learning of motor skills (hopping, skipping, jumping, etc.), sport skills (throwing, catching, kicking, striking with bat, etc.), dance, and fitness. The purpose of this chapter is to examine what is known about current K-12 OLPE programs based upon how well these courses meet physical education content standards and guidelines. In addition, this chapter will synthesize and evaluate the limited research regarding OLPE, then outline suggestions for policy, practice, and future research. OLPE is an exciting, yet unproven, option as an alternative method of delivering physical education content at the secondary level.

Introduction

Online physical education (OLPE) is unique in the digital world because the subject matter, if taught well, should elicit a movement response from the learner. Because of this, some of the goals of physical education become extremely difficult to meet online even with readily available technology. At the surface, the term "online physical education" seems counterintuitive and even an oxymoron. How can a subject matter that is primarily about learning motor skills (hopping, skipping, jumping, etc.), sport skills (throwing, catching, kicking, striking with bat, etc.), dance, and fitness be taught online? That question and more will be will explored in this chapter.

We will summarize the limited research on K-12 blended physical education and OLPE but also make connections to the research completed with blended and online physical activity courses at the University level. To fully understand the research synthesis section of this chapter, it will require a contextual understanding of the recent evolution of OLPE. We will also discuss the implications for policy, practice, and research. This chapter will purposely omit the research on generic use of technology in face-to-face physical education courses such as exergaming (Wii Fitness, Dance Dance Revolution, etc.) as we wanted to differentiate between teaching physical education utilizing technology and teaching physical education content while utilizing distance education tools. We will end the chapter with recommendations for future research and conclusions based on the empirical evidence, of how, or if, OLPE might contribute to a student's overall education.

Initial awareness of K-12 OLPE came about with the release of the 2006 *Shape of the Nation* (SON) report (NASPE, 2006) which was co-authored by the American Heart Association (AHA) and the National Association for Sport and Physical Education (NASPE). This report provided a state-by-state outline of policies and practices regarding K-12 physical education. In this report, it was found that 12 states allowed physical education credits to be earned through OLPE courses. In subsequent reports the number of states that allowed physical education credits to be earned online rose to 22 in 2010 (NASPE, 2010) and 30 states by 2012 (NASPE, 2012). Surprisingly, only seven of the 12 (58%) states in 2006, 10 of the 22 (46%) states in 2010, and 17 of the 30 (57%) states in 2012, required those courses to be taught by state certified physical education teachers. It is important to note that during this six-year span, there were no data published regarding the prevalence of OLPE (at the state or district level), the number of teachers involved in OLPE, the number of students taking OLPE courses, nor detailed information about the qualification of those teaching this subject matter. More important, these early SON reports failed to mention curricular focus, pedagogical strategies, or evidence of student learning. It is noteworthy to mention that these status reports highlighted fully online courses and not blended physical education courses, thus it is impossible to speculate on the prevalence and quality of blended physical education in the United States.

Prior to these SON reports, the only evidence that OLPE existed were news articles that both praised and criticized this emerging technology for learning (Balona, 2003; Brooks, 2003; Cerabino, 2004; Gussow, 2002; Whritenour, Voss & Vogt, 2006) and an editorial in the *Journal of Physical Education, Recreation and Dance* (Buschner, 2006). In this editorial Buschner (2006) examined the potential advantages and disadvantages of OLPE. The advantages were: 1) students are motivated by technology, 2) benefits students who live in remote areas,

3) fits students' needs by using a personalized system of instruction (PSI), 4) it is convenient for students, parents, and administrators, and 5) it could be used as an elective once required coursework was complete. The disadvantages he listed were: 1) OLPE threatens face-to-face programs and teaching positions, 2) the counterintuitive message to students taking physical education online, 3) difficulty meeting state and national content standards for learning, 4) first generation OLPE courses do not satisfy the criteria for comprehensive physical education, and 5) data were unavailable to validate OLPE as a viable medium for learning.

In response to the apparent growth and development of K-12 OLPE programs across the country, NASPE put together a taskforce, which developed the *Initial Guidelines for Online Physical Education* (2007). Both authors of this chapter were part of the taskforce. After a thorough literature review, the initial guidelines document acknowledged that there were no empirical studies regarding K-12 OLPE. Due to this lack of research, it was recommended that K-12 OLPE proceed with a blended model as the "reasonable instructional alternative for this subject matter until further research is available" (NASPE, 2007, p. 3). It was the position of NASPE and physical education leaders that technology can be a valuable tool in enhancing teaching and learning in physical education, however, the technology needs to be carefully selected and used in a pedagogically sound manner (NASPE, 2009).

Subsequent editorials and viewpoints concerning best practices in K-12 OLPE were published in the physical education literature. Articles by Ransdell, Rice, Snelson and Decola (2008) and Mohnsen (2012a; 2012b) discussed solutions to some of the challenges outlined in Buschner's (2006) article such as using proctors to conduct fitness tests, journaling, videotaping of performance in physical activities, and virtual field trips. Regardless of what had been written about OLPE, most authors came to the same conclusion, more research is needed to validate K-12 OLPE and any new learning technology must maximize student learning (Buschner, 2006; Buschner, 2014; Mosier, 2012; Ransdell, et al., 2008; Rhea, 2011).

Like other school subjects, physical education leaders have published and promoted student learning standards for the past twenty years (NASPE, 1995; NASPE 2004; SHAPE 2014). The National Association for Sport and Physical Education (NASPE) was recently renamed The Society of Health and Physical Educators (SHAPE) America. It retains the same mission to enhance the teaching and learning of school-based physical education. While it is up to each state to determine their own content standards, many teachers, school districts, and states use or modify the national learning standards to fit their needs. Teaching and learning benchmarks are important for evaluating face-to-face, blended, or online physical education courses. After decades of debate, the agreed upon aim of school physical education "is to develop physically literate individuals who have the knowledge, skills and confidence to enjoy a lifetime of healthful physical activity" (SHAPE, 2014, p. 11). SHAPE (2014) defines the physically literate individual as someone who has learned the skills necessary to participate in a variety of physical activities, knows the implications and benefits of being physically active, participates regularly in physical activity, is physically fit, and values physical activity and its contribution to a healthy lifestyle. There are five national standards (SHAPE, 2014) relating to what the physically literate individual should be able to do. The physically literate individual:

1. demonstrates competency in a variety of motor skills and movement patterns;
2. applies knowledge of concepts, principles, strategies, and tactics related to movement and performance;
3. demonstrates the knowledge and skills to achieve and maintain a health-enhancing level of physical activity and fitness;
4. exhibits responsible personal and social behavior that respects self and others; and
5. recognizes the value of physical activity for health, enjoyment, challenge, self-expression, and/or social interaction.

The above national standards are accepted in the profession as the gold standard for K-12 student learning and the basis for planning and teaching in physical education. This introduction, to include a recent history, context, and the challenges regarding OLPE, is essential to understanding the empirical evidence that will follow.

Research Synthesis

As stated in the introduction, the literature regarding K-12 blended physical education and online physical education (OLPE) is very limited. The published research includes one peer-reviewed article regarding blended learning (Karp & Woods, 2003), three peer-reviewed research articles (Kane, 2004; Daum & Buschner, 2012; Mosier & Lynn, 2012), and three doctoral dissertations regarding fully online physical education courses (Daum, 2012; Futrell, 2009; Williams, 2013). In addition, there is a research article that investigated a college-level weight training course that used face-to-face, blended and online modes (McNamara, Swalm, Stearne, & Covassin, 2008). Table one summarizes background information on the literature regarding Blended and OLPE, which includes the participants, the purpose of the studies, and how data were collected. Based on the literature, we have organized this portion of the chapter by what is known about the physical activity levels and requirements of those who take K-12 OLPE, the characteristics of the learners and teachers involved in K-12 OLPE, and teacher educators' perceptions of K-12 OLPE.

Table 1: Summary of Research Completed on Blended and OLPE

Researchers	Participants	Purpose and Method
Karp and Woods (2003)	Nineteen secondary students enrolled in a hybrid physical education course and their teacher	The purpose of the study was to determine perceptions of students who were enrolled in a face-to-face secondary physical education class using online modules to teach health concepts. Data were collected by utilizing a student technology survey, various student assignments (knowledge tests, goal setting assignment, fitness paper, and nutrition analysis), and interviews with students and their teacher.
Kane (2004)	Thirty-eight secondary students enrolled in a hybrid physical education course and their teacher	The purpose of the study was to determine teacher and student perceptions of an 18-week online personal fitness course. Data sources were phone conversations, responses to assignments, informal online interviews, site visits, focus groups, student surveys, course evaluation, and faculty meetings.
McNamara, Swalm, Stearne, and Covassin (2008)	College students enrolled in a face-to-face (*n*=27), blended (*n*=25), or a fully online (*n*=27) section of a weight training course	The purpose of the study was to compare fitness and cognition outcomes of college students enrolled in a face-to-face, blended, and fully online weight training class. Each section of the 16-week course had the same curriculum and work out requirements. Pre and posttests were administered for knowledge and two weight lifting techniques; the squat and bench press.
Futrell (2009)	High School Students enrolled in an OLPE (*n*=24) or a face-to-face (*n*=36) physical education course.	The purpose of the study was to determine course satisfaction and fitness of secondary face-to-face physical education and OLPE students. End of course satisfaction survey and pretest and posttest physical fitness data (Fitnessgram) were collected on all participants.
Daum and Buschner (2012)	Thirty-two secondary OLPE teachers	The purpose of the study was to investigate course requirements, assessment techniques, curriculum focus, and teacher perceptions of secondary OLPE. An online survey was utilized.
Mosier and Lynn (2012)	19,000 secondary students enrolled in an Florida Virtual School (FLVS) online personal fitness course	The purpose of the study was to examine the Florida Virtual School OLPE courses in regard to student completion rates and characteristics of the OLPE courses. Student surveys were collected by an external non-profit group and FLVS, and then the data were analyzed by Mosier and Lynn. In addition, the online course shell was analyzed, and four FLVS employees were interviewed.
Daum (2012)	Twenty-five tenure-track Physical Education Teacher Educators (University Faculty)	The purpose of the study was to determine physical education teacher educators' perceptions and attitudes towards K-12 OLPE. In-depth open-ended interviews were conducted.
Williams (2013)	Four secondary OLPE teachers	The purpose of the study was to describe the daily practices of OLPE teachers, the educational theories that guide the teachers, how they enhance learning, and the teachers' perceptions of what students got out of their OLPE course. Completed a case study utilizing interviews, virtual classroom observations, field notes, e-mails, and researcher's journal.

Physical Activity Levels and Student Requirements

One of the major concerns of critics of K-12 OLPE is that students are not being physically active and engaged in motor learning (Buschner, 2006; Buschner, 2014; Mosier, 2012; NASPE, 2007; Ransdell, et al., 2008; Rhea, 2011). In addition, SHAPE America considers the development of motor skill competence as the highest priority of physical education because of its impact upon student engagement, intrinsic motivation, perceived competency, participation in physical activity, and sufficient levels of health-related fitness (SHAPE, 2014). Physical activity is inherently important to physical education and is what makes the subject matter different than any other in the K-12 curriculum. There were only two published studies (Daum & Buschner, 2012; McNamara, Swalm, Stearne, & Covassin, 2008) and one doctoral dissertation (Futrell, 2009) that addressed the physical activity levels and other requirements of students enrolled in K-12 OLPE.

Not much is known about the course requirements of students who take blended and OLPE. Theoretically, blended and online courses should at minimum meet the state educational standards, however, as outlined in the introduction, findings from the Shape of the Nation reports were not entirely encouraging. A variety of curricular models exist (Lund & Tannehill, 2010; Metzler, 2011) for face-to-face physical education, however, due to the novelty of OLPE, there are no established curricular models. Daum and Buschner (2012) found that 67% of the secondary OLPE teachers, in their study, followed the “Fitness for Life” curriculum, which is a secondary physical education textbook (Corbin & Le Masurier, 2014). The most common form of assessment in OLPE courses were physical activity logs for assessing fitness and/or activity levels and the use of tests or quizzes to assess cognitive learning (Daum & Buschner, 2012; Mosier & Lynn, 2012).

The primary focus of current OLPE curricula is cognitive, which indicates that a minimal level of the course focused on physical activity (Daum & Buschner, 2012). This was further confirmed when only 28% of OLPE courses in Daum and Buschner’s (2012) study met or exceeded the NASPE (2004) recommendation of 225 minutes of learning per week and 19% of the courses had no physical activity requirements. Sixty-six percent of the participants, however, required their students to be physically active on three or more days per week. Regardless, these numbers fall short of the 60 minutes of moderate to vigorous physical activity on all or most days per week recommended by the Center for Disease Control (CDC). A historically accepted professional axiom for teaching face-to-face physical education is to keep the majority of the class physically active, the majority of the allocated time. A major challenge for OLPE teachers is the verification of physically active learning especially if they are allowing their students to go to local gyms or other facilities to complete the physical activity component of their course (Daum & Buschner, 2012).

Blended and online courses have proven to improve cognitive knowledge with a college level weight training course (McNamara's et al. 2008), however, no studies to date have investigated cognitive gains in K-12 blended or OLPE courses. While cognitive gains cannot be discounted, the primary goal of physical education is the development of motor skills, which requires students to be physically active. There are no studies that have investigated blended or OLPE courses in regards to gains in motor skills, such as throwing, dance, or other sport skills; a couple have investigated strength and flexibility gains. Results of these studies are mixed, one study found that online college students enrolled in a blended and online weight training course did not significantly (p<.05) improve their bench press and squat scores while another study found that high school students enrolled in an OLPE course increased their flexibility and muscular strength but not cardiovascular fitness (McNamara's et al. 2008; Futrell, 2009). Because of the population size and differences, and alternative methods to assess strength, these two studies offer inconclusive evidence about the worth of a student increasing physical fitness while taking a blended or fully online course. These types of scattered results are consistent with the literature reviews, such as the No Significant Difference Phenomenon (Russell, 2001), that compared face-to-face and distance education and found no significant differences between delivery modes in regards to student learning.

Learner and Teacher Characteristics

It is important to know why students take online courses in addition to knowing if the online courses meet the needs of the students. In addition, it is also important that we know about the training and qualifications of teachers who teach OLPE and if online courses are meeting student needs. Four studies (Daum & Buschner, 2012, Mosier & Lynn 2012; Kane, 2004; Karp & Woods, 2003) and two dissertations (Futrell, 2009; Williams 2013) examined the characteristics of students and/or teachers involved with blended or fully online K-12 physical education courses.

Teacher characteristics. What OLPE teachers thought of K-12 OLPE are mixed, some OLPE teachers believe that because of the continued emergence of online education and technology in general that OLPE is necessary. However, equally, there are teachers of OLPE that believe that the current courses (including the course they taught) did not meet student learning standards nor had enough physical activity (Daum & Buschner, 2012). Half of the participants in Daum and Buschner's (2012) study, however, were indifferent and saw both the pros and cons of offering K-12 OLPE. While it was reported in the *Shape of the Nation* reports (NASPE, 2006; 2010; 2012) that some states did not require their online teachers to have teaching licenses, three seminal studies delimited their populations to those holding a physical education teaching license and experience teaching face-to-face physical education courses (Daum & Buschner, 2012; Mosier & Lynn, 2012; Williams 2013). Regardless of how OLPE teachers feel about the subject the reasons they chose to teach online was because of the time flexibility of being able to work when it was best for them. Specifically, having young children and being able to work part time as a non-traditional physical education teacher were mentioned (Williams, 2013).

It is important to note that participants in each of the aforementioned studies, who teach OLPE, are often philosophically divided in regards to their support of this online subject (Daum & Buschner, 2012). Those who supported this mode discussed knowing students on a one-to-one basis (Daum & Buschner, 2012; Williams, 2013), while the detractors had major concerns about the accuracy and accountability for student learning, primarily regarding keeping track of physical activity levels (Daum & Buschner, 2012; Kane, 2004, Williams, 2013). Buschner (2014) observed that teaching secondary OLPE was similar to walking a tightrope when considering the multitude of challenges to produce student learning.

Limited data are available regarding course structure, retention rates, and teacher requirements. Most of what is known of these factors is from Mosier and Lynn's (2012) study involving the Florida Virtual School's (FLVS) OLPE courses. The courses are self-paced which allowed students to complete the course as fast or as slow as they wanted, however, the longer it took a student to complete the course, the lower the final grade was likely to be. The teachers of OLPE at FLVS are required to be available 8:00 a.m. to 8:00 p.m., seven days a week and respond to e-mails within 24 hours (Mosier & Lynn, 2012). One-on-one communication, typically e-mail and/or phone calls, were not only the most common form of communication between OLPE teacher and OLPE student, but were the most effective (Daum & Buschner, 2012; Mosier & Lynn, 2012; Williams, 2013). Mosier and Lynn (2012), for example, found that it is a requirement of the FLVS online teachers to call their students at the beginning of the course and at least once a month during the course.

Learner characteristics. Karp and Woods (2003) published the first, and only, study dealing with a blended high school physical education class. For this small sample the results indicated that the students felt the online units/sections met their learning styles, allowed them to focus their learning, and allowed them to work at their own pace. However, both the teacher and students felt disconnected from their peers and each other. It is important to note that the blended course and the online delivery of the health information was a new experience for the instructor and could explain the feelings of being disconnected.

The first research regarding OLPE indicated similar results to Karp and Woods (2003); the students missed the face-to-face interaction with the teacher, but they enjoyed the flexibility of the course (Kane, 2004). Additional benefits besides schedule flexibility of OLPE include physical activity choice, and working out in an environment that is comfortable for the learner (Karp & Woods, 2003; Williams, 2013). Related to the benefit of being able to work out in an environment that is comfortable for the learner, teachers of OLPE reported that students found the learning to be relevant because of the choice of where and when to work out. In addition, teachers of OLPE noticed their students improved attitude and advocacy behaviors for health and wellness by sharing what they learned with their whole family (Williams, 2013). Related to the feeling of disconnectedness mentioned earlier, students of OLPE demonstrated they had a difficult time keeping track of their learning (Kane, 2004). Perhaps this feeling of disconnectedness could result in OLPE students being slightly less or as satisfied with their course experiences as the face-to-face students (Futrell, 2009). It is easy to wonder how many of the issues the teacher and students faced in Karp and Woods (2003) and Kane's (2004) studies were due to the technology of the time, however, these studies did provide an initial view into what blended and OLPE looked like.

Teacher Educators Perceptions

K-12 OLPE could be described as the "elephant in the room" as the physical education profession appears unwilling to examine its merits (Kooiman, 2014). As outlined in the introduction, online education is well established in the United States education system, and compels teacher educators to catch up with school districts using this delivery model. There has been only one dissertation (Daum, 2012) that has investigated physical education teacher educators perceptions of K-12 OLPE and how, or if it can, meet the learning standards for physical education. University faculty believe there is a greater push from their administration to offer more University courses online thus requiring more faculty to teach online (Daum, 2012). While the extent of faculty training is unknown, Daum, 2012) did find that faculty are receiving some training in regards to online education. This training, or lack thereof, with online pedagogies likely influenced the response of these educators.

Despite the apparent growth of online education across the United States, the majority of the Physical Education Teacher Education (PETE) professoriate had minimal knowledge of K-12

OLPE existing in their state (Daum (2012). PETE faculty, however, did know that OLPE existed but viewed it as being available primarily for students from rural areas or those who were home schooled. Regardless of this lack of knowledge, twenty of the twenty-five participants in Daum's (2012) study felt that, for better or worse, K-12 OLPE was likely part of physical education's future. Conversely, five participants believed it was a negative trend and detrimental to the profession. It is important to note that Daum (2012) only asked questions regarding fully online courses and not blended learning.

When revisiting the agreed upon aim of physical education and the national standards, PETE faculty were almost unanimous in their view that elementary OLPE was developmentally inappropriate. These experts know and believe that motor skill learning requires face-to-face contact, and that most children lack the understanding, motivation, and self-direction for efficient psychomotor learning. Regarding middle school OLPE, the PETE professoriate were split; some felt it was not appropriate because of the wide range of skills and abilities in middle school learners, while others felt there are some middle school students who would be able to handle the responsibility. Likewise, participants were nearly unanimous in being supportive of high school OLPE (Daum, 2012).

While the participants in Daum's (2012) study were lacking knowledge of model K-12 OLPE programs, they were experts in physical education and spoke to how, or if, K-12 OLPE could or could not meet the SHAPE 2014 content standards for physical education. The discussion of physical education standards focused on two areas, motor skill competency (SHAPE Standard 1) and cognition (SHAPE Standards 2 and 3). Motor skill competency is a major concern of physical educators and was a major concern of the PETE faculty in Daum's (2012) study. In the online environment, activity logs could be used to track physical activity as suggested by Ransdell et al. (2008), however, the participants questioned the ability to teach motor skills and be able to provide timely feedback. One of the participants stated, "You can go back and do video analysis and look over the skill, but there is something to being in the moment and giving someone feedback when they are actually producing a movement (Brian, p. 48)."

The majority of participants in Daum's (2012) study felt that online education and K-12 OLPE could thrive if the focus was cognitive learning. They considered this a natural fit; however, there were a few participants' who questioned the ability of online teachers to assess student application of tactical knowledge (SHAPE Standard 2) in sport and game play. The remaining standards were fairly equally split between those who felt an OLPE teacher could or couldn't assess them through the online medium. One participant felt that the degree to which the standards could be met was only limited by the creative thinking of the teacher and the design of the course, while on the other hand some participants felt the lack of social interaction and feedback for motor skills were an insurmountable barrier. Regardless of their differing beliefs, most PETE faculty believed that future teachers needed to receive training on how to use online technology (Daum, 2012). The initial studies on blended and online learning in physical education can be considered first steps for understanding the magnitude of questions and challenges that warrant attention. However, the eight aforementioned studies are sparse and disconnected. Nevertheless, this research synthesis provides a starting point for clarifying a common research agenda. It is imperative that the physical education research community accepts the challenge to thoroughly examine the merits of K-12 blended and OLPE. This will require more sophisticated research designs and a team of career researchers who establish needed lines of inquiry. Concomitantly, the creation of valid and reliable instruments (and replication studies) will help better assess the worth of OLPE at the secondary level.

Implications for Policy and Practice

Policies that will drive blended and OLPE in our nation's schools will come from six primary groups: school administrators, physical education teachers, teacher education programs, professional organizations (ex. SHAPE America), parents, and students. All educational innovations are fraught with economic, political, ethical, social, and pedagogical challenges. A viable blended or OLPE delivery model will necessitate communication and consensus among the aforementioned groups. The reasons states and/or school districts may implement a blended or OLPE program will vary based upon local values and needs. This variation will make reaching a consensus about best practices difficult.

We concur with the *Initial Guidelines for Online Physical Education* (NASPE, 2007) and encourage revision of this important document for physical education teachers. This forward thinking position paper recommended blended physical education courses until additional research verifies OLPE. Students and teachers would likely benefit from a blended model of physical education (Futrell, 2009; Karp & Woods 2003); however, recent research findings indicate that OLPE can be worthy as a fully online option as long as it is designed to be interactive and meet educational standards (Mosier & Lynn, 2012; Williams, 2013). The obvious benefit of the blended model would be that the face-to-face time would address some of the criticism of OLPE regarding minimal student socialization and motor skill learning. On the other hand, an issue with the blended model is that it may not be feasible for all students, especially if the student is across the state, country, or world. The concept of the blended model also goes against the reason that some students take online courses, for schedule flexibility, to be able to learn when they want to, and perhaps be able to exercise on their own without pressure from peers.

Another perplexing problem for physical education professionals is the close connection between a student's screen time and lack of physical activity. One-third of US youth have been found to be overweight or obese (CDC, 2013). The highly regarded Kaiser Foundation Study (2010) found that youth, ages 8-18, average 7.5 hours "of media per day" often multitasking). Screens include TV, video games, music, movies, reading, social media, the panoply of websites and apps, and online learning in a variety of educational related areas. There is no doubt that a backlash against screen time has surfaced in our culture. A Massachusetts Institute of Technology (MIT) scholar Sherry Turkle (2011), an early advocate of the Internet, now questions the value of communication technologies and the effects of social media (both positive and negative) on child development. Not surprisingly, the American Academy of Pediatrics recommends no more than two hours of entertainment screen time per day for the appropriate development of children and adolescents (AAP, 2013). This influential group argues that media can supplant important childhood activities such as exercising or playing with friends. Youth who spend more time with media earn lower grades and possess lower levels of personal contentment (Kaiser, 2010). Our view is that all educators and parents must examine the impact and role of screen time for children and youth in the 21st Century. It may be that school physical education would be the school subject that should minimize screen time so that real time motor skill activity, socialization, and physical activity becomes an important habit and a respite from the digital world. In short, youth need to move more and sit less.

Our suggestions for OLPE policy and practice, based on limited evidence, include many of the guidelines and recommendations by NASPE (2007; 2012), the National Education Association (NEA, 2002), and the International Association for K-12 Online Learning (iNACOL, 2011). These include:

Implications for Policy and Administrators

- Policy should set minimum expectations for blended and OLPE courses to include physical activity. For example, to receive credit for secondary physical education, blended and OLPE students must verify they were physically active at least 225 minutes a week (50 minutes per day), preferably physical activity that was moderate to vigorous in intensity.
- Policy should set minimum education standards for blended and OLPE to ensure

student achievement in regards to motor, cognitive, and social learning. Policy should delineate what needs to be included in a blended and OLPE course to meet educational standards to satisfy graduation credits.

- Policy should define the type or amount of online learning that is acceptable for each grade level (elementary, middle and high school); it is our recommendation that OLPE not be available for elementary-aged children, limited at the middle school level, and an option at the high school level.
- Policy should create a teaching licensure track or certificate for blended and online learning.
- Policy should ensure that blended and online learning will be modified to meet the needs of all students, including those with disabilities.
- Administrators need to ensure that quality blended and OLPE is delivered by certified/licensed physical education teachers and ensure that those teachers have received adequate preparation to teach online.
- Administrators need to assist their blended and online teachers by offering in-service training or access to training that covers educational technology, online pedagogy, online curriculum design, and best practices.
- Administrators need to ensure blended and OLPE courses are updated frequently and that appropriate technologies are being used.

Implications for Teacher Preparation

- Teacher educators need to model appropriate use of technology in their current courses by including online pedagogies to prepare future teachers for the possibility of teaching online.
- Teacher educators should develop partnerships with online schools to generate internship experiences for teacher candidates, especially where blended and OLPE is prevalent.
- Teacher educators need to take advantage of in-service opportunities to learn about online pedagogies so they have a better understanding of online education, its possibilities, and its pitfalls.

Implications for Students, Parents, and Teachers

- Students should be screened to determine their readiness before taking any course online including OLPE. In addition to some sort of online academic skills readiness test, screening could include passing a face-to-face physical education course, fitness test, and/or a motor skills test.

- Parents need to assist the blended and online teacher by monitoring their child's learning. They can start by verifying daily physical activity participation and work carefully with the online physical educator to maximize learning.
- Teachers need to meet frequently (virtually or otherwise) with the parent(s) and student about course structure and the assessment of learning.
- Teachers of blended and OLPE need to ensure that there are assessments for motor, cognitive, and social learning to meet the SHAPE (2014) and/or state learning standards. These assessments should include technology that their students have access to and contribute to quality learning.
- Teachers need to ensure the developmentally appropriateness of their course and ensure that students enrolled in their courses are ready for blended and online learning.
- Teachers should design short-term and semester-length courses around key formative and summative assessments. Profound learning can occur if students are provided with extended contact to course materials. In addition teachers need to ensure their courses meet and/or exceed quality online standards created by NEA the (2002), NASPE (2007), and/or iNACOL (2011).

Some may view online learning as a panacea for education's (and physical education's) ills. It could also be seen as a threat to the brick and mortar school, teachers' jobs, and as a cost saving and convenience issue. Some educators believe that face-to-face teaching and learning should not be sacrificed without sufficient evidence to prove the worth of online education. Nevertheless, physical education teachers and their professors must spend the time and effort to evaluate the merits of OLPE. Unfortunately, research lags behind educational practice. "Good practices" will not occur without close examination of the blended and OLPE teaching and learning process. We believe, optimistically, that parents and students will support quality physical education, regardless of delivery mode, as long as it is meaningful in the lives of students. Lastly, we do not see federal legislation driving blended and OLPE in the immediate future, or other online subjects for that matter. It is likely that online learning will remain a state and local issue based on recent prevalence studies (Watson, Murin, Vashaw, Gemin, & Rapp, 2012).

Implications for Research

The research regarding K-12 blended and OLPE is sparse, and somewhat disconnected, now generating numerous questions for study. Four of the studies included teachers of secondary OLPE (Daum & Buschner, 2012; Kane, 2004; Mosier & Lynn, 2012; Williams, 2013), three included

data collected from fully online students (Futrell, 2009; Kane, 2004; Mosier & Lynn 2012), one included physical education teacher educators (Daum 2012), one included college students (McNamara, et al., 2008), and one included a health blended model (Karp & Woods, 2003).
A reason for the lack of research could be due to the controversial nature of this subject matter. Educational change is met with skepticism and resistance, and perhaps this is compounded by the fact OLPE seems like an oxymoron. Another reason for the lack of research could be that the United States is in the midst of a major health crisis in which physical education is seen as part of the solution. Because of this, valuable research resources have been put into studying solutions to childhood obesity or justifying physical education's status in the schools. It is apparent that more research is needed on the students who take these courses, the teachers who teach these courses, and the courses themselves.

Research is needed to determine the physical activity levels of students who take blended and OLPE compared to students enrolled in face-to-face programs. It should also be asked what types of physical activity these students are completing. Also of interest would be what technology skills these students have or have access to. Perhaps the most important question related to students, is why students are taking physical education online? Is it due to convenience, bullying in the face-to-face classroom, freedom of choice, a pathway for students with lower academic success, etc.? In addition, what are the characteristics of students who are taking blended and OLPE (race, ethnicity, socio-economic status, high skilled, low skilled, at-risk, gender, students with disabilities, etc.)? These types of comparative studies should not be framed to disprove or disparage blended and online learning, but to assist in making them better. We believe blended and online learning are, and will be, a part of the educational landscape for some time to come. Our hope is that the answers to those questions have the potential to impact how teachers of physical education and professors in physical education view this delivery model and help enhance them. Similarly, what types of physical education content are taught in blended and OLPE programs now, and what types of content should be taught? An important question by Mosier (2010) ponders how blended and OLPE programs impact parent involvement in student learning to include the successful completion of a blended or OLPE course.

Research also needs to investigate the teachers who teach K-12 blended and OLPE. This area needs research for teacher educators to know what pedagogical skills and tools are required for the online job. In addition, the daily practices and schedule of a blended and OLPE teacher should be investigated; this could include physical activity levels, full-time vs. part-time employment, career satisfaction, socialization, class sizes/student load, planning time, technological acumen, coping mechanisms, and more. Research questions should also be asked in regards to teachers' dispositions and perceptions regarding content (what should be taught) and content delivery (blended or fully online).

Curriculum in K-12 OLPE courses needs to be researched. A question many physical educators and teacher educators want to know is if blended and OLPE can or does meet state and/or the SHAPE (2014) physical education standards? Research should be conducted to develop a valid and reliable fitness test students can self-administer in addition to other valid and reliable assessments for the online student. There is a need for authentic ways to assess the psychomotor, cognitive, and affective domains. Studies should also address curricular design (self-paced vs. structured) and even the types of curriculum or curricular models that would be best suited for blended and OLPE. Another consideration is that research needs to be conducted on developmentally appropriate ways to modify courses to fit the needs of students with disabilities.

It is difficult to discuss K-12 schooling without addressing teacher education. To help teacher educators prepare the next generation of physical education teachers, they need to know essential 21st Century technological skills and tools required for teachers on the front line of education. Further, researchers should investigate the preparedness of the professoriate, including online pedagogy and strategies for teaching online and the use of technology to facilitate student learning. It is highly unlikely there will be major changes within teacher education unless the accreditation bodies include standards related to online pedagogy. Even then, the resistance to change might overpower the desire to change. Teacher educators must realize that many school districts now expect teacher competency with online delivery models. Some school districts may not offer interviews to teachers who are technologically deficient. Teacher educators are part of the problem and solution for the improvement of school physical education using all forms of technology.

Our suggestions for future research are offered to stimulate thought and action. Tomorrow's blended and OLPE research must address the most important questions that will help lead physical education teachers to employ best practices and ultimately student learning. We believe limited research efforts should compare face-to-face physical education to blended physical education and OLPE. It is not a matter of validating blended and OLPE; rather, it is a matter of ensuring that blended and OLPE teachers and curricula meet indicators of quality established by the profession.

Conclusion

The question should not be if K-12 blended and OLPE should exist, the question should be how to ensure K-12 blended and OLPE meets the needs of the stakeholders, meets educational learning standards, and promotes lifelong physical activity. Physical education is physical by nature, and OLPE seems counterintuitive. While it can be argued that blended and OLPE can address fitness (Futrell, 2009; McNamara et al., 2008), and it does show promise in being able to meet or exceed the physical education content standards (Daum & Buschner 2012; Futrell, 2009; Mosier & Lynn, 2012), it has apparent weaknesses in being able to enhance motor skill development. Current programmatic weaknesses have the potential to be remedied, in due time, by thoughtful research.

With the technology readily available, the development of basic motor skills (hopping, skipping, jumping, etc.) and sport skills (throwing, catching, kicking, striking with bat, etc.) is almost impossible in a purely online course. While it is plausible to video record a student's motor skill (ex. dribbling a ball), the question of immediate teacher feedback is lacking with OLPE. By the time the feedback is received the child could have incorrectly practiced the skill, thus hindering, versus enhancing, long-term development of the child (Silverman, 1985). It is imperative that feedback be delivered immediately for learners to progress during motor skill instruction (Goodway, Crowe, & Ward, 2003). A possible solution would be to have students view a video of a motor skill being performed correctly (ex. tennis forehand), then compare against a self-made video of the same skill. Online communication between student and teacher might yield improved performance, but these tools and strategies must be studied. Thinking from a developmental perspective we know the accuracy of a student's ability to self-assess is linear with age (Feltz & Brown, 1984; Harter, 1998; Horn & Weiss, 1991). This perspective tells us that most children and youth lack the ability to self-assess thus furthering the argument against OLPE in younger grades. Another possibility is for a teacher to watch a child perform motor skills live via the Web, however, the legal implications (ex. child safety) and logistical implications (scheduling, equipment, etc.) currently seem insurmountable. Nevertheless, creative ways to help students learn using blended and OLPE may be part of a future research program. Funds will need to be allocated, by interested groups, so that these and other important questions can be addressed.

This chapter offered a blended and OLPE snapshot, based on the research evidence and best practices, of what we currently know and where we need to go. It is our belief based on the limited data outlined above, that blended and OLPE should only be available for secondary students after they have demonstrated they have the motor and social skills to be a successful online student. Because the primary goal of physical education is to develop motor skills (SHAPE, 2014), and the issues related to assessment of motor skills online, blended and OLPE is not prudent at this juncture for elementary aged children. Until research can address the feasibility of teaching motor skills online, including best practices, blended and OLPE should be primarily a fitness-focused curriculum. Teachers of blended and OLPE should incorporate physical activity monitoring devices such as pedometers, heart rate monitors, and other movement trackers as better ways to ensure that physical activity is taking place rather than activity logs. Administrators, parents, and teachers who value educating the whole child and student learning cannot afford blended and OLPE to become a physical activity wasteland. Current and future blended and OLPE courses must ensure student learning and influence the next generation of movers to become physically active and healthy for a lifetime.

References

American Academy of Pediatrics (2013). Policy statement: Children, adolescents, and the media. *Pediatrics, 132,* 958-961.

Balona, D. M. (2003, October 6th). Virtual gym classes click with busy high schoolers; as online physical education classes grow, some wonder if they feed teens' sedentary habits. *Orlando Sentinel*. Retrieved from http://www.proquest.com

Brooks, S. (2003, August 12th). Virtual PE makes a splash; online fitness courses let the kids sweat at home while earning high school credit. *USA Today*. Retrieved from http://www.proquest.com

Buschner, C. (2006). Online physical education: Wires and lights in a box. *The Journal of Physical Education, Recreation and Dance*, *77*, 3-5 and 8.

Buschner, C. (2014). *Secondary online physical education: Walking a tightrope*. Retrieved from http://www.pelinks4u.org/articles/buschner2_2014.htm

Carnegie Foundation for the Advancement of Teaching (2011). *A Carnegie classification of institutions of higher education*. Menlo Park, CA: Author.

Center for Disease Control and Prevention (2013). *Overweight and obesity*. Retrieved from http://cdc.gov/obesity/childhood/problem.html

Cerabino, F. (2004, January 7th). Online PE class: Where students find cheating virtually no sweat. *Palm Beach Post*. http://www.proquest.com

Corbin, C. B., & Le Masurier, G. C. (2014). *Fitness for life*. Champaign, IL: Human Kinetics.

Daum, D. N. (2012). *Physical education teacher educators attitudes toward and understanding* *of online physical education* (Unpublished doctoral dissertation). University of Illinois at Urbana-Champaign, Champaign, IL.

Daum, D. N., & Buschner, C. (2012).The status of secondary online physical education in the United States. *Journal of Teaching in Physical Education, 31,* 86-100.

Feltz, D., & Brown, E. (1984). Perceived competence in soccer skills among young soccer players. *Journal of Sport Psychology, 6*, 385-394.

Futrell, J. (2009). *A comparative study of virtual high school instruction versus traditional instruction of high school student outcomes and attitudes in physical education* (doctoral dissertation). Retrieved from ProQuest. (3360073).

Goodway, J. D., Crowe, H., & Ward, P. (2003). Effects of motor skill instruction on fundamental motor skill development, *Adapted Physical Activity Quarterly*, *20*, 298-314.

Gussow, J. (2002, August, 5th). Online PE is more than mouse clicks. *St. Petersburg Times*. Retrieved from http://www.proquest.com

Harter, S. (1985). *Manual for the self-perception profile for children*, Denver, CO: University of Denver

Horn, T. S., & Weiss, M.R. (1991). A developmental analysis of children's self-ability judgments in the physical domain. *Pediatric Exercise Science, 3*, 310-326.

International Association for K-12 Online Learning (2011). *National standards for quality online courses*. Vienna, VA: Author.

Kaiser Family Foundation. (2010). Generation M2: Media in the lives of 8-18 year olds. Menlo Park, CA: The Henry J. Kaiser Family Foundation.

Kane, J. J. (2004). The dog ate my disk: Teacher and student perspectives of an online personal fitness course. *The Florida Alliance for Health, Physical Education, Recreation and Dance Journal, 2,* 8-12.

Karp, G. G., & Woods, M. L. (2003). Wellness nutrifit online learning in physical education for high school students, 2, Retrieved from http://www.ncolr.org/jiol/issues/pdf/2.2.3.pdf

Kooiman, B. (2014). *Online physical education: The elephant in the room*. Retrieved from http://www.pelinks4u.org/articles/brian_kooiman4_2014.htm

Lund, J. & Tannehill, D. (2010). Standards-based physical education curriculum development (2nd ed.) Sudbury, MA: Jones & Bartlett.

McNamara, J. M., Swalm, R. L., Stearne, D. J., & Covassin, T. M. (2008). Online weight training, *Journal of Strength and Conditioning Research, 22,* 1164-1168.

Metzler, M. (2011). *Instructional models for physical education* (3rd ed.), Scottsdale, Arizona: Holcomb Hathaway.

Mohnsen, B. (2012a). Implementing online physical education, *The Journal of Physical Educa-*

tion, Recreation and Dance, *83*, 42-47.

Mohnsen, B. (2012b). *Using technology in physical education*. Big Bear Lake, CA: Bonnie's Fitware, Inc.

Mosier, B. (2010). A descriptive study of Florida virtual school's physical education students: An initial exploration. (Unpublished doctoral dissertation). The Florida State University, Tallahassee, FL.

Mosier, B. (2012). Virtual physical education: A call for action. *The Journal of Physical Education, Recreation and Dance*, *83*, 6-7 and 10.

Mosier, B. & Lynn, S. (2012). An initial exploration of a virtual personal fitness course. The Online Journal of Distance Learning Administration, 15(3), Retrieved from http://www.westga.edu/~distance/ojdla/fall153/mosier_lynn153.html

National Association for Sport and Physical Education. (1995). *Moving into the future: National standards for physical education.* Reston, VA: Author.

National Association for Sport and Physical Education. (2004). *Moving into the future: National standards for physical education (2nd ed.).* Reston, VA: Author.

National Association for Sport and Physical Education. (2006). *Shape of the nation: Status of physical education in the USA.* Reston, VA: Author.

National Association for Sport and Physical Education. (2007). *Initial guidelines for online physical education,* [Position Paper]. Reston, VA: Author.

National Association for Sport and Physical Education. (2009). *Appropriate use of instructional technology in phyiscal education* [Position statementj]. Reston, VA: Author.

National Association for Sport and Physical Education. (2010). *Shape of the nation: Status of physical education in the USA.* Reston, VA: Author.

National Association for Sport and Physical Education. (2012). *Shape of the nation: Status of physical education in the USA.* Reston, VA: Author.

National Education Association (2002). *Guide to online high school courses*. Washinton, DC: Author.

Ransdell, L. B., Rice, K., Snelson, C., & Decola, J. (2009). Online health-related fitness courses: A wolf in sheep's clothing or a solution to some common problems? *The Journal of Physical Education, Recreation and Dance*, 79, 45-52.

Rhea, D. J. (2011). Virtual Physical Education in the K-12 Setting. *The Journal of Physical Education, Recreation and Dance*, *82*, 5-6 and 50.

Russell, T. (2001). *The no significance difference phenomenon*, Availible from: https://www.idecc.org/content.cfm?page=resources

Silverman, S. (1985). Relationship of engagement and practive trials to student achievement, *Journal of Teaching in Physical Education, 5*, 13-21.

Society of Health and Physical Educators. (2014). *National Standards & Grade-Level Outcomes for K-12 Physical Education*. Champaign, IL: Human Kinetics.

Turkle, S. (2011). *Alone together; Why we expect more from technology and less from each other*. New York, NY: Basic Books.

Watson, J. F., Murin, A., Vashaw, L., Gemin B., & Rapp, C. (2012). *Keeping pace with K-12 online learning: An annual review of policy and practice.* Retrieved from Evergreen Education Group Website: http://www.kpk12.com

Williams, L. (2013). *A case study of virtual physical education teachers' experiences in and perspectives of online teaching* (Unpublished doctoral dissertation). University of South Florida, Tampa, FL.

Whritenour, C., Voss, J., & Vogt, C. (2006, August 23rd). Students take gym online; no really: it might sound like an oxymoron, but the students who take physical education on the web say it really works *The Star Tribune*. http://www.proquest.com

IV.
Research on Teaching

What's this section about? K-12 blended and online programs do not replace the need for having a highly qualified teacher. Indeed, research has provided evidence that the role of the teacher is still critical in teaching and learning in these environments. However, research has also suggested the role of the teacher changes in these settings. Teachers need to be prepared to succeed and that preparation involves skillsets that overlap and are different to how they are trained to engage students in traditional settings. The chapters in this section address what we know about preparing teachers at both the preservice and inservice levels.

What's in this section? The importance of preservice teacher education in K-12 online and blended learning environments is not a new concept, yet Archambault and Kennedy argue that the teacher education programs have been slow to act on modifying their traditional-based programs to teach their candidates what it is like to be an online teacher. Despite the slow reaction from the majority of teacher education programs, some teacher education programs are forging the way and making great advances in this area as to how to prepare their teachers for these very unique learning environments.

Dawson and Dana suggest we learn from what has taken place in professional development (PD) research in traditional setting in order to inform what occurs in teacher PD in online and blended learning environments. They emphasize the need for K-12 online and blended learning programs to partner with university scholars in order to study the nuances of this very important topic. Dawson and Dana also explore teacher mentoring in K-12 online and blended learning programs; due to the scant research that exists, they suggest studying those mentoring programs that do exist to develop a framework for categorizing the varying types of models. There is also a need to look at the differences and similarities between what happens in mentoring models in traditional and online learning environments.

What's missing from this section? Future iterations of this book will provide chapters that continue to lay a framework for understanding the best preparation of teachers for instruction in K-12 online and blended environments. There are opportunities for new authors to add to this Handbook by writing about teacher professional development at multiple levels, differences in preparation for online vs. blended environments, and unique variations in the preparation of teachers based on the content area of instruction. Future chapters will also explore nuances of preparation that will occur with the development and implementation of innovative tools and technologies.

Chapter 10

Teacher Preparation for K-12 Online and Blended Learning

Leanna Archambault, *Arizona State University, leanna.archambault@asu.edu*
Kathryn Kennedy, *Michigan Virtual University, kkennedy@mivu.org*

Abstract

The field of K-12 education is constantly evolving with new learning models, especially those featuring online and blended learning options. With the emergence of these learning environments, teacher education programs are posed as an ideal place for preservice and inservice teachers to gain knowledge of teaching in online and blended settings. This chapter reviews the state of the field as it pertains to the preparation of preservice teachers for K-12 online and blended learning. It also shares ideas for future areas of research as well as implications for policy and practice.

Introduction

Considering the rapid rate at which society is changing and evolving, particularly as a result of the influence of the advancement in technology, emerging teachers today will live and work in a drastically different learning environment. As our society and schools become increasingly connected, demands on teachers and the many roles they are asked to fill continue to expand. Unfortunately, many teacher education programs are not adequately preparing teachers for the jobs that they will fill, particularly those in K-12 online educational settings (Archambault, 2011).

Responsible for a new shift in schooling, K-12 online education is a disruptive force that is on the brink of an exponential growth pattern (Miller & Ribble, 2010). The need for highly-qualified, classroom teachers is essential in all settings, but in the modern era, these teachers need to be prepared to meet the challenges of interacting and engaging students that are separated from them in space and/or time (Charania, 2010). To be effective, increasingly, teachers must be able to (a) convey knowledge with limited face-to-face contact, (b) design and develop course content in a technology-based environment, (c) deliver content in a way that will engage students, and (d) use assessment measures to assure that students master content. Unfortunately, however, there is a significant disconnect between the growing expectations for online education and the training of teachers expected to teach in this uniquely different environment. While some form of online learning is now available in every state (Watson, Murin, Vashaw, Gemin, & Rapp, 2011), only a small minority of current K-12 online teachers have received formal training on how to teach online during the course of their teacher education program (Archambault, 2011; Dawley, Rice, & Hinks, 2010).

To a large extent, the new expectation of a successful and effective educator in the 21st century will be one who can blend together the best technology-based resources with engaging pedagogical strategies in both online as well as face-to-face settings. To address this issue, we must design curricula and field experiences to prepare teachers with skills, strategies, and dispositions so that they are able to create independent learners who can collaborate, problem-solve, and teach themselves using all the resources that are and will be available to them (Lankshear & Knobel, 2007; Leu, Kinzer, Coiro, & Cammack, 2004). Teacher education programs must adapt existing practices in order to produce the next generation of effective teachers. This chapter presents an overview of relevant theoretical themes and existing research that influence our current understanding about the types of experiences needed for effective teacher preparation for online and blended environments. Stemming from this research, it suggests relevant implications for policy and practice and explores areas for future research.

Theoretical Framework

In order to gain a better understanding of what K-12 online teachers need to know along with the skill sets they need in order to be effective, an examination of relevant theoretical perspectives is helpful. Two specific frameworks, technological pedagogical content knowledge (TPACK) and situated cognition, provide guidance when exploring knowledge and skills pertaining to online teaching. TPACK involves an understanding of the complexity of relationships among students, teachers, content, technologies, practices, and tools (Mishra & Koehler, 2005). In examining how teachers should be prepared to teach in online and blended environments, TPACK articulates the transformation of the three major components needed to ensure quality teaching: technological knowledge, pedagogical knowledge, and knowledge specific to one's content area. Using the TPACK framework to focus on online and blended environments specifically, emphasis is centered on the technological aspects that impact the extent to which technology facilitates student learning. Teachers need to be prepared to implement teaching strategies that adapt curriculum to an online environment. While the principles of effective teaching transcend the educational environment, the methods of implementation are different. Online teachers need to learn how to encourage student interaction, how to manage the multiple roles they will play in an online environment, and how to assess student learning in an online setting. These skills, together with the principles of instructional design, including sufficiently knowing a particular content to be able to use adopted technology to develop and offer quality online teaching, are at the crux of what the TPACK framework aims to convey. The question then becomes how to train teachers to acquire and translate these skills in an online environment.

According to the framework of situated cognition, value is placed on practical, hands-on experience as a primary mechanism of learning. Being in an authentic teaching environment allows preservice teachers to apply their technological pedagogical content knowledge in a real-world context. This is accomplished through the cognitive apprenticeship, an essential and central element of situated cognition that "supports learning a domain by enabling students to acquire, develop, and use cognitive tools in authentic domain activity" (Brown, Collins & Duguid, 1989, p. 39). During the cognitive apprenticeship, preservice teachers directly observe the classroom, emulate and model the practice of their mentor teacher, and then reflect on their observations and teaching. Mentor teachers are able to provide direct feedback including addressing any related misconceptions with the goal of making their expert tacit knowledge explicit, modeling effective teaching strategies, and providing scaffolded support during instruction (Collins, Brown & Newman, 1989). This apprenticeship is essential for preservice teachers to be able to translate what they learned in their teacher education programs to their future classrooms (Moore, 2003).

In teacher education, the cognitive apprenticeship takes place during a field experience component, which has long been a central and vital part of preparing teachers (Aiken & Day, 1999; Buck, Morsink, Griffin, Hines, & Lenk, 1992; Harlin, 1999; Joyce, Yarger, Howey, Harbeck, & Kluwin, 1977; Wiggins & Follo, 1999). This is because learning to teach requires a contextualized, authentic setting with the participant engaged in direct interaction and reflection within the environment (Brown, Collins & Duguid, 1989). In the 1970s, field experiences were deemed essential and, as a result, were mandated by the U.S. state departments of education as part of the teaching certification process (Moore, 1979). The field experience has become a key component of teacher education programs across the country with programs, such as Arizona State University's iTeach program, experiencing success with extending it from one semester to an entire school year.

While field experiences are considered to be a cornerstone of traditional teacher education programs, the authentic learning environment to prepare a teacher for a virtual environment needs to be an online, web-based setting. This virtual apprenticeship should occur with the cooperation of an expert online teacher who is able to make strategies, techniques, and approaches to teaching explicit. Through the cognitive apprenticeship in an online environment, the preservice teacher can observe how the mentor teacher is able to engage and motivate students who may be separated by space as well as time. The mentor teacher can also model how to evaluate students' progress, strategies for handling the volume of email, and ways to encourage self-regulation, which is an important trait for success in virtual settings (Tsai, Shen, & Fan, 2013). Student teachers in online contexts can use the opportunity to examine their beliefs about what it means to be a teacher and consider whether or not this form of instruction represents a good fit. Just as online learning is not for all students, it may not be for all teachers. Having the chance to explore this type of teaching is an important experience for future educators. Unfortunately, as of 2011-2012, only 1.3% of nationally surveyed teacher education programs offered a systematic form of field experiences in an online setting (Kennedy & Archambault, 2012a). This study is reviewed in further detail later in this chapter.

Relevant Standards Pertaining to Online Teaching

One of the ways that the field has sought to outline the necessary skills for quality online teaching is through the development of relevant sets of standards. Standards have been created by various professional organizations to assess effective online teaching. In chronological sequence these sets of standards include:

- Southern Regional Education Board (SREB) *Essential Principles for High-quality Online Teaching* (SREB, 2003)
- National Education Association (NEA) *Guide to Teaching Online Courses* (NEA, 2006)
- International Society for Technology in Education (ISTE) *National Educational Technology Standards for Teachers* (NETS-T) (ISTE, 2008)
- International Association for K12 Online Learning (iNACOL) *National Standards for Quality Online Teaching* (iNACOL, 2011; 2008)
- Quality Matters *Design Standards for Online and Blended Courses* (Quality Matters, 2010)

When examining desired skills and dispositions teachers should possess to become successful in the online setting, common themes become apparent. These include online pedagogy (i.e., classroom management, communication, feedback, etc.); instructional design, including accessibility and accommodation; assessment/evaluation of student learning; professionalism/ethics; and technical expertise. A cross-walk of the skills covered comes from Kennedy & Archambault (2012b), and is included here for reference (Table 1).

Table 1. Cross Reference of Online Teaching Standards

GT*	PO*	Standards
Qualifications, professional development, & credentials	iNACOL	• Knows and understands the professional responsibility to contribute to the effectiveness, vitality, and self renewal of the teaching profession, as well as to their online school and community; • Knows and understands the need to coordinate learning experiences with other adults involved in providing support to the student (e.g., parents, local school contacts, mentors) to support student learning; • Knows and understands the need for continuing to update academic knowledge, pedagogy, and skills; • Knows and understands the need for professional activity and collaboration beyond school (e.g., professional learning communities) to update academic skills and knowledge and collaborate with other educators; • Interacts in a professional, effective manner with colleagues, parents, and other members of the community to support students' success; • Knows and understands the participation in an online course from a student-centered approach; and • Knows and understands the subject area and age group they are teaching.
	SREB	• Meets the professional teaching standards established by a state licensing agency or the teacher has academic credentials in the field in which he or she is teaching; meets the state's professional teaching standards or has academic credentials in the field in which he or she is teaching; provides evidence that he or she has credentials in the field of study to be taught; knows the content of the subject to be taught and understands how to teach the content to students; facilitates the construction of knowledge through an understanding of how students learn in specific subject areas; and continues to update academic knowledge and skills; and • Has experienced online learning from the perspective of a student; applies experiences as an online student to develop and implement successful strategies for online teaching; demonstrates the ability to anticipate challenges and problems in the online classroom; and demonstrates an understanding of the perspective of the online student through appropriate responsiveness and a supportive attitude toward students.
Curriculum, instruction, and student achievement	iNACOL	• Knows and understands the process for aligning teacher and student expectations for the course, in general; • Knows and understands the need to create and explain objectives, concepts, and learning outcomes in a clearly written, concise format and to explain the course organization to students; • Develops and delivers assessments, projects, and assignments that meet standards-based learning goals and assesses learning progress by measuring student achievement of the learning goals; • Knows and understands the relationships between the assignments, assessments, and standards-based learning goals; • Demonstrates competency in using data from assessments and other data sources to modify content and to guide student learning; knows and understands techniques to plan individualized instruction incorporating student data; knows and understands how data is used to modify the content, instruction, and assessment to meet student needs; knows and understands how instruction is based on assessment data; • Knows and understands options to expand student thinking, address styles of learning, and provide avenues for enrichment or intervention; • Knows and understands a variety of methods and tools to reach and engage students who are struggling; • Knows and understands the importance of self-reflection or assessment of teaching effectiveness; and • Knows and understands the role of student empowerment in online learning.
	NEA	• Online teachers should have the facility to track student participation in the course, viewing course logs, student postings in the discussion area, and student assignments.
	SREB	• Differentiates instruction based on students' learning styles and needs and assists students in assimilating information to gain understanding and knowledge; • Exhibits the ability to assess student knowledge and instruction in a variety of ways; • Provides student-centered lessons and activities that are based on concepts of active learning and that are connected to real-world applications; and • Demonstrates growth in teaching strategies in order to benefit from current research and practice.

***GT: General Topic • PO: Professional Organization**

GT*	PO*	Standards
Online pedagogy	iNACOL	• Knows the primary concepts and structures of effective online instruction and is able to create learning experiences to enable student success; • Knows and understands the current best practices and strategies for online teaching and learning and their implementation in online education; • Knows and understands the role of online learning in preparing students for the global community they live in, both now and in the future; • Knows and understands the instructional delivery continuum (e.g., fully online to blended to face-to-face); • Plans, designs, and incorporates strategies to encourage active learning, application, interaction, participation, and collaboration in the online environment; • Knows and understands the techniques and applications of online instructional strategies, based on current research and practice (e.g., discussion, student-directed learning, collaborative learning, lecture, project-based learning, forum, small group work); and • Knows and understands differentiated instruction based on students' learning styles.
	SREB	• Plans, designs and incorporates strategies to encourage active learning, interaction, participation and collaboration in the online environment; • Demonstrates effective strategies and techniques that actively engage students in the learning process (e.g., team problem-solving, in-class writing, analysis, synthesis and evaluation instead of passive lectures); and • Leads online instruction groups that are goal-oriented, focused, project-based and inquiry-oriented.
Ethics of Online Teaching	iNACOL	• Models, guides, and encourages legal, ethical, and safe behavior related to technology use; • Knows and understands the responsibilities of digital citizenship and techniques to facilitate student investigations of the legal and ethical issues related to technology and society; • Knows and understands how the use of technology may lead to instances of academic dishonesty; • Knows and understands resources and techniques for implementing Acceptable Use Policies (AUP); • Knows and understands techniques for recognizing and addressing the inappropriate use of electronically accessed data or information; and • Knows and understands privacy standards about other students and their posting and performance that are outlined in FERPA or other similar guidelines.
	SREB	• Models, guides and encourages legal, ethical, safe and healthy behavior related to technology use; • Facilitates student investigations of the legal and ethical issues related to technology and society; • Establishes standards for student behavior that are designed to ensure academic integrity and appropriate uses of the Internet and written communication; • Identifies the risks of academic dishonesty for students; • Demonstrates an awareness of how the use of technology may impact student testing performance; • Uses course content that complies with intellectual property rights policies and fair use standards; • Provides students with an understanding of the importance of Acceptable Use Policies (AUP); and • Demonstrates knowledge of resources and techniques for dealing with issues arising from inappropriate use of electronically accessed data or information; and informs students of their right to privacy and the conditions under which their names or online submissions may be shared with others.
Communication / Interaction	iNACOL	• Knows and understands techniques to create an environment that will engage, welcome, and reach each individual learner; • Knows and understands the need to establish and maintain ongoing and frequent teacher-student interaction, student-student interaction, teacher-parent interaction, and teacher-mentor interaction; • Knows and understands techniques to maintain strong and regular communication with students, using a variety of tools; • Knows and understands the need to define the terms of class interaction for both teacher and students; • Knows and understands the process for maintaining records of relevant communications; • Knows and understands the importance of interaction in an online course and the role of varied communication tools in supporting interaction; • Knows and understands the process for facilitating, monitoring, and establishing expectations for appropriate interaction among students; • Knows and understands the techniques for developing a community among the participants; and • Knows and understands the process for facilitating and monitoring online instruction groups that are goal-oriented, focused, project-based, and inquiry-oriented to promote learning through group interaction.
	NEA	• Be sensitive to problems of misinterpretation, and use an appropriate online tone in course design and course delivery; • Model an appropriate tone, and guide students toward an appropriate tone when they stray; • Foster appropriate online student behavior, model an effective and respectful online tone, guide discussions' tone and substance, and address problems with inappropriate online behaviors such as "flaming"; • Communicate with a number of other stakeholders through a variety of methods, some online, some not; • Foster student-to-student discussion during course design and deliver; • Build in course discussion as a feature of student assessment; • Provide instructions regarding when, where, and how students participate in online discussions; • Facilitate course discussions by intervening appropriately when discussions are either not occurring or are inappropriate; • Foster student-to-student collaboration through the use of online discussions, group projects, team activities, and instructional style; • Demonstrate skill at facilitating discussions, and be reliable guides to student learning; and • Demonstrate the appropriate use of both synchronous and asynchronous communications with students, using one-on-one communications when needed, and fostering and guiding group discussions.

***GT: General Topic • PO: Professional Organization**

GT*	PO*	Standards
	SREB	• Facilitates and monitors appropriate interaction among students; builds and maintains a community of learners by creating a relationship of trust, demonstrating effective facilitation skills, establishing consistent and reliable expectations, and supporting and encouraging independence and creativity; • Encourages collaboration and interaction among all students; and • Promotes learning through group interaction.
Assessment & Evaluation	iNACOL	• Demonstrates competencies in creating and implementing assessments in online learning environments in ways that ensure validity and reliability of the instruments and procedures; • Knows and understands the need to define the assessment criteria for the course; • Knows and understands adequate and appropriate assessment instruments to measure online learning that reflect sufficient content validity (i.e., that adequately cover the content they are designed to measure), reliability, and consistency over time; • Knows and understands the implementation of online assessment measures & materials in ways that ensure instrument validity & reliability; • Knows and understands multiple strategies for ensuring the security of online student assessments, academic integrity, and assessment data; • Knows and understands the reach of authentic assessments (i.e., the opportunity to demonstrate understanding of acquired knowledge and skills, as opposed to testing isolated skills or retained facts) are part of the evaluation process; • Knows and understands varied assessment strategies that address levels of ability through a variety of alternative interventions; • Knows and understands the process of continuous evaluation of students to include formative and summative assessments and student feedback, including polls and surveys that reflect student learning progress throughout the course; • Knows and understands the use of effective learning strategies data for an individual student to formulate detail-specific changes in future instruction, based on assessment results and research study (data-driven and research-based); • Knows and understands ways for teacher and students to assess student readiness for course content and method of delivery; • Knows and understands that student success (e.g., grade, level of participation, mastery of content, completion percentage) is an important measure of teaching and course success; and • Knows and understands the importance of student self-assessment.
	SREB	• Demonstrates competencies in creating and implementing assessments in online learning environments in ways that assure validity and reliability of instruments and procedures; • Creates or selects fair, adequate and appropriate assessment instruments to measure online learning that reflect sufficient content validity (i.e., that adequately cover the content they are designed to measure), reliability and consistency over time; • Implements online assessment measures and materials in ways that ensure instrument validity and reliability; • Develops and delivers assessments, projects and assignments that meet standards-based learning goals and assesses learning progress by measuring student achievement of learning goals; • Continually reviews all materials and Web resources for their alignment with course objectives and state and local standards and for their appropriateness; • Creates assignments, projects and assessments that are aligned with students' different visual, auditory and hands-on ways of learning; • Includes authentic assessment (i.e., the opportunity to demonstrate understanding of acquired knowledge and skills as opposed to testing isolated skills or retained facts) as part of the evaluation process; • Provides continuous evaluation of students to include pre- and post-testing and student input throughout the course; and demonstrates an understanding of the relationships between and among the assignments, assessments and standards-based learning goals; • Demonstrates competencies in using data and findings from assessments and other data sources to modify instructional methods and content and to guide student learning; • Assesses each student's background and content knowledge and uses these data to plan instruction; • Reviews student responses to test items to identify issues related to test validity or instructional effectiveness; • Uses observational data (e.g., tracking data in electronic courses, Web logs, e-mail) to monitor course progress and effectiveness; • Creates opportunities for self-reflection or assessment of teaching effectiveness within the online environment (e.g., classroom assessment techniques, teacher evaluations, teacher peer reviews); • Demonstrates frequent and effective strategies that enable both teacher and students to complete self- and pre-assessments; • Employs ways to assess student readiness for course content and method of delivery; • Employs ways for students to effectively evaluate and assess their own readiness for course content and method of delivery; and • Understands that student success (e.g., grade, level of participation, mastery of content, completion percentage) is an important measure of teaching and course success; and provides opportunities for student self-assessment within courses.
Feedback	iNACOL	• Promotes student success through clear expectations, prompt responses, and regular feedback; • Knows and understands techniques for using appropriate communications in support of student engagement through prompt and regular feedback, and setting and communicating high expectations; • Knows and understands the need to provide clear expectations for teacher response time to student queries; and • Knows and understands the need for timely, constructive, personalized feedback to students about assignments and questions.

***GT: General Topic • PO: Professional Organization**

GT*	PO*	Standards
Feedback	NEA	• Monitor student learning, and provide students with feedback on their performance; • Review submitted work in a timely fashion (usually within one week of submission), and should provide students with feedback; • Be active and regular participants in their classes; • Take part in class discussions, review submitted work promptly, respond to student questions on a regular and consistent basis, and schedule online meeting times, as needed; and • Attend their online class on a daily basis, and respond to student questions expeditiously.
	SREB	• Provides online leadership in a manner that promotes student success through regular feedback, prompt response & clear expectations; • Models effective communication skills and maintains records of applicable communications with students; • Encourages interaction and cooperation among students, encourages active learning, provides prompt feedback, communicates high expectations, and respects diverse talents and learning styles; • Persists, in a consistent and reasonable manner, until students are successful; • Establishes and maintains ongoing and frequent teacher-student interaction, student-student interaction and teacher-parent interaction; • Provides timely, constructive feedback to students about assignments and questions; and • Gives students clear expectations about teacher response time.
Accommodations and Diversity awareness	iNACOL	• Is cognizant of the diversity of student academic needs and incorporates accommodations into the online environment; • Knows and understands the diversity of student learning needs, languages, and backgrounds; • Knows and understands how adaptive/assistive technologies are used to help people who have disabilities gain access to information that might otherwise be inaccessible; • Knows and understands the process for connecting with local support personnel to verify student's IEP requirements or 504 accommodations needed for student success; • Knows and understands legal mandates stipulated by the Americans with Disabilities Act (ADA), the Individuals with Disabilities Education Act (IDEA), the Assistive Technology Act, and Section 508 or other similar guidelines/requirements for accessibility; and • Knows and understands that students have varied talents and skills and make appropriate accommodations designed to include all students.
	SREB	• Understands and is responsive to students with special needs in the online classroom; • Understands that students have varied talents and skills and uses appropriate strategies designed to include all students; • Demonstrates knowledge and responds appropriately to the cultural background and learning needs of non-native English speakers; • Provides activities, modified as necessary, that are relevant to the needs of all students; and • Adapts and adjusts instruction to create multiple paths to learning objectives.
	NEA	• Demonstrate an ability to use multimedia, as appropriate, in course materials, in ways that comply with Section 508 requirements.
Management	iNACOL	• Knows and understands the need to establish criteria for appropriate online behavior for both teacher and students; • Knows and understands effective time management strategies; • Knows and understands online course management tasks; • Provide course materials to students in a timely manner, so that students have all course materials when needed. These include physical materials that may be mailed to students at school or at home, or electronic materials in the form of reference works or Internet links.
	SREB	• Provides an online syllabus that details the terms of class interaction for both teacher and students, defines clear expectations for both teacher and students, defines the grading criteria, establishes inappropriate behavior criteria for both teacher and students, and explains the course organization to students; and • Provides a syllabus with objectives, concepts and learning outcomes in a clearly written, concise format; uses student data to inform instruction, guides and monitors students' management of their time, monitors learner progress with available tools and develops an intervention plan for unsuccessful learners.
Technological knowledge	iNACOL	• Understands and is able to use a range of technologies, both existing and emerging, that effectively support student learning and engagement in the online environment; • Knows and understands the use of an array of grade-appropriate online tools for communication, productivity, collaboration, analysis, presentation, research, and content delivery; • Knows and understands the use of emerging technologies in a variety of mediums for teaching and learning, based on student needs • Knows and understands basic troubleshooting skills and the responsibility to address basic technical issues online students may have; • Knows and understands the need to continuously update their knowledge and skills for using the evolving technology tools that support online learning; • Knows and understands appropriate tools and technologies to make accommodations to meet student needs • Knows and understands critical digital literacies and 21st century skills; and • Knows and understands appropriate use of technologies to enhance learning.

***GT: General Topic • PO: Professional Organization**

GT*	PO*	Standards
Technological knowledge	SREB	• The teacher has the prerequisite technology skills to teach online; • Demonstrates the ability to effectively use word-processing, spreadsheet and presentation software; • Demonstrates effective use of Internet browsers, e-mail applications and appropriate online etiquette; • Demonstrates the ability to modify and add content and assessment, using an online Learning Management System (LMS); • Incorporates multimedia and visual resources into an online module; • Utilizes synchronous and asynchronous tools (e.g., discussion boards, chat tools, electronic whiteboards) effectively; • Troubleshoots typical software and hardware problems; • Demonstrates the ability to effectively use and incorporate subject-specific and developmentally appropriate software in an online learning module; and • Demonstrates growth in technology knowledge and skills in order to stay current with emerging technologies.
	NEA	• Be familiar with online tools and online infrastructure, including Learning Management Systems (LMS) and Content Management Systems (CMS), and they should understand the appropriate uses of each system to support online course design and delivery; • Answer student questions on certain technical issues, including posting to discussions, submitting assignments, using the Internet, and viewing online grades; • Pay particular attention to the course enrollment process, be able to determine which students are enrolled in the online course, and know how to add and drop students from the course; • Be adept with the various platform features so that they can provide students the opportunity to submit their work online; • Demonstrate an ability to search and use Internet sites so that links to them can be incorporated into course documents; and • Employ CMS features to use and appropriately reference web sites, and have the Information Literacy skills to determine which sites are legitimate and of sufficient merit for inclusion.
Design	iNACOL	• Arranges media and content to help students and teachers transfer knowledge most effectively in the online environment.
	NEA	• Make appropriate use of the CMS platform's features, producing documents that are well organized for use by students, and that are kept up-to-date during course delivery; • Be familiar with the full range of CMS elements, and be able to select the appropriate elements while designing and teaching online courses; • Be familiar with online design and content standards, have the ability to determine which standards are appropriate for their course design and delivery needs, and be able to demonstrate use of design and content standards in course-document creation and course delivery; and • Revise course documents to keep them up-to-date and accurate.

***GT: General Topic • PO: Professional Organization**

Together with standards geared toward online teaching, accreditation standards, such as those developed by the National Council for Accreditation of Teacher Education (NCATE) and the Teacher Education Accreditation Council (TEAC), can also be used to inform the design and development of preparing teachers for online and blended contexts. These standards do not solely concentrate on preparing teachers for online learning; they also apply in blended settings and encapsulate the principles of effective teaching and the meaningful use of technology integration in the classroom. In general, accreditation standards focus on similar areas as those that focus on online teaching. These include a focus on the learning process, content knowledge, teaching methods or pedagogy, assessment strategies, and professional conduct/responsibilities. Both sets of standards (online and accreditation standards focused on traditional teaching) emphasize what quality teachers should know and be able to do. However, the ways in which these skills are implemented can be very different in an online setting.

Together with relevant theory, such as technological pedagogical content knowledge and situated cognition, standards play an important role in attempting to identify the necessary knowledge, skills, and dispositions teachers need in order to be successful in the online environment. Building from this foundation, we can examine relevant research literature to inform the further development of teacher education programs designed to prepare educators for 21st century classrooms.

Research Synthesis

As early as 2003, researchers were calling for teacher preparation programs to teach preservice teachers how to teach online (Irvine, Mappin, & Code, 2003). A few years later, iNACOL pushed the field to think outside the box towards a "new vision of the future of education" (Davis & Rose, 2007). Specifically, this work advocated for teacher preparation in the areas of online pedagogy and student support strategies (Lowes, 2007). Unfortunately, research in this area is scarce and mostly consists of case studies discussing what specific programs are doing to prepare their students for K-12 online and blended learning. However, there have been a few key pioneering programs that have worked to move the field forward and establish a foundation upon which teacher education programs continue to build.

The first pioneer teacher education program was Iowa State University together with University of Florida, University of Virginia, and Graceland University. ISU brought the issue of teacher preparation for K-12 online learning to national attention in 2007 with the help of a Fund for the Improvement of Postsecondary Education (FIPSE) grant for Teacher Education Goes

Into Virtual Schooling (TEGIVS; Davis et al., 2007). As part of the TEGIVS project, the ISU research team reported on a field experience in a K-12 online learning program that they conducted in the fall of 2007 (Compton, Davis, & Mackey, 2009). ISU's field experience program partnered with Iowa Learning Online (ILO) to offer preservice teachers a chance to see what it was like to be a K-12 online teacher. Two preservice teachers were paired with an ILO teacher, who guided the preservice teachers through the learning environment. The field experience was a one-credit course at ISU, and the preservice teachers were required to reflect on their learning, engage in a discussion forum, and participate in interviews about their experience. The result of the research found that the preservice teachers' grew in their understanding of K-12 online learning and formed personal theories about this new learning environment (Compton et al., 2009).

In addition to ISU, the University of Central Florida (UCF) and the University of Florida (UF) began offering their preservice teachers field experiences in online learning programs in spring 2009. These programs lasted seven weeks and four weeks, respectively. The UCF experience catered to undergraduate-level preservice teachers, whereas the UF experience served graduate-level preservice teachers (Kennedy, Cavanaugh, & Dawson, 2013). Both institutions collaborated with FLVS. In addition to UCF and UF, the University of South Florida offered their first field experience in an online learning program in fall 2009, and by spring 2010, this pilot was expanded to a college-wide program.

Building from the awareness that Iowa State's TEGIVs project started, several teacher education programs, predominently in Florida as mentioned above, began offering some form of field experience placement in a virtual school setting. However, a national survey found activity in this area to be lacking among most major teacher education programs. Kennedy and Archambault (2012a) used the Tailored Method Design (Dillman, 2010) to survey two to three contacts at each of the AACTE and NCATE-accredited teacher education program field experiences offices from across the United States. Out of a possible 1,528 respondents, 522 responded, representing a 34% response rate that is considered acceptable for web-based surveys (Manfreda, Bosnjak, Berzelak, Haas, & Vehovar, 2008; Shih & Fan, 2008). Of the teacher education programs surveyed, only 1.3% were offering field experiences in K-12 online learning programs (Kennedy & Archambault, 2012a). The survey also collected open-ended responses as well, and the results shed light on the perceptions of teacher education programs when it comes to K-12 online learning specifically and online learning in general. The list below share some of the responses to why the programs would not offer virtual school field experiences:

- "If we were training teachers for virtual schools, virtual field experiences would be appropriate."
- "That [online learning] isn't the way I learn. I don't understand how people can learn something without human contact—or why they would even want to."
- "Online learning isn't learning."
- "At the moment, since there does not seem to be such a thing as a virtual teaching job, only ones in actual schools with real-live students, I don't know how close a virtual school field experience would be to the real setting"
- "Good teaching must happen in person."

The above statements show the uphill climb that teacher educators, who understand the need for teachers to be trained to teach online, have to scale. For respondents who indicated they were considering starting pilot programs for field experiences in K-12 online learning programs, several mentioned that they did not know of examples to follow. In response to the lack of examples, Kennedy and Archambault (2012b) published a guide on the design and development of field experiences in K-12 online learning environments in the open access journal, *Journal of Applied Instructional Design*, available at http://www.jaidpub.org/.

Currently, there is very little in terms of longitudinal studies showing the effectiveness of preservice preparation for K-12 online learning programs. There is one qualitative study that explores the experiences of first-year virtual school teachers' experiences after taking part in a virtual school field experience in their teacher education program (Kennedy, 2013). Using a phenomenological approach, six preservice teachers were interviewed to document their lived experiences when transitioning from their preservice teacher education program into an online teaching position at a virtual school. The preservice teachers' program had a preparation program specifically geared toward preparing teachers for online teaching and learning. Findings relayed the teachers' collective view that teacher education programs need to be preparing teachers for online teaching because "this is the future of education and we have to be ready for it" (Natalie). New hires to the virtual school expressed their frustration with other teacher education programs saying that they were "behind on times" in terms of "preparing teachers for the learning environments of today and tomorrow" (Chad and Shawna). Another response came from Tom, where he said, "Wow, I feel sorry for the ones graduating from colleges that do not offer courses and/or internships specific to virtual schools. That's the only way I knew this career was even an option for me, and having the chance to explore it during my preservice education allowed me to try it, you know, try it on for size and realize I was interested in pursuing it." Ashley added, "Maybe if the colleges gave an option of which track to choose, like online, traditional, or blended, and if we could choose our own internships within these varying environments, maybe then our education would be more relevant to what we're doing now." As is evident from the data from both studies (Kennedy, 2013; Kennedy & Archambault, 2012;), there is currently a disconnect between what the preservice teachers and teacher education programs feel is best when it comes to the preparation of teachers for new learning environments.

Implications for Policy and Practice

Despite the lack of progress on the part of teacher education programs, recommendations for preparing teachers for new learning environments are informed by the literature pertaining to the necessary skills online teachers need to be successful (Brennan, 2003; DiPietro, Ferdig, Black, & Preston, 2008; Ferdig, Cavanaugh, DiPietro, Black, Mulkey, Dawson, 2009; Kearsley & Blomeyer, 2004). Curriculum for teacher preparation in online and blended settings should be aligned with standards for online teaching, as outlined in this chapter. This means designing coursework that specifically focus on designing and implementing curriculum and instruction for online/blended settings, online pedagogy, and online assessment and evaluation. These areas are well aligned to how the literature and the TPACK framework characterize quality online teaching.

In addition to coursework, applying the concepts of situated cognition, any teacher preparation or professional development course designed for online teachers should include a field experience component that offers teachers the opportunity to gain experience in an authentic online learning environment. The field experience should provide teachers with an applied cognitive apprenticeship that occurs with the collaboration of an expert online teacher. This cooperating teacher should be able to model effective strategies, techniques, and approaches unique to online teaching, how to motivate online students, track their progress using real-time data, and manage the vast amount of ongoing digital communication. Not only does this type of field experience expose future teachers to the intricacies of online teaching, it also provides them with the opportunity to experience first hand the multiple roles teachers play in this environment to decide if this form of instruction represents a career option they would like to pursue.

To be in a position to offer a field experience in an online setting requires vision on the part of teacher education programs to begin creating statewide and national partnerships with virtual schools and districts that have online components. Unfortunately, only a small minority of current accredited teacher preparation programs offer a field experience opportunity in an online setting (Kennedy & Archambault, 2012a). Currently, teacher preparation programs continue to prepare teachers in much the same way that they have done for generations (Levine, 2006). In fact, some programs perceive online learning in an unfavorable light and may not see it as a valid form of education (Kennedy & Archambault, 2012a). This value must adapt and change if we hope to have teachers prepared to be successful in both the face-to-face as well as the blended and online learning environments.

One of the obstacles is that a field experience of this kind requires extensive collaboration with virtual schools to ensure fruitful pairings of skilled online mentor teachers with novice ones. Memoranda of understand need to be agreed upon to ensure an effective partnership and to outline the expectations and requirements of each organization. Because these placements are not location-bound, however, it is possible that online teachers from a virtual school in one state could mentor preservice teachers from another. This opens the possibilities, particularly with the number of virtual schools who are willing to work with teacher education programs, and is already happening in existing models (Kennedy & Archambault, 2012a).

One example of a successful partnerships is the Idaho model in which Boise State University, the Idaho Digital Learning Academy (IDLA), and the Idaho Department of Education work together to ensure the preparation of qualified online teachers. In 2011, Idaho added its online teaching endorsement as a competency-based program requiring that teachers complete a minimum of 20 credit hours in courses directly related to online teaching and demonstrate proficiency in the Idaho Standards for Online Teaching, based on the International Society for Technology in Education (ISTE) National Educational Technology Standards (NETS) (K-12 Online Teaching Endorsement, 2013). Offered as a supplement to existing teaching certificates, the endorsement is only available to teachers who meet the Idaho professional teaching standards and/or are licensed to teach in the state. The Idaho Department of Education serves as the accrediting body, while IDLA provides mentor online teachers and an authentic environment in which prospective online teachers can gain much needed skills and experience. Boise State provides the necessary coursework and crediting mechanism. This model provides an excellent example of stakeholders working together to ensure teachers are well prepared to teach in an online environment.

As increasing numbers of students gravitate toward online learning opportunities, necessitating a larger number of teachers to meet the growing demand, states will want to consider their requirements for teaching online. While Idaho and Georgia have specific state-level endorsements pertaining to online teaching, other states, such as Wisconsin and Minnesota have tried passing state statute requiring professional development for online teaching. However, the statute requiring at least 30 hours of professional development designed to prepare a teacher for online teaching was removed in 2013. In Minnesota, a law was passed in 2012 to require teacher preparation for online settings beginning for preservice teachers entering programs after June 30, 2014. This statute is relatively new, and it remains to be seen what impact, if any, it will have on the transformation of teacher preparation when it comes to online instruction. Interestingly, the law focuses on teacher preparation, which is the first attempt to mandate the inclusion of digital and blended teaching in preservice teacher preparation programs. This inclusion is needed across programs, particularly because of the growth of online and blended programs. As we progress into the 21st century, all teachers will need to be skilled in strategies for teaching online. This will require an acknowledgement of online/blended teaching as a key area of high quality teacher preparation program, particularly by major accrediting bodies and professional organizations, such as the National Council for Accreditation of Teacher Education (NCATE), the Teacher Education Accreditation Council (TEAC), and the American Association of Colleges for Teacher Education (AACTE).

Implications for Research

With the ever increasing number of students taking online courses throughout the United States, there is a need on the part of states to consider the systems already in place to provide necessary training to prospective teachers and to consider putting into place additional structures to prepare educators for online and blended settings (Archambault, DeBruler, Freidhoff, 2014). Examining theoretical and practical considerations for what teachers should know and be able to do in an online environment allows teacher education and/or professional development programs to work toward ensuring online teacher quality (Archambault & Kennedy, 2012). To date, there is only one longitudinal study that is a qualitative view of how preservice teachers, who have been involved in a program that prepares them for online learning, transition into future positions where these skills are used (Kennedy, 2013). Additional research is needed to determine what constitutes effective online teaching and specific practices to support this effort, along with the efficacy of such programs. Quality online teaching standards, such as iNACOL and Quality Matters, can be used to evaluate programs to ensure their candidates are graduating with the skills they need to teach in these new environments. Feedback from supervisor teachers at the university level, mentor teachers at the K-12 online learning program, and preservice and inservice teachers participating in the program should be taken into consideration during program evaluation-type studies.

Standardization studies should seek to discover and define what constitutes effective online teaching and, correspondingly, define the optimal program for the preparation of effective online K-12 teachers. Because online education is expanding beyond the boundaries of any particular school or school district and is evolving into a national network of learning alternatives that range from single lessons or modules to complete degree programs, consideration should be given to the development of an empirically proven core program for preparing online teachers.

Further research involving K-12 online teachers and teacher preparation might productively focus on two main areas, namely (a) empirically defining skills and techniques for effective online teaching, and (b) developing educational and training standards for online teacher education across pre-service preparation and in-service professional development. This research should focus on identification of specific difference between the skills necessary to teach online as compared to skills required for traditional face-to-face teaching. These studies might include examining how to develop specific teaching strategies for (a) creating, modifying and individualizing highly effective lessons for online delivery, (b) communicating with and managing students effectively at a distance and (c) defining best practices for creating structure and efficient organization of an online classroom.

Conclusion

As described in this chapter, with the rise in K-12 online and blended learning environments, there is an obvious need for preservice teacher preparation to ensure that beginning teachers have the necessary knowledge and skills to be successful in an online/blended environment. Increasingly, new teachers may be recruited directly from their teacher education programs. As a result, teacher preparation programs will need to examine what it means to prepare teachers for 21st century teaching and learning environments, providing them the necessary skills and dispositions to be quality online instructors. Along with preparation for beginning teachers, inservice teachers will also need to be provided with professional development for online teaching, especially if the school districts in which they are employed begin or expand online learning programs. Together with in-house training, teacher education programs can also be a source of this professional development. What is clear is that all stakeholders will need to consider how to help teachers achieve a greater degree of meaningful technology integration as a part of quality instruction. This includes modeling evidence-based quality online and blended teaching strategies, providing opportunities for field experiences, and mentoring teachers new to the online environment. Through these efforts and by establishing mutually beneficial partnerships, teacher education programs, school districts, virtual schools, and other online education providers will need to work together to ensure that teachers are prepared to enter online and blended classrooms of the 21st century.

References

Aiken, I. P., & Day, B. D. (1999). Early field experiences in preservice teacher education: Research and student perspectives. *Action in Teacher Education, 21*(3), 7-12.

Archambault, L. M. (2011). The practitioner's perspective on teacher education: Preparing for the K-12 online classroom. *Journal of Technology and Teacher Education, 19*(1), 73-91.

Archambault, L. M., DeBruler, K., & Freidhoff, J. (2014). K-12 online and blended teacher licensure: Striking a balance between policy and preparedness. Journal of Technology and Teacher Education, 22(1), 83-106.

Archambault, L. M. & Kennedy, K. (2012). Situated online: Theoretical underpinnings of field experiences in virtual school settings. In C. Maddux (Ed.), *Research highlights in technology and teacher education* (pp. 53-60). Chesapeake, VA: Society for Information Technology & Teacher Education.

Brennan, R. (2003). One size doesn't fit all: Pedagogy in the online environment. Kensington Park, Australia: National Centre for Vocation Education Research, Australian National Training Authority.

Brown, J., Collins, A., & Duguid, P. (1989). Situated cognition and the culture of learning. *Educational Researcher, 18*, 32-42.

Buck, G., Morsink, C., Griffin, C., Hines, T., & Lenk, L. (1992). Preservice training: The role of field-based experiences in the preparation of effective special educators. Teacher Education and Special Education, 15(2), 108-123.

Charania, A. K. (2010). Preparing future teachers for virtual schooling: Assessing their preconceptions and competence. Iowa State University.

Collins, A., Brown, J. S., & Newman, S. E. (1989). Cognitive apprenticeship: Teaching the crafts of reading, writing, and mathematics. In L. Resnick (Ed.), *Knowledge, learning and instruction: Essays in honor of Robert Glaser* (pp. 453-494). Hillsdale, NJ: Lawrence Erlbaum.

Compton, L., Davis, N. E., & Mackey, J. (2009). Field experience in virtual schooling: To be there virtually. *Journal of Technology and Teacher Education, 17*(4), 459-477.

Davis, N. E., Roblyer, M. D., Charania, A., Ferdig, R. E., Harms, C., Compton, L., & Cho, M. (2007). Illustrating the "virtual" in virtual schooling: Challenges and strategies for creating real tools to prepare virtual teachers. *Internet and Higher Education, 10*(1), 27-39.

Davis, N. E., & Rose, R. (2007). *Professional development for virtual schooling and online learning.* International Association for K-12 Online Learning. Retrieved from http://www.nacol.org/docs/NACOL_PDforVSandOlnLrng.pdf

Dawley, L., Rice, K., & Hinks, G. (2010). *Going virtual 2010! The status of professional development and unique needs of K- 12 online teachers.* Retrieved from http://edtech.boisestate.edu/goingvirtual/goingvirtual3.pdf

Dillman, D. A., Smyth, J. D., & Christian, L. M. (2009). Internet, mail, and mixed-mode surveys: The tailored design method. Hoboken, NJ: Wiley & Sons.

DiPietro, M., Ferdig, R. E., Black, E. W., & Preston, M. (2008). Best practices in teaching K-12 online: Lessons learned from Michigan Virtual School teachers. *Journal of Interactive Online Learning, 7*(1), 10-35.

Ferdig, R., Cavanaugh, C., DiPietro, M., Black, E., Mulkey, J., & Dawson, K. (2009). Virtual schooling standards and best practices for teacher education. *Journal of Technology and Teacher Education, 17*(4), 479-503.

Harlin, R. P. (1999). Developing future professionals: Influences of literacy coursework and field experiences. *Reading Research and Instruction, 38*(4), 351-370.

Idaho State Board of Education. (2011). IDAPA 08, Title 02, Chapter 02. Retrieved from www.adm.idaho.gov/adminrules/rules/idapa08/0202.pdf

International Association for K12 Online Learning (iNACOL) *National Standards for Quality Online Teaching* (iNACOL, 2011;

International Association for K-12 Online Learning (2008). *National Standards for Quality Online Teaching*. Retrieved from http://www.inacol.org/resources/nationalstandards/NACOL%20Standards%20Quality%20Online%20Teaching.pdf

International Society for Technology in Education (2008). National Educational Technology Standards (NETS*T) and Performance Indicators for Teachers. Retrieved from http://www.iste.org/Content/NavigationMenu/NETS/ForTeachers/2008Standards/NETS_for_Teachers_2008.htm

Irvine, V., Mappin, D., & Code, J. (2003). Preparing teachers to teach online: The role of faculties of education. In D. Lassner & C. McNaught (Eds.), *Proceedings of World Conference on Educational Multimedia, Hypermedia and Telecommunications* (pp. 1978-1981). Chesapeake, VA: AACE.

Joyce, B., Yarger, S. J., Howey, K., Harbeck, K., & Kluwin, T. (1977). Reflection on preservice education: Impressions from the national survey. *Journal of Teacher Education, 28*(5), 14-37.

Kearsley, G., & Blomeyer, R. (2004). Preparing teachers to teach online. *Educational Technology, 44*(1), p. 49-52.

Kennedy, K., & Archambault, L. (2012). Offering pre-service teachers field experiences in K-12 online learning: A national survey of teacher education programs. *Journal of Teacher Education, 63*(3), 185-200. http://jte.sagepub.com/content/63/3/185

Kennedy, K., & Archambault, L. (2012). Design and development of field experiences in K-12 online learning environments. *Journal of Applied Instructional Design, 2*(1), 35-49. http://www.jaidpub.org/wp-content/uploads/2012/08/KennedyArchambault-3.pdf

Kennedy, K., Cavanaugh, C., & Dawson, K. (2013). Pre-service teachers' experience in a virtual school. *American Journal of Distance Education, 27*(1), 56-67. http://www.tandfonline.com/doi/abs/10.1080/08923647.2013.756757?journalCode=hajd20#

Kennedy, K. (2013). Virtually hired: Pre-service teachers' transitions directly into online teaching positions at a virtual school. American Educational Research Association (AERA), San Francisco, CA, Apr 27-May 1.

Lankshear, C., & Knobel, M. (2007). Researching new literacies: Web 2.0 practices and insider perspectives. *e-Learning, 4*(3), 224-240.

Leu, D. J., Jr., Kinzer, C. K., Coiro, J., Cammack, D. (2004). Toward a theory of new literacies emerging from the Internet and other ICT. In R.B. Ruddell & N. Unrau (Eds.), *Theoretical Models and Processes of Reading*, Fifth Edition (1568-1611). Newark, DE: International Reading Association.

Levine, A. (2006). Educating school teachers. Washington, D.C.: The Education Schools Project. Retrieved from http://files.eric.ed.gov/fulltext/ED504144.pdf

Lowes, S. (2007). Professional development for online teachers. In C. Cavanaugh & R. Blomeyer (Eds.), *What works in K-12 online learning* (pp. 161-178). Eugene, OR: International Society for Technology in Education.

Miller, T., & Ribble, M. (2010). Moving beyond bricks and mortar: Changing the conversation on online education. *Educational Considerations, 37*(2), 3-6.

Koehler, M. J. & Mishra, P. (2005). What happens when teachers design educational technology? The development of Technological Pedagogical Content Knowledge. *Journal of Educational Computing Research, 32*(2), 131-152.

Moore, C. (1979). National survey queries early clinical experiences. *ATE Newsletter, 12,* 3.

Moore, R. (2003). Reexamining the field experiences of preservice teachers. *Journal of Teacher Education, 54*(1), 31-42.

National Education Association. (2006). *NEA Guide to Teaching Online Courses*. Retrieved from http://www.nea.org/home/30103.htm

Southern Regional Educational Board. (2006). SREB essential principles of high-quality online teaching: Guidelines for evaluating K-12 online teachers. Retrieved from http://info.sreb.org/programs/EdTech/pubs/PDF/Essential_Principles.pdf

Tsai, C., Shen, P., & Fan, Y. (2013). Research trends in self-regulated learning research in online learning environments: A review of studies published in selected journals from 2003-2012. *British Journal of Technology, 44*(5), E107-E110.

Watson, J., Murin, A., Vashaw, L., Gemin, B., & Rapp, C. (2011). Keeping pace with K-12 online learning: An annual review of policy and practice. Evergreen, CO: Evergreen Education Group.

Wiggins, R. A., & Follo, E. J. (1999). Development of knowledge, attitudes, and commitment to teach diverse student populations. *Journal of Teacher Education, 50*(2), 94-105.

Chapter 11

Professional Development for K-12 Online Teachers

Kara Dawson, *University of Florida, dawson@coe.ufl.edu)*
Nancy Fichtman Dana, *University of Florida, ndana@coe.ufl.edu*

Abstract

This chapter provides a survey of what is known about professional development for both brick and mortar and online teachers and uses this knowledge as a springboard to suggest policy and research implications for the professional development of K-12 online teachers. While research is currently limited, opportunities abound for practitioners, policymakers, and researchers to make important contributions to the professional development of K-12 online teachers.

Introduction

Since the inception of virtual schools, online learning has grown exponentially (Ferdig, Cavanaugh, DePietro, Black, & Dawson, 2009). As online learning continues to grow, so does the need to cultivate programs of professional development for online teachers (Rice, 2009). Professional development, defined as "a comprehensive, sustained, and intensive approach to improving teachers' effectiveness in raising student achievement," is a necessary aspect of teachers' work throughout their professional lifetimes, so they may continue to grow, learn, and respond to the ever changing needs of the students they teach (Learning Forward, online).

Since K-12 online learning is a relatively new endeavor, creating rich opportunities for continuing professional development of practicing K-12 online teachers is essential for the long-term health and productivity of the online movement. Knowledge that has been generated on PD from years of studying this construct in brick and mortar contexts can be informative to the online enterprise. In addition, there is a growing body of literature on professional development for online educators. The purpose of this chapter is to provide a survey of what is known about professional development for both brick and mortar and online teachers and use this knowledge as a springboard to suggest policy, practice, and research implications for the professional learning of K-12 online teachers. We begin by describing what is known about professional development for brick and mortar teachers and then address specific research about professional development for K-12 online teachers in the next section.

Teacher Professional Development: Brick and Mortar Schools and the Movement to Job-Embedded Learning

Historically, the most prominent way that professional learning for brick-and-mortar teachers has been actualized in the United States is as an event—a workshop delivered on an in-service day when teachers work but students have a holiday (Cochran-Smith & Lytle, 1999; Lieberman 1995; Sparks & Hirsch, 1997). In these workshops, teachers often learn about new strategies, approaches, and pedagogy from an outside expert, and then they are expected to return to their classrooms and independently implement new knowledge.

Experts in the area of teacher professional development recognize the limitations of this traditional model. For example, Borko (2004, p. 4) refers to such events as "fragmented, intellectually superficial" seminars. Furthermore, Barnett (2002) asserts that such seminars do not provide ongoing guidance for teachers as they attempt to learn and change their practices. Killion and Harrison (2006, p. 8) concur that "traditional professional development usually occurs away from the school site, separate from classroom contexts and challenges in which teachers are expected to apply what they have learned, and often without the necessary support to facilitate transfer of learning." In sum, scholars agree and research supports that when used in isolation, the prevalent 'event' model of professional development for brick-and-mortar teachers is not effective in changing classroom practice (e.g. Joyce & Showers, 1995).

Leading the way to respond to the plethora of research documenting the ineffectiveness of one-time workshop professional development experiences, the premiere professional development association in the United States, Learning Forward (formally National Staff Development Council), has made it the organization's mission to insist that 'every educator engages in effective professional learning every day so every student achieves' (Learning Forward, online). According to Learning Forward, high quality professional development involves systematic, planned, intentional, and regularly scheduled efforts to embed teacher learning within teachers' daily lives. This concept is known as job-embedded professional development (Yendol-Hoppey & Dana, 2010).

The concept of job-embedded professional development is consonant with what research suggests effective professional development that goes beyond the one-time workshop looks like (Garet, Porter, Desimone, Birman, & Yoon 2001; Lee, 2005; Little & McLaughlin, 1993). Specifically, Desimone (2009, p. 183) suggests that “a research consensus [exists] on the main features of professional development that have been associated with changes in knowledge, practice, and, to a lesser extent, student achievement.” These core features of effective professional development include content focus, active learning, coherence, duration, and collective participation, all of which are essential ingredients of strong professional development programs. *Content focus* programs emphasize both subject matter content and how students learn the content. *Active learning* in PD programs involves teachers as observing experts, participating in interactive feedback and discussion, and reviewing student work, rather than listening to a lecture. *Coherence* relates to the extent to which what is taught in the PD program aligns with state and district goals and standards for student learning. *Duration* is the time spent in PD programs, and although research has not indicated an exact amount of time, programs that include at least 20 hours of contact time are recommended. Finally, *collective participation* refers to teachers working together which can be a powerful form of teacher learning. Many models of professional learning have emerged in brick and mortar contexts that take into account Desimone’s five core features of professional development. Among others, these models include lesson study, teacher inquiry/action research, and professional learning communities.

Lesson study, an approach to teacher professional development originally developed for and used extensively with teachers in Japan, involves teachers collaboratively examining and improving their teaching practice through “studying” lessons. According to the Lesson Study Research Group at Teachers College, Columbia University, the term “lesson study” is derived from the Japanese word “jugyokenkyuu,” which translates to English as “research lesson,” indicating “the level of scrutiny applied to individual lessons” (http://www.tc.columbia.edu/lessonstudy/lessonstudy.html)/). The process entails teachers creating study lessons together by planning, teaching, observing, critiquing, and revising the lessons as a group, with the goal of becoming more effective teachers. This spiraling process begins with the development of an overarching goal and a research question shaped by the group, which drives lesson plan development and revision. The process ends with the production of a report in which teachers discuss what they have learned through their study lessons in relationship to their research question.

While much of the research and literature on lesson study has focused on understanding adaptations and barriers to its implementation in the U.S. (Chokshi & Fernandez, 2004; Fernandez, Cannon & Chokshi, 2003; Fernandez, 2002; Perry & Lewis, 2009), several additional studies have indicated that it is a viable framework for improving teaching practice within the context of brick-and-mortar classrooms (Chokshi & Fernandez, 2004; Rock & Wilson, 2005; Dudley, 2013; Murata, 2010). The end result is not only a better developed lesson, but research indicates that typically teachers also develop a stronger understanding of the content, enhanced observation skills, stronger collegial networks, and a tighter connection between daily practice and long-term goals (Lieberman, 2009; Lewis, Perry, & Hurd, 2004). The promise of lesson study as a professional development mechanism for classroom teachers in the United States led to its use with preservice teachers. Studies examining lesson study during pre-service teacher education document challenges and benefits of effective implementation of lesson study (Chassels & Melville, 2009; Marble, 2006; Sims & Walsh, 2009), recommendations for adapting lesson study (Cohan & Honigsfield, 2006), and the ways lesson study fosters quality preservice teacher reflection (Myers, 2012).

Similar to lesson study, teacher inquiry/action research involves teachers in the systematic and intentional study of their own teaching practice (see, e.g., Cochran-Smith & Lytle, 1993; 2009). Inquiring professionals seek out change by reflecting on their practice. They do this by engaging in a cyclical process of posing questions or "wonderings," collecting data to gain insights into their wonderings, analyzing the data along with reading relevant literature, taking action to make changes in practice based on new understandings developed during inquiry, and sharing findings with others (Dana & Yendol-Hoppey, 2014; Dana, 2013).

The research and literature on teacher inquiry/action research indicates its long, rich history and research on the process. Rooted in the work of John Dewey (1933), Kurt Lewin popularized the process in the 1940s (Adelman, 1993), and Stephen Corey (1953) applied it to the field of education shortly thereafter. The process has been utilized by pre-service teachers within initial teacher preparation programs (i.e., Cochran-Smith, Barnatt, Friedman, & Pine, 2009; Dana, Yendol-Hoppey, & Snow-Gerono, 2006; Grossman, 2005; Price & Valli, 2006; Rinke & Stebik, 2013), practicing teachers as a form of teacher professional development (i.e., Ermeling, 2010; Levin & Rock, 2003; Zeichner, 2003), and administrators to gain insights into school improvement (i.e., Dana, Tricarico, & Quinn, 2010; Jacobs, Yamamura, Guerra, & Nelson, 2013).

Research has focused on the influence of teacher inquiry on both preservice and inservice teacher learning. Findings suggest that practitioner research promotes deeper reflection about teacher identity (Levin & Rock, 2003; Rock & Levin, 2002) and can shift beliefs about instruction (Dawson & Dana, 2007; Hagevik, Aydeniz, & Rowell, 2012; Levin & Rock, 2003;

Rock & Levin, 2002). In addition, practitioner research has facilitated an increase in teachers' knowledge and understanding of students (Butler & Schnellert , 2012; Dresser, 2007; Levin & Rock, 2003; Rinke and Stebick, 2013; Rock & Levin, 2002; Wallace, 2013), promoted growth and change in teaching practice (Dresser, 2007; Ermeling, 2010; Levin & Rock, 2003; Rock & Levin, 2002), increased data literacy (Athanases, Wahleithner, & Bennett, 2012), and fostered attention to social justice and diversity issues (Athanases, Wahleithner, & Bennett,, 2012; Hyland & Noffke, 2005; Martin, 2005). Practitioner research fosters teacher empowerment and transformation as teachers deepen their understanding and improve practice (Bonner, 2006; Esposito & Smith, 2006; Merino & Holmes, 2006). Studies are also beginning to look at the positive influence inquiry has on student learning (Dawson, 2012; Esposito & Smith, 2006; Knight, Wiseman, & Cooner, 2000). In combination, these findings illustrate the power practitioner research offers educators in brick and mortar contexts who are interested in innovation that strengthens teacher and student learning.

Professional learning communities (PLCs) can serve as the "container" in which the processes of lesson study and inquiry may unfold. PLCs are defined generically as small groups of faculty and/or administrators who meet regularly to study more effective learning and teaching practices (Dana & Yendol-Hoppey, 2008). A professional learning community's time together is often structured by the use of protocols to ensure focused, deliberate conversation and dialogue by teachers about student work and student learning (McDonald, Mohr, Dichter, & McDonald, 2003). Protocols for educators provide a script or series of timed steps for how a conversation among professionals on a chosen topic will develop.

A variety of different protocols have been developed for use in professional learning communities by a number of noteworthy organizations such as Learning Forward (see, for example, Lois Brown's *Powerful Designs for Professional Learning*, 2004), School Reform Initiative (http://www.schoolreforminitiative.org/), and the National School Reform Faculty (www.nsrfharmony.org), who developed the version of a professional learning community called Critical Friends Groups (CFGs). The CFGs provide deliberate time and structures dedicated to promoting adult professional growth that is directly linked to student learning. When used within a professional learning community, protocols ensure planned, intentional conversation by teachers about student work, a teacher's dilemma, a lesson to be taught, or other aspects of practice. Different protocols are selected for use depending upon the topic for discussion. Recently, protocols that have been used in face-to-face professional development endeavors have also been adopted for online use (McDonald, Zydney, Dichter, & McDonald, 2012). Several studies on professional learning communities and protocols show the value inherent in this professional development organizational structure for teacher learning, and student learning when student learning is the explicit focus of learning community work (Curry, 2008; Little, Gearhart, Curry, & Kafka, 2003; McLaughlin & Talber, 2006; Phillips, 2003; Supovitz, 2002; Supovitz & Christman, 2003).

Complementing the wealth of literature on teacher professional development strategies such as lesson study, inquiry/action research, and professional learning communities in brick and mortar contexts, online teacher professional development (oTPD) has emerged in recent years and suggests its promise for brick-and-mortar teachers (Dede, Ketelhut, Whitehouse, Breit & McCloskey, 2009). However, much less research exists on professional development for K-12 online teachers despite the fact that the number of online and blended schools, programs, and courses continue to grow (Watson, Muir, Vashaw, Gemin & Rapp, 2012).

Research Synthesis

Professional Development for K-12 Online and Blended Teachers

While growth in online and blended learning increases the need for research on professional development in these contexts (Rice, 2009), this growth also complicates the process because K-12 online and blended learning models differ widely. Some teachers work full-time in virtual schools, others teach full-time in brick and mortar contexts and part-time in supplemental online programs not affiliated with their full-time positions, and others teach online and face-to-face courses in a brick and mortar school district (Rice, Dawley, Gasell & Florez, 2008). To further complicate matters these teachers might work in state-led, district-led, consortium-led, or charter schools (Rice & Dawley, 2009).

Still other teachers work in blended learning models ranging from brick and mortar teachers who use blended learning on an as-needed basis to online programs with face-to-face components required (Horn and Stake, 2011). While there are published studies about blended professional development (See, for example, Owston, Sinclair, & Wideman, 2008 and Berger, Eylon, & Bagno, 2008), there are few studies about professional development designed to support blended learning (see, for example, Wayer, 2013). Thus, most research discussed below is related to professional development for K-12 online teachers.

The Going Virtual! 2010 report (Dawley, Rice & Hinck, 2010) is the most comprehensive effort to describe the landscape of professional development for online teachers. A national survey of online teachers representing all the contexts mentioned above revealed that one-quarter of online teachers received no professional development prior to their first online teaching experience although most received professional development within their first five years of online teaching (Dawley, Rice, & Hinck, 2010). The content of these professional development efforts varied widely with training on technical skills being the most common and training related to meeting the needs of online students with disabilities being the topic on which online teachers most desired professional development (Dawley, Rice, & Hinck, 2010). This report is extremely useful in providing a snapshot of professional development models and practices for online teachers; however, survey research is not designed to provide a deep analysis of those models and practices.

One way to more deeply review professional development for online teachers is to consider this research in the context of what is already known about professional development in brick and mortar contexts. In the following sections, we examine literature on professional development for K-12 online teachers through the lens of Desimone's (2009) five core features of professional development (discussed earlier) in an effort to build on what is already known about quality professional development and consider similarities and differences for K-12 online teachers.

Content focus. This core feature emphasizes both subject matter content and how students learn the content. Some researchers have studied the practices of online teachers within different content areas and have advocated for differentiating professional development for online teachers, in part, based on the content and grade level they teach (Oliver, Kellogg, Townsend, & Brady, 2010; DiPietro, 2008, 2010; DiPietro, Ferdig, Black & Preston, 2008). However, most professional development opportunities for online teachers are focused on generic topics such as online teaching and learning or technical skills rather than teaching within a specific content area (Barbour, 2012; Dawley, Rice & Hinck, 2010). The five most common concepts identified in a national survey of professional development for online teachers were generic in nature (i.e. foundational knowledge, facilitation strategies, technology tools, online design and development and digital etiquette, behavior and assessment) although 64% of respondents to the survey reported receiving some content-specific professional development (Dawley, Rice & Hinck, 2010).

Content focus, as interpreted through the lens of online learning, may also address the need to provide focused professional development to other personnel who are critical to the success of K-12 online education. For example, Davis and Rose (2007) identified three potential roles of K-12 online educators - online teachers, designers of online instruction, and facilitators of online instruction. Online teachers work directly with online students to teach particular content while designers create the courses and instructional materials used by online teachers. Facilitators typically serve as a bridge between traditional and online education by working in brick-and-mortar schools with students enrolled in online courses (Borup, Graham & Drysdale, 2013; Varre, Keane & Irvin, 2010). Educators in each of these roles require professional development with content aligned to their particular job responsibilities. Ferdig, Cavanaugh, DiPietro, Black, and Dawson (2009) identify more roles for online educators that require content specific professional development including administrators, guidance counselors, technology coordinators, and local key contacts who handle registration and reporting issues. While this chapter is focused on K-12 online teachers, it is important to consider varying roles, often unique to K-12 online learning, when planning professional development, especially considering that online programs, especially those set in districts, have begun to rethink educator roles.

Active learning. This core feature involves professional development in which teachers are actively involved in the learning process and do more than listen to lectures. One way to promote active learning during professional development for online teachers is to use a variety of strategies and interaction formats such as modeling, role-playing, discussions, simulations and case studies (SREB, 2009). These strategies can be used to support teachers' active involvement in professional development related to a wide array of important skills and concepts in online teaching such as, but not limited to, providing online teachers with an awareness of and practice with providing quality student feedback (Liu & Cavanaugh, 2011), communicating with students and parents (Davis & Rose, 2007), identifying ways to differentiate instruction for all students including those at-risk (Archambault, Diamond, Coffey, Foures-Aalbu, Richardson, Zygouris-Coe, Brown & Cavanaugh, 2010), supporting community (Davis & Rose, 2007), facilitating online discussions (Rose & Smith, 2007) and online assessments (Davis & Rose, 2007). There are likely more options for active learning during professional development for online teachers because of the variety of media typically used during online instruction.

Coherence. This core feature relates to the extent to which what is taught in the PD program aligns with state and district goals and standards for student learning. Professional development for online teachers should also be aligned to standards related to online teaching and learning. Standards of online teaching and learning can be found in documents such as *National Standards for Quality Online Teaching* (iNACOL, 2011) and *Standards for Quality Online Teaching* (South Regional Education Board, 2006). Many schools also have their own standards for online education. In fact, over one-third of online teachers report that their professional development is based on guidelines developed by their place of employment or on no standards at all. Nearly 16% of online teachers are unsure whether standards guide their professional development (Dawley, Rice, & Hinck, 2010).

Coherence in professional development programs for online teachers can also be interpreted through a technical lens. Online teachers should receive professional development using the synchronous and asynchronous media with which they will be teaching (Davis & Rose, 2007). Teachers should obviously learn the technical aspects of such media, but they should also experience quality modeling on what it is like to learn via this media. Decades of research in teacher education and professional development show that teachers tend to teach as they were taught (Lortie, 1973), and this appears to be holding true for professional development of online teachers as well (Davis & Rose, 2007).

Duration. This core feature of professional development refers to the length of the programs. While research is not definitive on how much time is ideal, one-shot workshops are mainly ineffective for impacting change in the practices of brick-and-mortar teachers (Borko, 2004). A large percentage of online teachers participate in both ongoing professional development (81%) and one-time workshops (77%) (Dawley, Rice, & Hinck, 2010). While the high percentage of workshops may be interpreted as negative based on what is known about professional development, in some cases one-time workshops may be of more value to online teachers than to brick-and-mortar teachers. While there is little published research about the effectiveness of professional development for online teachers (whether it be ongoing or short-term), some online teachers report appreciating the flexibility, relevance, and brevity of workshops; particularly workshops hosted online by other teachers and workshops that address technical aspects of their job. These same teachers also appreciated the opportunity to analyze and reflect on their practices during a year-long action research initiative (Dana, Dawson, Wolkenhauer, & Krell, 2013). These preliminary findings suggest a mix of short and long-term professional development opportunities based on the content of the sessions may be appropriate for online teachers.

Collective participation. This core feature refers to teachers working together during professional development, often within professional learning communities. Over half (66%) of online teachers report participating in professional learning communities as part of their professional development activities although the specifics of such communities are not detailed (Dawley, Rice & Hinck, 2010). There are likely many more options to support collective participation by online teachers because these teachers are comfortable working with technology designed to support community and are used to collaborating with geographically disparate people.

Descriptive articles about professional learning communities for online teachers are somewhat commonplace in the literature (see Kennedy & Archambault, 2012 and Cavanaugh & Blomeyer, 2007), however, research is lacking. A recent dissertation examined online teachers' perceptions of their experience in a professional learning community and found the teachers believed the community supported their ability to help students succeed, to maintain a healthy balance between work and personal lives and to develop professionally (Purnell, 2013). Another study of an action research-based professional learning community suggests that combining a professional learning community with action research supports online teachers in improving their practice and in illuminating their voices to identify priorities and practices across a virtual school (Dawson, Dana, Wolkenhauer & Krell, 2013).

Implications for Policy and Practice

We know teachers make a difference in student outcomes in brick-and-mortar contexts and research on online teachers suggest that they, too, are one of the most important factors contributing to student success in online environments (Ferdig, 2010). Thus, effective policy and practice related to professional development for K-12 online teachers are imperative to the success of K-12 online schooling.

Based on what we learned from the research presented above we make the following recommendations for policy and practice related to professional development for K-12 online and blended teachers.

- All K-12 online or blended teachers should receive professional development prior to their first online or blended teaching experience. Data suggesting many teachers begin their online teaching careers without such preparation is unacceptable if the goal is to ensure quality online experiences for all students.
- Professional development for K-12 online or blended teachers should be systematically and intentionally planned across an organization whether it be a state-led, district-led, or consortium-based organization. Standards for quality online teaching and quality professional development for online teachers can be helpful in developing these plans. Likewise, having individuals whose main focus is professional development within the organization would also be helpful. Expecting individuals to take on too many varied responsibilities in an organization means they are unable to give appropriate attention to any area.
- Professional development opportunities should be provided for those new to teaching in

online or blended environments as well as for those with more experience. Professional learning should span the career of K-12 online teachers.

- Providers of professional development for K-12 online or blended teachers should familiarize themselves with literature on professional development practices for brick-and-mortar teachers as this can be helpful in informing practices for K-12 online teachers.
- While research-based literature on professional development for brick-and-mortar teachers can be helpful, modifications will likely evolve as more is learned about the unique needs of K-12 online or blended teachers. For example, professional development will need to align with the unique roles played by online teachers and with the unique technological tools, infrastructures, and pedagogies used in online environments. Similarly, professional development for teachers who blend within their classroom must include effective face-to-face and online pedagogy so these teachers can make decisions about which parts of their curriculum would be best implemented online.
- Providers of professional development for K-12 online and blended teachers should also be well-versed in principles of instructional design (Morrison, Ross & Kemp, 2010).
- Providers of professional development for K-12 online and blended teachers should ensure a robust evaluation system is in place to determine the effectiveness of and guide the improvement of the professional development. Rigorous models used to evaluate brick-and-mortar professional development will likely prove helpful here (Guskey, 2000).
- Providers of professional development for K-12 online and blended teachers should consider reaching out to university faculty who are working in and studying the K-12 online movement. Such partnerships have the potential to enrich professional development experiences and to positively impact research and evaluation on such professional development.
- K-12 school districts may also want to encourage, and ideally fund, their teachers to seek out degrees or certificates from accredited universities with coursework in online teaching and learning, online instructional design, blended learning, and/or K-12 online education.

Implications for Research

Research on professional development for K-12 online and blended teachers is currently limited. iNACOL has published edited books with primarily descriptive articles on professional development practices for K-12 online teachers (Kennedy & Archambault, 2012; Wortmann et. al., 2008; Cavanaugh & Blomeyer, 2007). iNACOL has also published several reports about blended learning including reports that give advice to blended teachers (Vanderkam, 2013) and examples of blended learning in practice (Bernatek, Cohen, Hanlon & Wilka, 2012). While these books and reports are certainly useful, iNACOL has identified the need for research "into promising practices for preparing all education professionals to support learners in K-12 blended and online learning environments" as a priority in the field of K-12 online and blended learning (iNACOL, online). We argue that identifying promising practices is important but not sufficient in terms of research on PD for K-12 online teachers and make the following recommendations for research:

- Research on PD for K-12 online and blended teachers should be conducted via mutually beneficial partnerships between K-12 online and blended organizations and university scholars who study the K-12 online learning movement.
- Research on PD for K-12 online and blended teachers should address a variety of research questions including ones associated with implementation and outcomes. Research focused on implementation could focus on the media used to offer the PD, the sustainability of the PD, the design of the PD, and the practices used by those delivering the PD. Research focused on outcomes could focus on teacher knowledge, teacher practices, and student performance. Research on how blended teachers select which parts of their curriculum to implement online would also be advantageous as blended teachers currently have little direction in this area.
- Research on PD for K-12 online and blended teachers should use a variety of methods ranging from small case studies and design-based research (DBR) initiatives to larger scale mixed method and quasi-experimental designs. Research methods should also take into account the wealth of data available through K-12 online and blended learning. Surveys of the state of PD for K-12 online teachers such as the GoingVirtual! Series should also continue.
- Research on professional development for K-12 online and blended teachers should consider how what is known about PD for brick-and-mortar teachers might transfer to PD for K-12 online and blended teachers. Based on our research synthesis presented above, Desimone's core features of professional development align well with much of what is known about professional development for K-12 online and blended teachers. However, we also identified some potential nuances related to PD for K-12 online and blended teachers. The table below summarizes Desimone's core features of professional development and the nuances we identified. Research is needed to substantiate these nuances and/or to identify core features of professional development for K-12 online teachers. Research is also needed to determine whether research-supported PD models such as lesson study, action research, and professional learning communities transfer to PD for K-12 online teachers.

Table 1: Desimone's Core Features of Professional Development and K-12 Online Learning

Core Features	Definition	Additional Consideration for Online and Blended Educators
Content focus	PD programs should emphasize both subject matter content and how students learn the content.	PD programs should also emphasize the varying roles encompassed in virtual contexts (i.e. administrators, designers, counselors, etc.). PD for blended teachers should also take into account the nature of face-to-face and online instruction.
Active learning	PD programs should actively involve teachers in the learning process.	There are likely more options for active learning during professional development for online teachers because of the variety of media typically used during online instruction.
Coherence	What is taught in the PD program should align with state and district goals and standards for student learning.	PD programs should also align with standards for online and/or blended teaching and learning and with the type of media teachers will use when teaching in their online or blended context.
Duration	PD programs of longer duration should be emphasized over short-term workshops.	A mix of short and long-term professional development opportunities based on the content of the sessions may be appropriate for online and blended teachers.
Collective Participation	Teachers should work together during PD programs.	PD programs for online and blended teachers are particularly well-suited for development of professional learning communities because of online teachers' comfort working and collaborating in online environments and because of the geographical distance often separating online teachers.

Conclusion

As K-12 online and blended learning continues to grow, so will the need to provide professional development to K-12 online teachers. It is clear from our research synthesis that there is much work to do in this area, and in this chapter we have only scratched the surface of what is needed in terms of policy, practice, and research. We recommend that a concerted effort, possibly via a professional organization or research-minded virtual school in collaboration with university scholars, be undertaken to develop an agenda for policy, practice, and research related to professional development for K-12 online teachers.

References

Alderman, C. (1993). Kurt Lewin and the origins of action research. *Educational Action Research,1* (1), 7-24.

Archambault, L., Diamond, D., Coffey, M., Foures-Aalbu, D., Richardson, J., Zygouris-Coe, V.,Brown, R. and Cavanaugh, C. 2010. *Research committee issues brief: An exploration of at-risk learners and online education*. Vienna, VA: iNACOL.

Athanases, S.Z., Wahleithner, J.M., & Bennett.L.H. (2012). Learning to attend to culturally and linguistically diverse learners through teacher inquiry in teacher education. *Teachers College Record, 114*, 1-50.

Barbour, Michael, "Training Teachers for a Virtual School System: A Call to Action" (2012). Education Faculty Publications.Paper 102. http://digitalcommons.sacredheart.edu/ced_fac/102

Barnett, M. (2002). Issues and trends concerning electronic networking technologies for teacher professional development: A critical review of the literature. *The annual meeting of American Educational Research Association*. New Orleans, LA.

Berger, H., Eylon, B. S., & Bagno, E. (2008). Professional development of physics teachers in an evidence-based blended learning program. *Journal of Science Education and Technology, 17*(4), 399-409.

Bernatek, B. Cohen, J., Hanlon, J., Wilka, M. (2012). *Blended Learning in Practice: Introduction to Case Studies from Leading Schools.* Vienna, VA: iNACOL.

Bonner, P. J. (2006). Transformation of teacher attitude and approach to math instruction through collaborative action research. *Teacher Education Quarterly, 33*, 27-44.

Borko, H. (2004). Professional development and teacher learning: Mapping the terrain. *Educational researcher, 33*(8), 3–15.

Borup, J., Graham, C. R., & Drysdale, J. S. (2013). The nature of teacher engagement at an online high school. *British Journal of Educational Technology.*

Butler, D.L., & Schnellert, L. (2012). Collaborative inquiry in teacher professional development. *Teaching and Teacher Education, 28*, 1206-1220.

Cavanaugh, C., & Blomeyer, R. L. (Eds.). (2007). *What works in K-12 online learning*. International Society for Technology in Education.

Chassels, C., & Melville, W. (2009). Collaborative, reflective, and iterative Japanese lesson study in an initial teacher education program: Benefits and challenges. *Canadian Journal of Education, 32*(4), 734-763.

Chokshi, S., & Fernandez, C. (2004). Challenges to importing Japanese lesson study: Concerns, misconceptions, and nuances. *The Phi Delta Kappan, 85*(7), 520-525.

Cohan, A., & Honigsfeld, A. (2006). Incorporating 'lesson study' in teacher preparation. *The Educational Forum, 71*(1), 81-92.

Cochran-Smith, M., Barnatt, J., Friedman, A., & Pine, G. (2009). Inquiry on inquiry: Practitioner research and student learning. *Action in Teacher Education, 31*(2), 17-32.

Cochran-Smith, M., & Lytle, S. L. (1993). *Inside/outside: Teacher research and knowledge.* New York: Teachers College Press.

Cochran-Smith, M., and Lytle, S.L. (1999). Relationships of knowledge and practice: Teacher learning in communities. *Review of research in education, 24*, 249-305.

Cochran-Smith, M., & Lytle, S. L. (2009). *Inquiry as stance: Practitioner research for the next generation.* New York: Teachers College Press.

Corey, S.M. (1953). *Action research to improve school practices.* New York: John Wiley

Curry, M. W. (2008). Critical friends groups: The possibilities and limitations embedded in teacher professional communities aimed at instructional improvement and school reform. *Teachers College Record, 110*(4), 733-774.

Dana, N. F., Dawson, K., Wolkenhauer, R., & Krell, D. (2013). Pushing the envelope on what is known about professional development: the virtual school experience. *Professional Development in Education, 39*(2), 240-259.

Dana, N. F. (2013). *Digging deeper into action research: A teacher inquirer's field guide.* Thousand Oaks, CA: Corwin Press.

Dana, N. F., & Yendol-Hoppey, D. (2014). *The reflective educator's guide to classroom research: Learning to teach and teaching to learn through practitioner inquiry.* Thousand Oaks, CA: Corwin press.

Dana, N. F., Yendol-Hoppey, D., & Snow-Gerono, J. L. (2006). Deconstructing inquiry in the professional development school: Exploring the domains and contents of teachers' questions. *Action in Teacher Education, 27*(4), 59–71.

Dana, N. F., Dawson, K, Wolkenhauer, R. and Krell, D. (2012). Virtual educator inquiry: Design and implementation of a year-long program to mentor virtual educators in the action research process. In. K. Kennedy & L. Archambault (Eds.), *Lessons Learned in Teacher Mentoring: Supporting Educators in K–12 Online Learning Environments* (pp. 115-130). Vienna, VA: iNACOL.

Dana, N. F., Tricarico, K., & Quinn, D. (2010). The administrator as action researcher: A case study of five principals and their engagement in systematic, intentional study of their own practice. *Journal of School Leadership, 19*(3), 232-265.

Dana, N. F., & Yendol-Hoppey, D. (Eds.). (2008). *The reflective educator's guide to classroom research: Learning to teach and teaching to learn through practitioner inquiry. Corwin Press.*

Davis, N., & Rose, R. (2007). Research Committee Issues Brief: Professional Development for Virtual Schooling and Online Learning. *North American Council for Online Learning.*

Dawley, L., Rice, K., & Hinck, G. (2010). *Going Virtual! 2010: The status of professional development and unique needs of K-12 online teachers*. Retrieved June, 11, 2013.

Dawson, K. (2012). Using action research projects to examine teacher technology integration practices. *Journal of Digital Learning in Teacher Education, 28*(3), 117-124.

Dawson, K., & Dana, N.F. (2007). When curriculum-based, technology-enhanced field experiences and teacher inquiry coalesce: An opportunity for conceptual change? *British Journal of Educational Technology, 38*(4), 656-677.

Dawson, K., Dana, N. F., Wolkenhauer, R., & Krell, D. (2013). Identifying the priorities and practices of virtual school educators using action research.*American Journal of Distance Education, 27*(1), 29-39.

Dede, C., Ketelhut, D. J., Whitehouse, P., Breit, L., & McCloskey, E. M. (2009). A research agenda for online teacher professional development. *Journal of teacher education, 60*(1), 8-19.

Dewey, J. (1933). *How we think: A restatement of the relation of reflective thinking to the educational process*. Lexington, MA: Heath

Desimone, L. M. (2009). Improving impact studies of teachers' professional development: Toward better conceptualization and measures. *Educational Researcher, 38*, 181-199.

DiPietro, M. (2008). Virtual school pedagogy: Beliefs, goals, and practices of K-12 virtual school teachers. Unpublished doctoral dissertation. Gainesville, FL: University of Florida.

DiPietro, M., Ferdig, R. E., Black, E. W., & Preston, M. (2008). Best practices in teaching K-12 online: Lessons learned from Michigan Virtual School teachers. *Journal of Interactive Online Learning, 7*(1), 10-35.

Dresser, R. (2007). The effects teacher inquiry in the bilingual language arts classroom. *Teacher Education Quarterly, 34*(3), 53-66.
Dudley, P. (2013). Teacher learning in lesson study: What interaction-level discourse analysis revealed about how teachers utilized imagination, tacit knowledge of teaching and fresh evidence of pupils learning, to develop practice knowledge and so enhance their pupils' learning. *Teaching and Teacher Education, 34*, 107.
Easton, L. B. (2004). *Powerful designs for professional learning.* Oxford, OH: National Staff Development Council.
Esposito, J., & Smith, S. (2006). From reluctant teacher to empowered teacher researcher. *Teacher Education Quarterly, 33*(3), 45-60.
Ermeling, B.A. (2010). Tracing the effects of teacher inquiry on classroom practice. *Teaching and Teacher Education, 26,* 377-388.
Ferdig, R. E. (2010). Continuous Quality Improvement Through Professional Development for Online K-12 Instructors. *Michigan Virtual University.*
Ferdig, R. E., Cavanaugh, C., Dipietro, M., Black, E., & Dawson, K. (2009). Virtual schooling standards and best practices for teacher education. *Journal of Technology and Teacher Education, 17(*4).
Fernandez, C. (2002). Learning from Japanese approaches to professional development: The case of lesson study. *Journal of Teacher Education, 53*(5), 393-405.
Fernandez, C., Cannon, J., & Chokshi, S. (2003). A U.S.–Japan lesson study collaboration reveals critical lenses for examining practice. *Teaching and Teacher Education, 19*(2), 171-185.
Garet, M. S., Porter, A.C., Desimone, L., Birman, B. F., & Yoon, K.S. (2001). What makes professional development effective? Results from a national sample of teachers. *American Educational Research Journal, 38*, 915-945.
Grossman, P. (2005). Research on pedagogical approaches in teacher education. In M.
Cochran-Smith & K. M. Zeichner (Eds.), *Studying teacher education: The report of the AERA panel on research and teacher education* (pp. 425–476). Mahwah, NJ: Erlbaum.
Guskey, T. R. (2000). *Evaluating professional development.* Corwin Press.
Hagevik, R., Aydeniz, M., & Rowell,C.G.(2012). Using action research in middle level teacher education to evaluate and deepen reflective practice. *Teaching and Teacher Education, 28,* 675-684.
Horn, M. B., & Staker, H. (2011). The rise of K-12 blended learning. I*nnosight Institute.* Retrieved on September, 7, 2011.
Hyland, N.E., & Noffke, S.E. (2005). Understanding diversity through social and community inquiry: An action research study. *Journal of Teacher Education, 56*(4), 367-381.

International Association for K-12 Online Learning (2013). Research agenda. Retrieved March 31, 2013 from http://www.inacol.org/cms/wp-content/uploads/2013/04/iNCL_Research_Agenda_v8.5b_lr_web.pdf.

International Association for K-12 Online Learning (2011). National standards for quality online teaching. Retrieved March 3, 2013 from http://www.inacol.org/cms/wp-content/uploads/2013/02/iNACOL_TeachingStandardsv2.pdf.

Jacobs, J., Yamamura, E., Guerra, P., & Nelson, S.W. (2013). Emerging leaders for social justice: Negotiating the journey through action research. *Journal of School Leadership, 23,* 91-120.

Joyce, B. R. and Showers, B. (1995). *Student achievement through staff development.* White Plains, NY: Longman, Inc.

Kennedy, K. & Archambault,. L. (2012). Lessons learned in teacher mentoring: Supprting educators in K-12 onilne learning environments. Vienna, VA: iNACOL.

Killion, J. and Harrison, C. (2006). *Taking the lead: New roles for teachers and school-based coaches.* Oxford, OH: National Staff Development Council.

Knight, S.L, Wiseman, D.L., Cooner, D. (2000). Cooperative teacher research to determine the impact of professional development school activities on elementary students' math and writing outcomes. *Journal of Teacher Education, 51*(1), 26-38. *Learning Forward.* Available from: http://www.learningforward.org/index.cfm. [Accessed March 4, 2014].

Lee, H. J. (2005). Developing a professional development program model based on teachers' needs. *The Professional Educator, 27*(1), 39-49.

Levin, B.B., & Rock, T.C. (2003). The effects of collaborative action research on preservice and experienced teacher partners in professional development schools. *Journal of Teacher Education, 54*(2), 135-149.

Lewis, C., Perry, R., & Hurd, J. (2004). A deeper look at lesson study. *Educational Leadership, 61*(5), 18.

Lieberman, A. (1995). Practices that support teacher development: transforming conceptions of professional learning. *Phi Delta Kappan, 76*(8), 591-596.

Lieberman, J. (2009). Reinventing teacher professional norms and identities: The role of lesson study and learning communities. *Professional Development in Education, 35*(1), 83-99.

Little, J. W., & McLaughlin, M.W. (1993). Teachers' work: Individuals, colleagues, and contexts. New York: Teachers College Press.

Little, J. W., Gearhart, M., Curry, M., & Kafka, J. (2003). Looking at student work for teacher learning, teacher community, and school reform. *Phi Delta Kappan, 83*(3), 185-

192.
Liu, F., & Cavanaugh, C. (2011). Success in online high school Biology: Factors influencing student academic performance. *Quarterly Review of Distance Education, 12*(1).
Lortie, D. C. (1973). Observations on teaching as work. *Second handbook of research on teaching,* 474-497.
Marble, S. T. (2006). Learning to teach through lesson study. *Action in Teacher Education, 28*(3), 86-96.
Martin,R.J. (2005). An American dilemma: Using action research to frame social class as an issue of social justice in teacher education courses. *Teacher Education Quarterly, 32*(2), 5-22.
McLaughlin, M. W., & Talbert, J. E. (2006). *Building school-based teacher learning communities.* New York: Teachers College Press.
Merino, B.J. & Holmes, P. (2006). Student teacher inquiry as an "entry point" for advocacy. *Teacher Education Quarterly, 33*(3), 79-96.
McDonald, J. P., Mohr, N., Dichter, A., & McDonald, E. C. (2003). *The power of protocols: An educator's guide to better practice.* New York: Teachers College Press.
Morrison, G. R., Ross, S. M., Kemp, J. E., & Kalman, H. K. (2010). *Designing effective instruction.* (5th Ed). Hoboken, NJ: John Wiley & Sons, Inc.
Murata, A. (2010). Teacher learning with lesson study. Penelope Peterson, Eva Baker, & Barry McGaw (Eds.), *International encyclopedia of education (third edition)* (pp. 575-581). Oxford: Elsevier.
Myers, J. (2012). Lesson Study as a Means for Facilitating Preservice Teacher Reflectivity. *International Journal for the Scholarship of Teaching & Learning,6*(1).
Oliver, K., Kellogg, S., Townsend, L., & Brady, K. (2010). Needs of elementary and middle school teachers developing online courses for a virtual school. *Distance Education, 31*(1), 55-75.
Owston, R., Sinclair, M., & Wideman, H. (2008). Blended learning for professional development: An evaluation of a program for middle school mathematics and science teachers. *The Teachers College Record, 110*(5), 1033-1064.
Perry, R., & Lewis, C. C. (2009). What is successful adaptation of lesson study in the US? *Journal of Educational Change, 10*(4), 365-391. doi:10.1007/s10833-008-9069-7
Phillips, J. (2003). Powerful learning: Creating learning communities in urban school reform. *Journal of Curriculum and Supervision, 18*(3), 240-258.
Price, J.N., & Valli, L. (2005). Preservice teachers becoming agents of change: pedagogical implications for action research. *Journal of Teacher Education, 56*(1), 57-72.

Purnell, C. P. (2013). *Exploring teachers' perceptions of professional development in virtual learning teams.* Florida Atlantic University.

Rice, K. (2009). Priorities in K-12 Distance Education: A Delphi Study Examining Multiple Perspectives on Policy, Practice, and Research. *Educational Technology & Society, 12* (3), 163–177.

Rice, K., & Dawley, L. (2009). The status of professional development for K-12 online teachers: Insights and implications. *Journal of Technology and Teacher Education, 17*(4), 523-545.

Rice, K., Dawley, L., Gasell, C., & Florez, C. (2008). Going virtual. *Unique needs and challenges of K-12 online teachers. Washington, DC: North American Council for Online Learning.*

Rinke, C.R., & Stebick, D.M. (2013). "Not just learning about it but actually doing it": The evolution of a teacher inquiry culture. *Action in Teacher Education, 35,* 72-84.

Rock, T.C., & Levin, B.R. (2002). Collaborative action research projects: Enhancing preservice teacher development in professional development schools. *Teacher Education Quarterly, 29*, 7-21.

Rock, T. C., & Wilson, C. (2005). Improving teaching through lesson study. *Teacher Education Quarterly, 32*(1), 77.

Rose, R. & Smith, A. (2007). Online discussions. In Cavanaugh, Cathy, and Robert L. Blomeyer, eds. *What works in K-12 online learning*. International Society for Technology in Education, 2007, p. 147-160.

Sims, L., & Walsh, D. (2009). Lesson study with preservice teachers: Lessons from lessons. *Teaching and Teacher Education, 25*(5), 724-733.

Southern Regional Education Board (SREB). (2009). Guidelines for professional development of online teachers. Retrieved March 2, 2014 from http://publications.sreb.org/2009/09T01_Guide_profdev_online_teach.pdf.

Southern Regional Education Board (SREB). (2006). Standards for quality online teaching. Retrieved March 2, 2014 from http://publications.sreb.org/2006/06T02_Standards_Online_Teaching.pdf

Sparks, D. and Hirsh, S. (1997). *A new vision for staff development*. Alexandria, VA: Association for Supervision and Curriculum Development.

Supovitz, J. A. (2002). Developing communities of instructional practice. *Teachers College Record, 104*(8), 1591-1626.

Supovitz, J. A. & Christman, J. B. (2003). *Developing communities of instructional practice: Lessons from Cincinnati and Philadelphia.* Philadelphia, PA: Consortium for Policy Research in Education, University of Pennsylvania.

Vanderkam, L. (2013). *Blended Learning: A Wise Giver's Guide to Supporting Tech-Assisted Teaching*. Vienna, VA: iNACOL.

Varre, C. D. L., Keane, J., & Irvin, M. J. (2010). Enhancing online distance education in small rural US schools: a hybrid, learner-centred model. *Research in Learning Technology, 18*(3).

Wallace, C.S.(2013). Promoting shifts in preservice science teachers' thinking through teaching and action research in informal science settings. *Journal of Science Teacher Education, 24*, 811-832.

Watson, J., Murin, A., Vashaw, L., Gemin, B., & Rapp, C. (2012). Keeping Pace with K-12 Online Learning: An Annual Review of Policy and Practice, 2012. *Evergreen Education Group.* Retrieved March 1, 2014 from http://kpk12.com/cms/wp-content/uploads/EEG_KP2013-lr.pdf.

Wayer, N. (2013). From Design to Enactment: A Case Study of Blended Learning Across the Content Areas in a K-12 School. Unpublished doctoral dissertation, University of Florida.

Wortmann, K., Cavanaugh, C., Kennedy, K., Beldarrain, Y., Letourneau, T., & Zygouris-Coe, V. (2008). Online Teacher Support Programs: Mentoring and Coaching Models. *North American Council for Online Learning.*

Whitford, B. L., & Wood, D. R. (2010). *Teachers learning in community: Realities and possibilities.* Albany, New York: State University of New York Press.

Yendol-Hoppey, D., and Dana, N. F. (2010). *Powerful professional development: building expertise within the four walls of your school.* Thousand Oaks, CA: Corwin Press.

Zeichner, K. (2006). Teacher research as professional development for P-12 educators in the US. *Educational Action Research, 11*(2), 301-306.

Chapter 12

Mentoring for Online Teachers

Kara Dawson, *University of Florida, dawson@coe.ufl.edu*
Nancy Fichtman Dana, *University of Florida, ndana@coe.ufl.edu*

Abstract

The purpose of this chapter is twofold. First, we provide a synthesis of what is known about mentoring in general, mentoring for K-12 brick and mortar teachers, and mentoring for K-12 online teachers. In order to synthesize this literature we have divided it into the broad categories of (1) the benefits and challenges of mentoring, (2) characteristics of effective mentors, (3) characteristics of effective mentees, (4) characteristics of effective mentoring programs, and (5) strategies to support mentoring. Second, we use this knowledge as a springboard to suggest policy and research implications for the mentoring of K-12 online teachers.

Introduction

Mentoring in K-12 education is a specialized form of professional development typically designed to meet the unique needs of new teachers or teachers transitioning from a brick and mortar setting to a virtual school or online context. While the previous chapter reviewed literature on professional development in general, we devote an entire chapter to mentoring because it is "one of the most important strategies to support novices' learning to teach and, thus, to improve the quality of teaching" (Wang, 2001, p. 52). And, it is also an important strategy to support continued professional development throughout an educator's career.

The concept of mentoring can be traced back to Homer's myth of Odysseus when the king entrusts his son to Mentor during his time in battle. The name Mentor has since been adopted to refer to someone with a strong knowledge base and extensive experience who teaches and guides others with less knowledge and/or experience (Kram, 1985). The less knowledgeable and/or experienced other is often called a protégé or mentee. While the concept of mentoring dates back to Homer, mentoring in K-12 contexts began in earnest in the 1980s and escalated in the 1990s with governmental policies to guide and mandate the spread of mentoring practices for new teachers (Hobson, Ashby, Malderez & Tomlinson, 2009). Mentoring for K-12 online teachers has received increased attention with the rise of K-12 virtual schools and other opportunities for teachers to teach and students to learn in online environments (Kennedy & Archamabult, 2012).

First, we provide a synthesis of what is known about mentoring in general and about mentoring for K-12 brick and mortar teachers. Next, we discuss mentoring for K-12 online teachers. Finally, we use this knowledge as a springboard to suggest policy, practice, and research implications for mentoring K-12 online and blended teachers.

Mentoring in general and specifically for K-12 teachers

Mentoring is a highly complex and contextual process, however, research across mentoring programs and contexts is relatively consistent. In order to synthesize the mentoring literature we have divided it into the broad categories of (1) the benefits and challenges of mentoring, (2) characteristic of effective mentors, (3) characteristics of effective mentees, (4) characteristics of effective mentoring programs, and (5) strategies to support mentoring. In the following sections we synthesize literature within each of these categories using general mentoring literature as well as literature on mentoring in K-12 brick and mortar contexts.

Benefits and challenges of mentoring

Mentoring can be instrumental to the socialization of new employees and to the transfer of tacit knowledge within organizations and disciplines (Swap, Leonard, Shields & Abrams, 2001) and has been demonstrated as effective across numerous disciplines including social work, entrepreneurship, business, and education (Perren, 2003).

Mentoring has been shown to elevate job performance, improve career outcomes and advancement opportunities, lead to salary increases, increase job satisfaction, increase career committee, and decrease turnover across disciplines (Allen, Eby, Poteet, Lentz, & Lima, 2004; Chao, Walz, & Gardner, 1992; Fagenson, 1989; Koberg, Boss, & Goodman, 1998; Lungding, Clements, & Perkins, 1978; Mullen, 1994: Noe, 1988; Scandura, 1992; Underhill, 2006; Whitely, Dougherty, & Dreher, 1991).

Mentoring in K-12 brick and mortar contexts has been shown to lead to similar outcomes for mentees including improved behavior and classroom management skills, ability to manage time and workloads, and ability to adapt to the standards and expectations of the teaching context (Wang & O'Dell, 2002; Evertson & Smithey, 2000; Ballantyne, Hansford, & Packer, 1995). In addition, research suggests mentoring for K-12 brick and mortar teachers can lead to reduced feelings of isolation, increased morale and job satisfaction, increased confidence and self-esteem, professional growth, and improved reflective and problem solving abilities (Mathur, Gehrke & Kim, 2013; Hobson et. al., 2009; Strong, Villar, & Fletcher, 2008; Yendol-Hoppey & Dana, 2008). While less conclusive, research has also suggested a link between mentoring and student achievement in mentees' classrooms (Hobson et. al., 2009; Strong, Villar, & Fletcher, 2008).

Research in K-12 contexts also suggests benefits for mentors including, but not limited to, increased self-reflection on their own practice, increased opportunities for collaboration with other teachers, improved communication skills, increased confidence in their own abilities, improved relationships with their own students, and increased professional satisfaction (Hanson & Moir, 2008; Simpson, Hastings, & Hill, 2007).

While the majority of literature on mentoring in K-12 environments reports positive results, several challenges, referred to as "the dark side of mentoring" by Long (1997), are also noted for both the mentor and the mentee. Challenges for mentees including ineffective or insensitive mentors, mentors unable or unwilling to devote sufficient time to the mentoring process, a lack of opportunities to reflect and critically examine their practices, and increased stress levels due to the time and energy required of them during the mentoring process. Challenges for mentors are similar and include lack of time and/or incentives to participate in the mentoring process, unmanageable workloads because mentoring is added to a full-time teaching assignment, lack of proper preparation to be a mentor, and insecurities caused when the mentor's own teaching practices are place under scrutiny by mentees (Hobson et. al., 2009). While these challenges are very real and have the potential to influence any mentoring situation, the literature also identifies characteristics of effective mentors, mentees, and mentoring programs, as well as strategies to support mentoring, many of which could lessen or alleviate these challenges.

Characteristics of effective mentors

Successful mentors tend to exhibit the following characteristics regardless of the context in which the mentoring occurs (Daloz, 1986; NASA, 2003; Ramani, Gruppen & Kachur, 2006;

Swap et. al., 2001):

- *Expertise.* Mentors should recognize patterns, synthesize information to solve complex problems, and readily access additional knowledge and information when needed.
- *Confidence*. Mentors should be secure in their own positions and abilities so they are willing and able to support the development of others. Mentors lacking confidence may be concerned with their personal welfare at the expense of helping to fully develop mentees.
- *Interpersonal Skills.* Mentors should have a genuine interest in helping mentees. They should have good listening skills, the ability to give both positive and constructive feedback, and the ability to resolve conflicts when necessary. Mentors also must be compassionate.
- *Self Awareness*. Mentors should be aware of the way their own experiences have shaped their personal and professional lives. They should be aware of any gender or cultural biases and work to ensure they do not adversely impact their mentoring.
- *Commitment.* Mentors should be willing and able to commit the time necessary to serve. Individuals with hectic personal or professional lives may not be able to give adequate time and attention to mentoring even if they wish to do so.
- *High yet Reasonable Expectations.* Effective mentors balance the need to support, challenge, and help provide a vision for mentees' future. They provide reasonable challenges with adequate support and assist the mentee in developing a vision for his future.

Research on mentoring in brick and mortar educational contexts support this more generic research. For example, in an extensive research study comparing mentor teachers in the United States, UK, and China, Wang (2001, p. 71-72) found that:

> Relevant teaching experience, though important, is not a sufficient condition for a teacher to be a professional mentor. Mentors who are practicing or moving toward practicing the reform-minded teaching may not develop the necessary conceptions and practices of mentoring that offer all the crucial opportunities for novices to learn to teach in a similar way. Thus, when selecting mentor teachers, not only is it important to consider the relevant teaching experiences of mentors but it is also important to identify how mentors conceptualize mentoring and their relevant experience in conducting the kind of mentoring practices expected.

In addition, literature on K-12 mentoring suggests that effective mentors also have the following characteristics (Hobson et. al, 2009; Yendol-Hoppey & Dana, 2007; Rippon & Martin, 2006; Clarke & Jarvis-Selinger, 2005):

- *Student-centered approach to teaching.* Mentors with this approach to teaching are more likely to have a mentee-centered approach to mentoring, are more likely to encourage mentees to reflect on their practice and are more likely to be able to demonstrate effective teaching practices for their mentees.
- *Comfort with being observed in their classrooms:* Mentors need to be confident in their own teaching abilities so that mentees can observe their practices and ask questions.
- *Strong work ethic.* Teaching is hard work and mentors should demonstrate that work ethic through their daily practices.
- *Commitment to educating all students.* Mentors should be committed to equity, meeting the needs of all students, and social justice. A mentee should see explicit examples of how this plays out in the mentor's classroom and be able to articulate to the mentor how she strives for the same.
- *Commitment to inquiry.* Inquiry involves teachers studying and reflecting on their practice in order to improve it. Mentors should be committed to such an inquiry stance and strive to facilitate that stance in their mentees.

Characteristics of effective mentees

Mentees are also important in the mentoring process and are also responsible for actively participating in and facilitating the mentoring process. Mentees with the following characteristics increase the likelihood of successful mentoring across contexts (Bierema & Merriam, 2002; NASA, 2003) including K-12 environments (Hobson et. al., 2009; Yendol-Hoppey & Dana, 2007).

- *Respect for Others*. Mentees likely to gain the most from mentoring have a general respect for others and recognize their need to learn and grow in the profession.
- *Eagerness to Learn.* Mentees should have a strong desire to learn and grow. They should be motivated and able to take initiative both on the job and within the mentoring relationship.
- *Ability to Accept Feedback*. Mentees must be able to accept feedback with grace and humility. And, they must be able to discuss and enact that feedback in positive ways.
- *Commitment:* Mentees should be willing and able to commit the time necessary to participate in a mentoring program. Individuals with hectic personal or professional lives may not be able to give adequate time and attention to mentoring even if they wish to do so.

Characteristics of effective mentoring programs

Mentoring programs can take a variety of forms. *Traditional one-to-one mentoring* occurs when a more knowledgeable and experienced person guides and teaches a less knowledgeable or experienced other. *Group mentoring* occurs when a more knowledgeable and experienced person guides and teaches a group of less knowledgeable or experienced others. *Team mentoring* occurs when several more knowledgeable and experienced people guide and teach a group of less knowledgeable or experienced others. *Supervisory mentoring* occurs when a person in a position of power mentors subordinates. *Situational or special projects mentoring* occurs for a brief period of time with clear and concise goals. *Peer mentoring or coaching* occurs when individuals of about the same knowledge, experience, and rank support each other (Bierema & Merriam, 2002; MENTOR, 2009).

There is also a wealth of literature on the characteristics of successful mentoring programs that are relevant regardless of the format of the program (Morrison, Ross & Kemp, 2007; Biereman & Merriam, 2002; Forret, 1996; Kogler Hill & Gant, 2000; NASA, 2003: Perren, 2003; Ramani, Gruppen & Kachur, 2006). These include a strong instructional design that includes clearly stated expectations and goals, a focus on mentees' individual growth and development as opposed to a sole focus on performance, clearly articulated expectations for communication between the mentor and mentee (or mentees), the ability for mentors and mentees to self-select each other as much as possible, incentives for mentors and mentees to participate and plans for evaluating success and embarking on continuous improvement of the mentoring program.

In general, effective mentoring programs for K-12 teachers combine instructional support, technical support, emotional support, and opportunities for mentors and mentees to work collaboratively to improve teaching practices and student learning (Fieman-Nemser, 1998). More specifically, literature in K-12 environments suggests the following characteristics for successful mentoring programs in addition to the generic characteristics mentioned above (Hobson et. al., 2009; Yendol-Hoppey & Dana, 2007; Harrison, Dymoke, & Pell, 2006): situating mentoring programs in schools characterized by collegiality and peer learning, providing appropriate mentor preparation, developing a community of practice for mentors and for mentees who can support each other regardless of whether they reside in the same school (possibly through technology), utilizing intentional strategies to develop a strong relationship between mentor and mentee(s) to provide the emotional support often needed by novice teachers, utilizing a multidimensional approach to mentoring that includes emphasis on curriculum, pedagogy, content, student learner, context, and classroom management without negating the necessary emotional support, using intentional strategies to promote self and critical reflection during the mentoring process, providing opportunities for the mentoring to take place during the school day possibly through release time for mentor and mentee(s), providing opportunities for the mentors to be involved in the design and evaluation of the mentoring program, pairing mentors and mentee who teach in the same or similar disciplines, ensuring that mentors have neither supervisory nor evaluative responsibilities for the mentee(s), providing opportunities for either mentor or mentee to request a new pairing without fear of consequence, and jointly developing and writing goals that are evaluated periodically by the mentor and mentee(s).

Strategies to support mentoring

Strategies for effective mentoring have been identified across contexts including K-12 environments. Six of the most common strategies include: (1) working within the mentee's zone of proximal development, (2) encouraging metacognition, (3) employing active learning strategies, (4) learning by observing, (5) learning through participation and (6) implementing adult learning principles.

Working within the mentee's zone of proximal development. A zone of proximal development represents the difference between what a mentee can do and understand on his own versus what he can do and understand with help and support from a more knowledgeable other (Vygotsky, 1978). Novices often have fragmented or incomplete understandings while experts tend to recognize patterns, make complex inferences from situations, and have extensive experience that make it difficult for them to understand how mentees may be thinking. Given that novices often lack foundational knowledge and experiences and, thus, may not have appropriate schema to learn from the mentor, mentors must work to scaffold the mentee from the place where they currently are to increasingly advanced places of higher understanding. This requires that mentors possess strong listening skills and continuously work to ensure mentees are operating from developmentally appropriate contextual and conceptual understanding. Many of the strategies described below can help mentors scaffold mentees to higher levels of understanding.

Encouraging metacognition. Encouraging metacognition and self-monitoring during the mentoring process is important for the development of mentees. Metacognition is essentially the ability to be self-aware of one's own thinking (Flavell, 1976; Hartman, 2001). Metacognitive people are able to self monitor their thinking, determine what information they have, what information they need, and whether their line of reasoning is plausible when solving a problem. Mentors can encourage such self-monitoring by asking relevant questions that scaffold a mentee toward higher levels of understanding. Feedback from the mentor regarding the mentees answers is also an important part of the process. In essence, the mentor wants to try to give the mentee a glimpse into his/her thinking. Mentors want to focus on the task at hand and not on the mentee as a person because an emphasis on the latter is frequently harmful to learning when mentees interpret this as a judgment of competence (Kluger & DeNisi, 1992).

Employing active learning strategies. Active learning supports learner-centered strategies that allows the mentees to take responsibility for their own learning (Bonwell & Eisen, 1991; Gagne, 1966). Active learning may refer to behavioral or cognitive activity (Kirschner, Sweller & Clark 2006). This may occur through active dialogue where the mentor encourages the mentee to ask questions, embark on authentic experiences, demonstrate a technical skill or simulate a company or school protocol (i.e. how to greet a customer or how to organize a parent-teacher conference). This may also occur through case studies, vignettes, or simulations.

Learning by observing. Observation is a powerful mentoring strategy (Bandura, 1977; Brown, Collins & Deguid, 1989), and providing mentees opportunities to observe mentors and other knowledgeable others in action may greatly enhance mentee growth and development.

Learning through participation. While observation may be an initial first step in the mentoring process, mentors may want to provide mentees with scaffolding opportunities for increasingly complex participation within the organization or school. This process, often referred to as legitimate peripheral participation, is often a successful strategy for enculturating members into the organization's community of practice (Wenger, 1998).

Implementing adult learning strategies. Adult learning strategies encompass much of what has been discussed in the previous sections. Mentors should respect mentees as adult learners and recognize their need for self-direction, relevance, and practicality. Mentors should also recognize that mentees will bring their personal experiences (past and present) to the mentoring relationship and likely desire goal-oriented planning as part of the mentoring process. Mentees will also appreciate it when mentors are in tune with their concerns as novice teachers (Knowles, 2012; Hobson et. al., 2009).

Clearly, much is known about mentoring in general and about mentoring for K-12 brick and mortar teachers. However, much less is known about mentoring K-12 online and blended teachers.

Research Synthesis

Mentoring for K-12 Online and Blended Teachers

In a previous section we overviewed literature related to the benefits of mentoring. Mentoring can also be effective in virtual organizations (Lavin Colky & Young, 2006) and for K-12 online teachers (Kennedy & Archambault, 2012).

The characteristics of mentor and mentees and effective strategies for mentoring hold true in online contexts; however, the geographical distances associated with such mentoring typically require increased levels of trust, self-motivation, flexibility, communication skills, and technical skills (Lavin Colky & Young, 2006).

The variety of different models for online learning, the variety of different contexts in which online teachers teach, and the lack of research-based literature make it difficult to succinctly describe how mentoring occurs for K-12 online and blended teachers (Kennedy & Archambault, 2012). However, over 60% of online teachers report participating in peer mentoring or coaching as part of their professional development (Dawley, Rice, & Hinck, 2010).

There is a small but growing body of literature describing how mentoring occurs for K-12 online teachers who work for virtual schools. The majority of this literature is published through iNACOL (International Association for K-12 Online Learning) in books such as *Lessons learned in teacher mentoring: Supporting educators in K-12 online learning environments* which devotes several chapters to describing mentoring programs in various virtual organizations (Kennedy & Archambault, 2012) and *Online teacher support programs: Mentoring and coaching models* (Wortmann, Cavanaugh, Kennedy, Bledarrain, Letourneau and Zygouris-Coe, 2008) which briefly summarizes mentoring models at selected virtual organizations. Other models are also described in journal articles (See, for example, Barbour, Kinsella, Wicks & Toker, 2010).

Most of the models described in these books consider mentoring as one component of their larger professional development program. In some cases, new teachers enroll in a professional development course prior to teaching their first online course and then proceed through multiple, formal levels of mentoring where scaffolding is decreased as the teacher becomes more experienced and demonstrates her competence as an online teacher (Pape, Leavey, Michalowski, Ribeiro & Worrell, 2012). In other cases, virtual organizations implement a one-to-many program where mentors are formally trained and assigned to a group of mentees in order to ensure adequate mentor preparation and to promote community within the organization (Wagner, 2012). Other organizations implement a model that includes one-to-one mentoring as well as situational (or just-in-time) mentoring that allows mentees to take advantage of the wealth of expertise within the organization (Cozart, 2012; O'Mara & Gietl, 2012). Some virtual organizations also provide mentor preparation to experienced teachers interested in mentoring new K-12 online teachers (Pape et. al., 2012; Wagner, 2012). In almost all cases, the mentoring programs are described as works in progress that evolve based on the goals of continuous improvement and improved student performance (Kennedy & Archambault, 2012).

While there are few published descriptions of mentoring programs for K-12 online teachers, they far outnumber research on the topic. In one instance, university researchers served as mentors to a group of online teachers embarking on action research for the first time. Research from this work elicited recommendations for mentoring online during the various stages of the action research cycle (Dana, Dawson, Wolkenhauer, & Krell, 2012). This research led to another initiative in which the same university researchers prepared online teachers to become action research mentors within the virtual school. These online teachers participated in professional development offered by the university researchers about mentoring action research and simultaneously mentored a group of online teachers through the action research process (Krell, Wolkenhauer, & Dana, 2012). Results from this work demonstrate that, when action research mentors are prepared to support online teachers through the process, it can benefit the virtual organization as well as the individual teachers who have an opportunity to carefully examine their own beliefs and practices (Dana & Dawson, 2012).

Another study explored the practices used by online teachers to motivate students through the lens of Keller's ARC model (Carpenter, 2011) and extrapolated from these findings recommendations for mentoring programs designed to increase student motivation. These recommendations included having mentors provide direct instruction on giving feedback, opportunities for deliberate practice, and reflection (Carpenter & Cavanaugh, 2012).

Finally, in one study practicing online teachers were prepared to mentor preservice teachers with an interest in online teaching (Kennedy, Cavanaugh & Dawson, 2013). While this study focused on the experiences of the preservice teachers, it was clear that attention to the mentoring process is essential for designing such experiences.

While there is limited research on mentoring for or by online or blended teachers, there is evidence to suggest that it is one of the most effective strategies for improving instruction in online environments (Farley & Lare, 2012). The online environment is conducive to supporting effective mentoring strategies (i.e. working within the mentee's zone of proximal development, encouraging metacognition, employing active learning strategies, learning by observing, and learning through participation) and supporting a variety of mentoring approaches (i.e. traditional one-on-one, peer, group, team, supervisory and situational). However, for mentoring to reach its potential for K-12 online teachers, more research is needed to guide practice.

Implications for Policy and Practice

Mentoring falls under the larger umbrella of professional development, and many of the recommendations we made in the previous chapter on professional development hold true for mentoring. In addition, policy and practice for the mentoring of K-12 online and blended teachers should consider the following:

- Ensure mentoring programs are designed using research-based best practices from other contexts and from mentoring for K-12 brick and mortar teachers.
- Ensure a selection process that considers the characteristics of effective mentors and mentees is in place to identify participants.
- Ensure mentors and mentees are given adequate time and incentives to effectively participate in mentoring programs.
- Ensure mentors are prepared for their mentoring roles.
- Ensure mentoring is provided to all teachers whether they are teaching online or moving their brick and mortar classes to a blended model.
- Ensure mentoring is provided to all teachers new to online or blended teaching whether they have previous teaching experience in brick and mortar contexts or not.
- Ensure opportunities to participate in mentoring are available for all teachers, not just those who are new to teaching in online environments.
- Promote mutually beneficial collaborations between those leading mentoring efforts and university scholars studying in this area.
- Ensure mentoring programs include robust evaluation plans and that data collected are used to inform future iterations of the programs.

Implications for Research

As stated in the previous chapter, research on professional development for K-12 online and blended teachers is scarce. However, research on mentoring K-12 online and blended teachers is almost non-existent. A first step to developing a research agenda in this area might be to study the variety of mentoring programs currently underway across a variety of contexts and develop a taxonomy or way of describing categories or types of mentoring programs. It is possible that the types of programs described earlier will hold true, but so little is known about mentoring practices for K-12 online and blended teachers that this is not certain. Similarly, there is a need to identify commonalities and distinctions between mentoring for K-12 brick and mortar teachers and mentoring for K-12 online and blended teachers. There is also a need to study the outcomes of these programs including their influence on teaching practices and student performance. These mentoring programs should also be studied through the lens of mentors, mentees, and mentor trainers. In addition, research on the design of these programs is necessary to identify core features of effective mentoring programs and to identify strategies and technologies most well-suited to different contexts and teachers. A variety of methods should guide these studies, and it would be very helpful to have a portal within which all these studies can be readily accessed such as the Research Clearinghouse for K-12 Blended and Online Learning (http:// http://k12onlineresearch.org/)

Conclusion

Mentoring is a very important component of a robust professional development plan for virtual schools and organizations, but there is little to no research to guide the development and implementation of mentoring programs for K-12 online teachers. There is also little to no research on the effectiveness of these programs. However, there is a strong research base for mentoring across other contexts, including brick and mortar K-12 education. The chapter begins a conversation about how to apply this research to the mentoring of K-12 online teachers.

References

Archambault, L., Diamond, D., Coffey, M., Foures-Aalbu, D., Richardson, J., Zygouris-Coe, V.,Brown, R. and Cavanaugh, C. 2010. *Research committee issues brief: An exploration of at-risk learners and online education.* Vienna, VA: iNACOL.

Ballantyne, R., Hansford, B., & Packer, J. (1995). Mentoring beginning teachers: A qualitative analysis of process and outcomes. *Educational Review,47*(3), 297-307.

Bandura, A. (1977). Self-efficacy: toward a unifying theory of behavioral change. *Psychological review, 84*(2), 191.

Barbour, M., Kinsella, J., Wicks, M., & Toker, S. (2009). Continuing Change in a Virtual World: Training and Recruiting Instructors. *Journal of Technology and Teacher Education, 17*(4), 437-457.

Bierema, L.L. & Merriam, S.B. (2002). E-mentoring: Using computer mediated communication to enhance the mentoring process. *Innovative Higher Education, 26*(3), 211-227.

Bonwell, C.; Eison, J. (1991). *Active Learning: Creating Excitement in the Classroom AE-HE-ERIC Higher Education Report No. 1*. Washington, D.C.: Jossey-Bass. ISBN 1-87838-00-87.

Brown, J.S., Collins, A. & Duguid, P. (1989). Situated cognition and the culture of learning. *Educational Researcher, 18*(1), 32-42.

Carpenter, J. (2011). An exploratory study of the role of teaching experience in motivation and academic achievement in a virtual ninth grade English I course. Unpublished dissertation, University of Florida.

Carpenter, J. & Cavanaugh, C. (2012). Increasing student motivation through mentoring pratices. In. K. Kennedy & L. Archambault (Eds.), *Lessons Learned in Teacher Mentoring: Supporting Educators in K–12 Online Learning Environments* (pp. 103-114). Vienna, VA: iNACOL.

Daloz, L.A. (1986) *Effective Teaching and Mentorship: Realizing the Transformational Power of Adult Learning Experiences,* San Francisco, CA: Jossey-Bass.

Dana, N. F., Dawson, K, Wolkenhauer, R. and Krell, D. (2012). Virtual educator inquiry: Design and implementation of a year-long program to mentor virtual educators in the action research process. In. K. Kennedy & L. Archambault (Eds.), *Lessons Learned in Teacher Mentoring: Supporting Educators in K–12 Online Learning Environments* (pp. 115-130). Vienna, VA: iNACOL..

Dawley, L., Rice, K., & Hinck, G. (2010). *Going Virtual! 2010: The status of professional development and unique needs of K-12 online teachers.* Retrieved June, 11, 2013.

Evertson, C. M., & Smithey, M. W. (2000). Mentoring effects on proteges' classroom practice: An experimental field study. *The Journal of Educational Research, 93*(5), 294-304.

Farley, G. & Lare, D. (2012). Instructional supervision in cyberschools. In. K. Kennedy & L. Archambault (Eds.), *Lessons Learned in Teacher Mentoring: Supporting Educators in K–12 Online Learning Environments* (pp. 131-146). Vienna, VA: iNACOL.

Feiman-Nemser, S. (1998). Teachers as teacher educators. *European Journal of Teacher Education, 21*(1), 63-74.

Flavell, J. H. (1976) Metacognitive aspects of problem solving. In L. B. Resnick (Ed.), The nature of intelligence (pp. 231–236). Hillsdale, NJ: Erlbaum.

Foret, M.L. (1996). Issues facing organizations when implementing formal mentoring programs. *Leadership and Organizational Development Journal, 17*(3), 27-30.

Gagné, R. (1966). "Varieties of learning and the concept of discovery: A critical appraisal". *Shulman, L. S. and Keislar, E. R. (Eds) Learning by discovery: A critical appraisal.* Chicago:

Rand McNally and Co.

Hartman, H. J. (2001). Metacognition in Learning and Instruction: Theory, Research and Practice. Dordrecht: Kluwer Academic Publishers.

Kennedy, K., Cavanaugh, C., & Dawson, K. (2013). Preservice teachers' experience in a virtual school. *American Journal of Distance Education, 27*(1), 56-67.

Kennedy, K. & Archambault,. L. (2012). Lessons learned in teacher mentoring: Supprting educators in K-12 onilne learning environments. Vienna, VA: iNACOL.

Kirschner, P.A.; Sweller, J.; Clark, R.E. (2006). Why minimal guidance during instruction does not work: an analysis of the failure of constructivist, discovery, problem-based, experiential, and inquiry-based teaching. *Educational Psychologist 41* (2): 75–86.

Kogler Hill, S.E. & Gant, G. (200). Mentoring by minorities: The organizational communication support program. *Review of Business, 21*(1/2), 33-38.

Kram, K. E. (1985). *Mentoring at work: Developmental relationships in organizational life.* Glenview, IL: Scott Foresman.

Krell, D., Wolkenhauer, R. & Dana, N.F. (2012). Action Research Goes Virtual: Strategies for Coaching the Action Research Process in Online Spaces. Association of Teacher Educators. St. Louis, MO.

Kluger, A.N. & DeNisi, A. The effects of feedback intervention on performance: a historical review, a meta-analysis, and a preliminary feedback intervention theory. Pyschological Bulletin, 199(2), 254-284.

Lavin Colky, D., & Young, W. H. (2006). Mentoring in the virtual organization: Keys to building successful schools and businesses. *Mentoring & Tutoring,14*(4), 433-447.

MENTOR (2009). *Elements of Effective Practice for Mentoring*, 3rd Edition. MetLife Foundation, Alexandria, VA.

Morrison, G. R., Ross, S. M., Kemp, J. E., & Kalman, H. K. (2007). *Designing effective instruction*. (5th Ed). Hoboken, NJ: John Wiley & Sons, Inc.

NASA (2003). *Mentoring program handbook: A guide for human resource professionals at NASA.* NASA: Washington, DC.

Perren, L. The role of e-mentoring in entrepreneurial education and support: a meta-reivew of academic literature. *Education + Training, 45*(8/9), 517-525.

Ramani, S., Gruppen, L., & Kachur, E. K. (2006). Twelve tips for developing effective mentors. *Medical teacher, 28*(5), 404-408.

Swap, W., Leonard, D., Shields, M. & Abrams, L. (2001). Using mentoring and storytelling to transfer knowledge in the workplace. *Journal of Management in Information Systems, 18*(1), 95-114.

Vygotsky, L.S. (1978). *Mind and society: The development of higher psychological processes*. Cam-

bridge, MA: Harvard University Press.
Wang, J. (2001). Contexts of mentoring and opportunities for learning to teach: A comparative study of mentoring practice. *Teaching and Teacher Education, 17*, 51-73.
Wang, J., & Odell, S.J. (2002). Mentored learning to teach according to standards-based reform: A critical review. *Review of Educational Research, 72*(3), 481-546.
Wenger, Etienne (1998), *Communities of Practice: Learning, Meaning, and Identity*, Cambridge, MA: Cambridge University Press
Wortmann, K., Cavanaugh, C., Kennedy, K., Beldarrain, Y., Letourneau, T., & Zygouris-Coe, V. (2008). Online Teacher Support Programs: Mentoring and Coaching Models. *North American Council for Online Learning.*
Yendol-Hoppey, D., & Dana, N. F. (2007). *The reflective educator's guide to mentoring: Strengthening practice through knowledge, story, and metaphor.* Thousand Oaks, CA: Corwin Press.

V.
Research on the Role of the Other

What's this section about? The familiar adage suggests that it takes a village to raise a child. The innovations of K-12 online and blended learning brought that adage to life. For instance, a student enrolled at a face-to-face school but taking a class from a virtual program might have a mentor to support their work. Parents now have greater access to their child's work. And, administrators, school psychologists, and librarians were now being asked to think more deeply about engagement in online and blended curriculum. The chapters in this section address what we currently know about the role of the other in these settings.

What's in this section? McLeod and Richardson look critically at the area of school administrator preparation for K-12 online and blended learning and urge the field to put great effort into this research, as the administrators are key in leading these new learning environments. They concede that currently and for the near future, these leaders will continue to make decisions without evidence-based findings.

Hasler Waters, Menchaca, and Borup convey that research in K-12 online and blended learning shows there is some importance of parental involvement for student achievement. They admit that there are variances in results given the nature of the spectrum of parental involvement in students' lives. They also find that measuring the quality of support and the type of support parents offer their children is key in understanding just how much parental involvement affects student achievement in K-12 online and blended learning and learning in general.

Borup and Drysdale admit that there is a great amount of self-report data in the research involving student mentoring/facilitation. They urge that it is important for researchers to identify effective practices for on-site and online facilitators/mentors and that practitioners should work to develop clear strategies for the preparation for these essential educators.

Tysinger, Tysinger, and Diamanduros delve into the area of school psychology and how that plays out in K-12 online and blended learning. Very little is known about school psychology services in these settings, however, the authors see some overlap with traditional services including crisis interventions and cyber bullying prevention. Much can be learned from school psychology in traditional settings, but the authors acknowledge the field's need to determine how student support services change as they transition to the online learning environment.

Despite the proliferation of K-12 online learning options and the strides school libraries have made toward virtualization of resources and online information fluency instruction, Kelly and Boyer suggest there is not a significant body of research specific to libraries in K-12 online environments. The stage is set, however, for this research to occur. Extant research discussed in this chapter includes studies exploring the need for and formats of embedded library services, as well as those probing the role of librarians in online environments. Comparing this emerging body of research with early strides school libraries have made toward online embedded efforts suggests multiple paths for new research in this field.

What's missing from this section? Future iterations of this book will provide chapters that continue to lay a framework for understanding the role of the other in K-12 online and blended environments. There are opportunities for new authors to add to this Handbook by writing about critical other roles, including school counselor, that emerge with transformations in online and blended models.

Chapter 13

School Administrators and K-12 Online and Blended Learning

Scott McLeod, *Prairie Lakes Area Education Agency, dr.scott.mcleod@gmail.com*
Jayson W. Richardson, *University of Kentucky, jayson.richardson@uky.edu*

Abstract

The importance of administrators to school and student success has long been recognized. This chapter examines the research literature on school administrators and P-12 online and blended learning. Unfortunately, despite the growing presence of online learning in both P-12 and higher education, the research literature addressing possible intersections with school principals and superintendents is extremely sparse. Right now the research landscape is essentially a green field; wide open for any and all explorations. Until a more robust research base exists to inform practice, we will continue to see educators and policymakers implement online learning environments without much guidance from the scholarly literature.

Introduction

The importance of administrators to school and student success has long been recognized. For example, other than classroom teachers themselves, principals are the school-related factor that has the greatest impact on student achievement (Leithwood & Riehl, 2003; Marzano & Waters, 2009; Vitaska, 2008), accounting for approximately one-fourth of all school-related learning impacts (Leithwood, Louis, Anderson, & Wahlstrom, 2004). Understanding the actions of leaders at all levels of our educational systems is essential for school improvement efforts and for effective policymaking.

This chapter examines the research literature on school administrators and K-12 online and blended learning. The number of online schools and classrooms continues to proliferate rapidly and it is helpful to know what guidance researchers can lend regarding learning impacts, best practices, obstacles and challenges, and many other implementation issues. While some of the knowledge about effective virtual school leadership may be similar to what is already known from more traditional brick-and-mortar settings, much will be different as learning and teaching migrates to these new technology-mediated and geographically-independent school environments.

Research Synthesis

Unfortunately, despite the growing presence of online learning in both P-12 and higher education, the research literature addressing possible intersections with school principals and superintendents is extremely sparse. What little research does exist is very fractured. There are neither clear lines of study that are being developed by individual researchers or teams of scholars across the country, nor are there places or people that seem to be adopting these research areas as focal points. At best there exist random, scattershot individual studies related to administrators and K-12 online and/or blended learning. The sections below attempt to coalesce the extant literature into some basic categories.

Online Preparation of Traditional School Leaders

The bulk of the peer-reviewed scholarship that exists regarding school administrators and K-12 online and blended learning has to do with online preparation of school principals and superintendents. These studies focus on traditional school administrator preparation programs and what occurs as these programs move online in part or in their entirety. These programs are focused on preparing administrators who can lead brick-and-mortar schools, not virtual learning environments. The research on these programs can be organized into several broad themes, including questions about whether online school leadership preparation programs are even appropriate, how to make that preparation most effective, and student experiences within those programs, among others.

Suitability of online or blended preparation of school leaders

Like for many other professions, much of the early literature related to online and blended learning in traditional preservice school administration programs addressed the suitability of technology-mediated learning spaces for principal and superintendent preparation. For instance, Brown and Corkill (2004), instructors in a fully-online educational leadership program, offered advocacy and general guidance for online teaching of preservice school leaders. They detailed how online instructors need to be cognizant of emotion, clarity and organization, class instructions, video and audio links, chats, projects, and student competencies. They also noted that online instructors of preservice administrators need to be responsive and caring if they are to create effective online learning environments.

In contrast, Killion (2002) recounted the basics of online learning and then debated the appropriateness of this mode of delivery for the field of educational leadership. After outlining the existing research at that time about the benefits and attractiveness of online learning, she went on to describe some potential pitfalls for school administrator preparation, including content and process quality, hidden costs, and other factors. Noting that the work of principals and superintendents in the field is "in the moment" and thus requires attention to "messages delivered not only in words, but also in voice tone and gestures" (pp. 6-7), Killion concluded by stating that "it is difficult to imagine how online learning will build the essential face-to-face interpersonal communication that is the hallmark of an effective leader" (p. 6).

Debates have continued over the past decade about the suitability of online and blended learning spaces for preservice administrators. For instance, both Ghezzi (2007) and Beem (2010) wrote narratives presenting the pros and cons of online educational leadership credentials. While practicing administrators regularly report a need for more flexible credentialing options, determination of how to best operationalize that need often has been a challenge. Both Ghezzi and Beem recognized the reality that teaching and learning in online programs can be very different compared to more traditional 'brick-and-mortar' programs. Both authors focused on the outputs of online preparation and compared those to the outputs from traditional face-to-face programs. Ghezzi also noted that blended learning models - defined by satellite connections, distance programs, or videotaped lessons - have long been a tradition in school leadership preparation programs.

Effectiveness of online or blended preparation of school leaders

Despite the early reservations of Killion (2002) and others, many school leaders are indeed earning their educational leadership credentials online. Instead of debating the suitability of Internet-mediated learning spaces for school administrator preparation, later authors have recognized the inevitability of online learning and instead focused on how to make virtual and blended learning environments more effective for preservice principals and superintendents. One example of this type of research is a self-study by Alvich et al. (2009), which described one university's early efforts to develop a hybrid educational leadership doctoral program. Students met three times per course, with the rest of the coursework and discussion occurring within an online learning management system. Additional fieldwork and dissertation courses also were part of the program, as were occasional campus visits for programmatic events such as defenses. End-of-course evaluations and students' reflective journals were used to assess the quality of the program. High percentages of the students in the preservice leadership program indicated their satisfaction with the blended model.

Similarly, Norman (2013) focused his dissertation on analyzing the content, completion rate, and student satisfaction for a practicum in one Florida educational leadership program that shifted from face-to-face delivery to online delivery. Through usage of surveys, interviews, and descriptive statistical analysis of demographic data, Norman found that course outcomes continued to be achieved after the transition. He also reported that student satisfaction and course completion rates remained high.

Other researchers also have focused on the structure of blended pre-professional course work for school principals and superintendents. For instance, Korach and Agans (2011) focused on one university's approach to incorporating an online learning management system, online discussion threads, and digital portfolios into its school leadership preparation program. Compared to the university's traditional face-to-face program, the authors found that the blended program fostered a community of learners, facilitated authentic leadership, and was "a powerful catalyst for leadership learning" (p. 230). Although the nature of instruction in that program is unclear, the authors noted that questions remained about "effective faculty development for the promotion of constructivism through online technologies" (p. 230).

Student satisfaction surveys and end-of-course evaluations appear to be common instruments used to judge the effectiveness of online or blended school administrator preparation courses and programs. For example, Sampson et al., (2010) compared a hybrid course delivery to that of a fully-online version of the same course using a student satisfaction survey. Students' level of satisfaction was not impacted by the mode of delivery. Moreover, both courses were rated low in similar areas - communication and teamwork - indicating that course content and pedagogy were more critical than the delivery model. Similarly, Sherman, Crum, and Beaty (2010) found that preservice administrators believed that their online course experiences were as equally successful as - but didn't necessarily hold an advantage over - their face-to-face classroom interactions.

Experiential aspects of online or blended preparation of school leaders

Some scholars have focused on the experiences of preservice administrators within online or blended preparation programs rather than the structural aspects of those programs. In a recent study, Ford and Vaughn (2011) investigated the experiences of a cohort of 14 students who went through a four-year online educational administration doctoral program. The authors discussed faculty and student relationships, technology issues, professional learning, identity, and collaboration. Online identity was a particular emphasis, including how virtual identities interplay with academic learning outcomes. In a practitioner-oriented article, Miller, Bennicoff-Nan, and Maestas (2010) presented their own experiences with earning an online doctorate in school administration. These authors discussed why they chose their institutions and detailed their experiences within their virtual programs.

Characteristics of online or blended preparation of school leaders

Rounding out the research that has attempted to globally assess or describe online and blended preparation programs for administrators who will serve in traditional schools, there also are some studies that have examined particular characteristics of these types of programs. For instance, Tucker and Dexter (2010) described the use of online, electronic cases in several educational leadership programs. Similarly, Rasmussen (2013) discussed the use of participant reflection in online educational administration courses. Both Shinsky and Stevens (2011) and LaFrance and Calhoun (2013) looked at the utilization and perceived benefits of social media and other online tools in preservice administrator courses. Garland and Martin (2004) used interviews to compare online and traditional school leadership cohorts, noting various relationships between preservice administrators' learning styles, program satisfaction, and delivery modality. Israel (2013) investigated whether it is possible to create ethical and resilient school leaders within online course delivery formats. Sherman and Beaty (2007) collected information on the types of distance technologies used by school leadership preparation programs as well as factors that affected greater or lesser usage of those tools. All of these studies help illuminate various aspects of virtual preparation programs for leaders of traditional schools.

Challenges of online or blended preparation of school leaders

Finally, describing some of the challenges of online preparation for school administrators, Owen (2012) wrote a peer-reviewed fictional case study that focused on a department chair's attempt to build an online option for school administrators. While this case is not empirical, it does portray some of the struggles and nuances that underlie the online preparation of school administrators. Owen's case touched on many aspects that accompany the development of an online school leadership degree, including the perception that online programs are 'degree mills,' student preferences for face-to-face contact, the offering of market-competitive degree programs, faculty preparedness, university infrastructure, recruitment into online programs, and administrative support structures. Although the case study was intended to be a lens on organizational theory, it illustrates the dilemmas that many university educational leadership programs must face as they initiate online or blended learning options for preservice school leaders.

Practices and Preparation of Virtual School Leaders

Although the literature described above discussed the virtual preparation of traditional school leaders, there also are a few reports and studies that address the practices and preparation of leaders of virtual schools. These articles are insufficient, however, to paint a rich picture of virtual school leadership, and we are in clear need of more research that addresses the unique needs of online school leaders. Nonetheless, what exists is described below.

In her 2010 dissertation, Lee studied the planning and implementation processes of two new virtual charter schools in Wisconsin. Stating that "guidance in planning and implementing these schools is crucial [for translating] educational philosophy into practice" (p. iv). Lee noted that six primary principles should guide virtual school leaders' work at the inception stages: 1) building consensus, 2) defining roles and responsibilities, 3) assessing needs and obtaining resources, 4) collaboration and teamwork, 5) external constraints management, and 6) a time efficiency process. Once virtual schools are up and running, Abrego and Pankake (2010) stressed the critical role of virtual school leaders as builders of organizational capacity and facilitators of organizational culture.

Another study attempted to ferret out the distinctions between virtual school leadership and virtual school management. Quilici and Joki (2011) paired up online principals and teachers who then interacted in a supervision-evaluation cycle. While the virtual school principals viewed themselves as instructional leaders (as defined by the Interstate School Leaders Licensure Consortium, ISLLC), the online teachers viewed their online principals more as managers. The authors noted that additional training in cognitive coaching and more frequent human contact could help close the discrepancy in perceptions.

Salsberry (2010) also discussed virtual school leaders' behaviors within the context of standards. Instead of administrator standards, however, she examined the AdvancEd school accreditation standards. Salsberry went through each of the seven primary accreditation standards and raised questions that were pertinent to leaders of online schools such as 'Does the teacher evaluation system reflect the unique skills, knowledge, and dispositions required for a virtual environment?' and 'How would a leader determine the nature of the [virtual] school climate?'

Salsberry's questions are quite helpful when considering what it means to transition traditional conceptions of school leadership into online contexts.

Given the growing prevalence of Internet-mediated learning opportunities for both students and educators, even if principals or superintendents are not leading virtual schools they still would likely benefit from some knowledge of and experience with online and blended learning environments. As Wenzel (1998) noted, immersion in and basic understandings of the technologies that are used helps school administrators make informed judgments about support and infrastructure. Additionally, administrators who have some familiarity with online learning spaces are more likely to positively influence the thinking of their teaching staff, parents, and communities and to facilitate additional virtual learning opportunities.

Unfortunately, despite the admonition by Abrego and Pankake (2010) that administrator preparation programs must "include specific training that ensures that school leaders acquire very specific knowledge and skills on how to reculture their schools and districts as e-learning and/or virtual campuses" (p. 11), most administrators do not get much exposure to the leadership aspects of online learning environments. LaFrance and Beck (2014) conducted a study of all of the school leadership preparation programs certified by the National Council for Accreditation of Teacher Education (NCATE) in order to determine the extent to which preservice administrators were exposed to virtual school settings. They found that only 9% of these university programs offered some type of field experiences in online school settings. Moreover, they also found that "more than 75 percent of NCATE-accredited educational leadership programs [had] no plans to add such a [virtual] field experience" (p. 181). This lack of attention to online school leadership positions is concerning given the rapid increase in virtual schools.

School Leaders and Perceptions of Online or Blended Credentialing

A third, small subset of the literature pertaining to school administrators and online or blended learning has addressed the viability of online credentialing for hiring purposes. These studies have focused on the perceptions of those individuals who are in positions to make employment decisions and have investigated the perceived credibility of teacher online credentials by principals as well as administrators' own online credentials.

In regard to teachers, Huss (2007) surveyed over 300 principals in three states to determine their level of concern regarding online teacher preparation programs. Only 2% of respondents said that they would be unconcerned if a teaching candidate applied for employment in their building with a credential that had been attained wholly or almost wholly via the Internet, and

59% of the principals said that they would be 'very concerned.' Nearly 95% of the principals stated that online teaching degrees carried less credibility than those earned in traditional, off-line programs. Given the choice between two candidates with strong interviews and comparable transcripts, less than 1% of the principals said that they would choose the teacher who was trained online over the teacher from a traditional brick-and-mortar program.

Similarly, Adams, Lee, and Cortese (2012) surveyed nearly 700 high school principals to see how they thought about online, partly online, and traditional teacher training programs. Respondents displayed a strong preference for coursework taken in traditional residential teacher training programs. Principals expressed particular concerns about the ability of preservice teachers to develop important social skills in wholly or partly online preparation programs. The authors noted that their results paralleled those in other professional disciplines, such as health, business, and university teaching (p. 7). Faulk's (2011) surveys of 72 Texas public school superintendents echo these findings. Faulk noted that superintendents "appear[ed] to be open-minded to [online preservice learning] but appear[ed] to be unconvinced that it will prepare teachers for the challenges that teachers face" (p. 25).

Regarding principals and superintendents, Ghezzi (2007) postulated that school administrators' online degrees may not be accepted by all school districts and that states may not accept online degrees for school principal or superintendent certification. A pair of articles several years later seemed to confirm the former. In their first article describing a nationwide study of school district human resource directors, Richardson, McLeod, and Garrett Dikkers (2011a) reported that the respondents believed strongly that online principal preparation programs are of lower quality than face-to-face programs and that traditional programs do a better job than online alternatives of preparing candidates for the demands of the principalship. The human resource directors also expressed greater faith in the quality of blended programs compared to those that were wholly online and in online principal preparation programs delivered by traditional colleges and universities compared to wholly online institutions. Additionally, they noted that it was more difficult to assess the quality of online principal preparation programs than it was for traditional face-to-face programs (see also Richardson, 2010).

A second article from Richardson, McLeod, and Garrett Dikkers (2011b) delved into the treatment by school districts of administrative applicants with online credentials. Human resource directors from across the United States consistently emphasized their concerns about principal candidates who were trained wholly or even partly online. Nearly two-thirds of the directors stated that they would treat candidates who were prepared wholly online differently during the hiring process and many reported that they would not even consider those candidates for employment. Another challenge noted by the respondents was a felt need for additional district investigation into the quality of online principal preparation programs, which thus required additional time and/or personnel. The majority of urban school district human resource directors felt capable of assessing the quality of online preservice principal programs, while the majority of rural district directors felt exactly the opposite.

Miscellaneous Studies of Administrators and Online or Blended Learning
The remaining studies that exist at this time regarding school administrators and online or blended learning represent a mixed bag of topics. Areas of study include school leaders' general perceptions of online learning, professional development, policy considerations, evaluation tools, and other issues. Each of these articles is discussed briefly in the paragraphs that follow.

Picciano and Seaman (2007; 2009) found in a pair of surveys of district level administrators that online learning opportunities are growing rapidly and are meeting a variety of student and school system needs. They also found that most school districts rely on multiple online learning providers and that virtual coursework was considered especially useful by the leaders of small, rural school districts.

As part of a larger dissertation of online secondary coursework in Indiana, Briggs (2011) found that high school principals in the state were interested in utilizing online learning to assist with student graduation rates but lacked guidance from the state regarding implementation and accountability guidelines. In another study of Indiana high school principals, Rayle (2011) found that using online learning for credit recovery and for retaking courses were believed to be some of the most effective uses of online learning for students. Other effective uses of virtual classes were considered to be offering courses not otherwise available, meeting the needs of at-risk students, and increasing the number of possible electives. Respondent principals also reported that course costs and the lack of course quality were significant barriers to their schools' ability to offer online classes for students but that technology infrastructure, bandwidth, and the master contract with teachers were less important.

An older investigation by Heidlage (2003) found that Catholic high school principals across 15 states were cautiously supportive of online courses as long as they were primarily for supplemental, elective purposes, had time limits for course completion, and also included limits on the number and types of virtual classes. Brown (2009) surveyed and interviewed virtual high school administrators to determine how they thought about the purpose and potential of their schools. Respondents believed that key purposes of virtual schools were to individualize learning experiences for students and to reform traditional education systems.

Batley (2009) investigated the perceptions of principals and other educators associated with a single online entity, the Louisiana Virtual School. She found that the administrators for the school were considered to be responsive to its curricular needs and that they perceived online learning as an effective learning vehicle for students.

Black, Ferdig, and DiPietro (2008) collected and discussed a variety of evaluation instruments that were helpful for school leaders. The evaluative tools profiled by the authors covered students, teachers, curriculum, technology, course-specific features, and other areas of virtual learning. The authors also highlighted the need for additional or better assessments for virtual learning contexts and advocated for better use of existing data.

On the policy front, Baker and Bathon (2013) outlined model legislation for virtual schools and provided detailed recommendations about financing and quality monitoring. Although their white paper was not aimed directly at online school leaders, it does pave the way for these leaders to understand possible financial models that may impact their own virtual or blended programs. In his article aimed at superintendents, Glass (2010) pleaded for school leaders to ask tough questions about teaching quality, authenticity, and accounting practices when considering online learning providers.

In addition to formal online coursework for school leaders, Ertmer et al. (2002) reported that online professional learning opportunities for practicing administrators can be an effective means of enhancing their technology leadership knowledge and skills. Over a decade later, both Cox (2012) and Brennan (2013) affirmed that principals' participation in informal virtual communities of practice enhances their ability to be effective organizational change agents.

Summary

Although it is challenging to synthesize the extant literature on school administrators and blended learning given both its scarcity and its diffuse coverage, a few highlights are worth noting. First, the bulk of the research has focused on online preparation of traditional brick-and-mortar school administrators, with a few studies on the preparation of virtual school leaders. As a result, the current research base does little to advance our understandings of what it means to be an effective leader of online or blended learning environments on a day-to-day basis. Second, research regarding perceptions of online learning appears to be the second largest area that has been studied. Since it is clear by now that blended learning models are usually a question of how, not if, most future research probably should focus more on implementation concerns rather than merely philosophical aspects. Finally, this leadership sector of virtual schooling research appears to be wide open for scholars who wish to claim it as their primary field of study. We encourage some researchers to take up the challenge of becoming the go-to experts in this area.

Implications for Policy and Practice

Given the dearth of research on administrators and online/blended learning, it is difficult to conclude anything other than that we really do not know much about what it means to be a leader of virtual schools. Aside from anecdotes and personal testimonials - and a few descriptive articles aimed at practitioners - there is no solid foundation of empirical research to inform our understandings of the administrative complexities that accompany being a leader of online learning environments.

The scholarly literature appears to indicate that, as for traditional schools, administrative supports are crucial to the success of virtual learning environments but that those supports take different forms when moved from brick-and-mortar to online settings. For instance, assurance of quality learning and teaching, observation and evaluation of faculty, student discipline, course calendars and timelines, employee induction and professional development, and many other aspects of schooling all can look quite different in blended environments. Administrators who are taking on virtual school leadership roles - either full- or part-time - should attempt to tap into the tacit knowledge of other leaders who already are in these roles. Even after the research and practice literature matures, current virtual school principals and directors often will be the best source of information about how to do the job effectively. As such, virtual school administrator interviews, internships, job shadowing, and other mechanisms for leadership development should be the norm for prospective leaders of blended learning. Also, given the widespread agreement that blended learning environments are qualitatively different than traditional learning spaces (see, e.g., Ghezzi, 2007; Beem, 2010), school administrators that will be leading virtual learning programs should experience such environments beforehand as both learners and teachers.

Although Beem (2010) concluded that online preparation of traditional school administrators is the way of the future, the existing research shows that virtual educational leadership preparation is still murky territory where acceptability, quality, and rigor are questioned at every step.

Accreditation and other quality indicators need to be affirmed for all educational leadership programs, whether traditional, online, or blended. This will mean judging programs based on course content, experiences, and impacts, not simply mode of delivery. School districts also need assistance from national organizations, researchers, state departments, or others regarding the assessment of the effectiveness of online administrator preparation programs. Currently there exist few guidelines for how to think about virtual preparation of school leaders. Organizations such as the University Council for Educational Administration, the National Council of Professors of Educational Administration, and iNACOL should be working together to create useful, research-based recommendations and practice guides.

In regard to preparation of virtual school leaders, current educational leadership programs must pay greater attention to effective facilitation and support of those learning spaces, including more discussion of the leadership practices that are unique to online environments and perhaps require leadership field experiences in virtual settings. Since virtual learning in elementary and secondary schools continues to grow at a rapid pace, school administrator preparation programs that continue to ignore online and blended learning will become increasingly disconnected from the realities and needs of modern schools.

Implications for Research

The absence of a substantive literature base on school administrators and online/blended learning mirrors the larger research scarcity regarding school leaders and digital technologies (see, e.g., McLeod & Richardson, 2011; McLeod, Bathon, & Richardson, 2011). Even though computers, the Internet, and other technological tools are completely transforming our information, economic, and learning landscapes, educational leadership scholars have not kept up. Grave deficiencies exist in the research literature, and, unfortunately, only a few researchers are even trying to study these issues (McLeod, 2011).

Kowch (2009) noted that cyberschools represent perfect opportunities to bring together what we know about effective school leadership with emerging understandings and best practices about educational technologies. Distributed leadership practices, improvement in school policy and governance mechanisms, new instructional leadership opportunities, and dynamic systems oriented toward substantive change can and should be encompassed within the realm of online and blended learning in elementary and secondary schools. A more robust research base is needed, however, to inform and support the online learning movement, which is proceeding forward despite scholars' reticence to address the needs of the field.

The lists of questions posed by Vail (2002) and Salsberry (2010) may be excellent places to begin for scholars interested in the intersections between school leadership and online and blended learning. Right now the research landscape is essentially a greenfield, wide open for any and all explorations. Researchers who are unsure where to start can examine the existing literature base for traditional educational leadership roles and then ask how those findings may be different if extrapolated to virtual school settings. Essential leadership functions of curriculum and instruction, professional development, management and operations, budgeting and finance, supervision and evaluation, law and policy, and so on all take new forms and require new considerations when transitioned from brick-and-mortar institutions into online learning spaces and structures.

Conclusion

Because there's so little of it, the existing literature on school administrators and online/blended learning fails to tell us much. Until a more robust research base exists to inform practice, we will continue to see principals, superintendents, virtual school directors and companies, and policymakers implement online learning environments without much guidance from the scholarly literature. Given the rapid expansion of online learning in elementary and secondary schools, much greater research attention is needed to the leadership necessary for effective facilitation of Internet-mediated school and classroom structures.

References

Abrego, J., & Pankake, A. (2010). PK-12 virtual schools: The challenges and roles of school leaders. *Educational Considerations, 37*(2), 7-13.

Adams, J., Lee, S., & Cortese, J. (2012). The acceptability of online degrees: Principals and hiring practices in secondary schools. *Contemporary Issues in Technology and Teacher Education, 12*(4). Retrieved from http://www.citejournal.org/vol12/iss4/general/article1.cfm

Alvich, D. L., Manning, J. B., McCormick, K. L., & Campbell, R. B. (2009, November). *Hybrid doctoral program: Innovative practices and partnerships.* Paper presented at the Annual Convention of the University Council for Educational Administration, Anaheim, CA.

Baker, B. D., & Bathon, J. (2013). *Financing online education and virtual schooling: A guide for policymakers and advocates.* Denver, CO: National Education Policy Center.

Batley, V. L. S. (2009). *The Louisiana Virtual School: A baseline study of the effectiveness and* *quality of online learning* [Doctoral dissertation]. Retrieved from ProQuest. (UMI 3401783)

Beck, D., LaFrance, J., & Richardson, J. W. (2014). Voices of virtual school leaders: Challenges and advice. Paper presented at the meeting of the American Educational Research Association, Philadelphia, PA.

Beem, K. (2010, September). Online doctorates for administrators. *The School Administrator, 8*(67), 10-16.

Black, E. W., Ferdig, R. E., & DiPietro, M. (2008). An overview of evaluative instrumentation for virtual high schools. *American Journal of Distance Education, 22*(1), 24-45.

Brennan, W. V. (2013). *School principals and virtual learning: A catalyst to personal and organizational learning* [Doctoral dissertation]. Retrieved from ProQuest. (UMI 3551332)

Briggs, C. S. (2011). *The extent and nature of online learning in Indiana's high schools* [Doctoral dissertation]. Retrieved from ProQuest. (UMI 3475395)

Brown, R. A. (2009). *The purpose and potential of virtual high schools: A national study of virtual high schools and their head administrators* [Doctoral dissertation]. Retrieved from ProQuest. (UMI 3387248)

Brown, W., & Corkill, P. M. (2004, April). The practice of virtual teaching. *The School Administrator, 61*(4), 26-30.

Cox, D. D. (2012). *School communications 2.0: A social media strategy for K-12 principals and superintendents* [Doctoral dissertation]. Retrieved from ProQuest. (UMI 3330347)

Ertmer, P. A., Bai, H., Dong, C., Khalil, M., Park, S. H., & Wang, L. (2002, June). Online professional development: Building administrators' capacity for technology leadership. Paper presented at the National Educational Computing Conference, Eugene, OR.

Faulk, N. T. (2011). Perceptions of Texas public school superintendents regarding online teacher education. *Journal of College Teaching & Learning, 8*(5), 25-30.

Ford, L., & Vaughn, C. (2011). Working together more than alone: Students' evolving perceptions of self and community within a four-year educational administration doctoral cohort. *The Qualitative Report, 16*(6), 1645-1668.

Garland, D., & Martin, B. N. (2004). *Cohorts, learning styles, online courses: Are they important when designing leadership programs?* Paper presented at the Annual Convention of the University Council for Educational Administration, Kansas City, MO.

Geer, C. (2011). Preparing technology leaders: A course design for teaching technology to school administrators. *The AASA Professor, 24*(3), 17-20.

Ghezzi, P. (2007, August). The online doctorate: Flexible but credible? *The School Administrator, 64*(7), 30-35.

Glass, G. V. (2010). Potholes in the road to virtual schooling. *The School Administrator, 67*(4), 32-35.

Heidlage, R. M. (2003). *Online schooling for United States Catholic high school students: Promise and practice as perceived by selected high school principals* [Doctoral dissertation]. Retrieved from ProQuest. (UMI 3126062)

Huss, J. A. (2007). Administrator attitudes towards online teacher preparation programs: Are principals logging on - or logging off? *International Electronic Journal for Leadership in Education, 11*(3). Available at http://iejll.journalhosting.ucalgary.ca/iejll/index.php/ijll/article/view/659

Israel, M. S. (2013). *Cultivating and sustaining ethically resilient leaders: Creating community through online and face-to-face teaching platforms.* Paper presented at the Annual Convention of the University Council for Educational Administration, Indianapolis, IN.

Killion, J. (2002). Online learning in educational leadership: Promise or peril. *The AASA Professor, 25*(2), 3-9.

Kim, C. K., & Knapp, M. S. (2014). Innovative, virtual, public schools managed by for-profit companies: A cautionary tale about public-private partnerships. Paper presented at the meeting of the American Educational Research Association, Philadelphia, PA.

Korach, S., & Agans, L. (2011). From ground to distance: The impact of advanced technologies on an innovative school leadership program. *Journal of Research on Leadership Education, 6*(5), 216-233.

Kowch, E. (2009). New capabilities for cyber charter school leadership: An emerging imperative for integrating educational technology and educational leadership knowledge. *TechTrends, 53*(4), 41-48.

LaFrance, J., & Beck, D. (2014). Mapping the terrain: Educational leadership field experiences in K-12 virtual schools. *Educational Administration Quarterly, 50*(1), 160-189.

LaFrance, J., & Calhoun, D. (2013). *Dipity and Wikipedia: Tools for educational leadership coursework.* Session presented at the Summer Conference of the National Council of Professors of Educational Administration, Meadowlands, NJ.

Lee, J. J. (2010). *Planning and implementing virtual charter schools in Wisconsin: A case study* [Doctoral dissertation]. Retrieved from ProQuest. (UMI 3438135)

Leithwood, K. A., & Riehl, C. (2003). *What we know about successful school leadership.* Philadelphia, PA: Laboratory for Student Success, Temple University.

Leithwood, K. A., Louis, K., Anderson, S., & Wahlstrom, K. (2004). *How leadership influences student learning*. New York, NY: The Wallace Foundation.

Marzano, R. J., & Waters, T. (2009). *District leadership that works.* Bloomington, IN: Solution Tree.

McLeod, S. (2011). Are we irrelevant to the digital, global world in which we now live? *UCEA Review, 52*(2), 1-5.

McLeod, S., Bathon, J., & Richardson, J. W. (2011). Studies of technology tool usage are not enough: A response to the articles in this special issue. *Journal of Research in Leadership in Education, 6*(5), 288-297.

McLeod, S., & Richardson, J. W. (2011). The dearth of technology coverage. *Journal of School Leadership, 21*(2), 216-240.

Miller, K. D., Bennicoff-Nan, L., & Maestas, G. E. (2010, September). The pursuit of an online doctorate: Three experiences. *The School Administrator, 8*(67), 24-28.

Nippard, E., & Brandon, J. (2014). Organizational identity formation in a virtual education organization. Paper presented at the meeting of the American Educational Research Association, Philadelphia, PA.

Norman, S. W. (2013). *Content analysis of the practicum course in the master of science in educational leadership/administration program.* Unpublished master's thesis, Florida State University, Tallahassee, Florida.

Owens, M. A. (2012). Online instruction as innovation in an educational leadership program: Possibilities and challenges, *Journal of Cases in Educational Leadership, 15*(4), 76-84.

Picciano, A. G., & Seaman, J. (2007). *K-12 online learning: A survey of school district administrators.* Needham, MA: The Sloan Consortium.

Picciano, A. G., & Seaman, J. (2009). *K-12 online learning: A 2008 follow-up of the survey of U.S. school district administrators.* Needham, MA: The Sloan Consortium.

Quilici, S. B., & Joki, R. (2011). Investigating roles of online school principals. *Journal of Research on Technology in Education, 44*(2), 141-160.

Rasmussen, K. (2013). *Evaluating and utilization of reflection in online courses in educational administration.* Session presented at the Summer Conference of the National Council of Professors of Educational Administration, Meadowlands, NJ.

Rayle, T. W. (2011). *Principal perceptions about the implementation and effectiveness of online learning in public high schools in Indiana* [Doctoral dissertation]. Retrieved from ProQuest. (UMI 3453915)

Richardson, J. W. (2010, September). Online credentials: A state of wariness. *The School Administrator, 67*(8), 18-22.

Richardson, J. W., McLeod, S., & Garrett Dikkers, A. (2011a). How do school districts treat K-12 principals and principal candidates with online credentials? *International Journal of*

Leadership in Education, 14(3), 351-368.
Richardson, J. W., McLeod, S., & Garrett Dikkers, A. (2011b). Perceptions of online credentials for school principals. *Journal of Educational Administration, 49*(4), 378-395.
Salsberry, T. A. (2010). K-12 virtual schools, accreditation, and leadership: What are the issues? *Educational Considerations, 37*(2), 14-17.
Sampson, P. M., Leonard, J., Ballenger, J. W., & Coleman, J. C. (2010, Fall). Student satisfaction of online courses for educational leadership. *Online Journal of Distance Learning Administration, 13*(3). Retrieved from http://www.westga.edu/~distance/ojdla/Fall133/sampson_ballenger133.html
Sherman, W. H., & Beaty, D. M. (2007). The use of distance technology in educational leadership preparation programs. *Journal of Educational Administration, 45*(5), 605-620.
Sherman, W. H., Crum, K. S., & Beaty, D. M. (2010). Perspectives on distance technology in leadership education: Transfer, meaning, and change. *Journal of Research on Leadership Education, 5*(13), 589-610.
Shinsky, E. J., & Stevens, H. (2011). *Enhancing your online teaching in educational leadership using Web 2.0 applications.* Paper presented at the Annual Convention of the University Council for Educational Administration, Pittsburgh, PA.
Tucker, P., & Dexter, S. (2010). *Online leadership cases to support the development of administrative decision making.* Session presented at the Annual Convention of the University Council for Educational Administration, New Orleans, LA.
Vail, K. (2002). A new kind of school. *American School Board Journal,* 189(9), 40-44.
Vitaska, S. (2008). *Strong leaders strong schools: 2007 state laws.* Washington, DC: National Conference of State Legislatures.
Wenzel, G. C. (1998). Why school administrators need to know about distance learning: A college professor's perspective. *Online Journal of Distance Learning Administration, 1*(4). Available at http://www.westga.edu/~distance/ojdla/spring21/wenzel21.html
Yuan, T., Asunka, S. A., Chae, H. S., & Fan, C. (2010). An evaluation of 73 publically funded k-12 virtual programs in the US. Paper presented at the meeting of the American Educational Research Association, Denver, CO.

Chapter 14

Parental Involvement in K-12 Online and Blended Learning

Lisa Hasler Waters,
Technology Integration Flint Hill School, haslerwaters@gmail.com
Michael P. Menchaca,
University of Hawaii at Manoa, mikepm@hawaii.edu
Jered Borup,
George Mason University, jborup@gmu.edu

Abstract

Research indicates children generally fare better in traditional schools when parents are involved. However, scant research exists in alternative settings such as blended and online schooling. This comprehensive review of the few studies in such settings found that: (a) categorization of technologically-mediated schools is ill-defined; (b) levels of parental involvement vary and are influenced by many factors; (c) links between parent involvement and student achievement exist in these alternative settings but further research is needed; (d) there are implications for public policy; and (e) finally, the review provides specific suggestions for further research.

Introduction

Decades of research have shown that children do better in traditional school settings when parents or guardians are involved in their education (Baumrind, 1971; Dornbusch, Ritter, Leiderman, Roberts, & Faraleigh, 1987; Eccles & Harold, 1993; Epstein, 1986, 1995; Jeynes, 2010; Lareau, 2011; Lareau & Horvat, 1999; Sui-Chu & Willms, 1996; Zellman & Waterman, 1998).). However, research concerning parental involvement in K-12 online and blended schooling is relatively uncharted. This may be the result of the newness of K-12 online and blended learning or the difficulty of gathering information from sources outside the actual school.

This chapter provides a comprehensive review of current research that examines parental and guardian involvement in online and blended learning environments for K-12. From this review, three significant themes have emerged: (a) a continuum of parental involvement; (b) links between parental involvement and student achievement; and (c) behaviors, roles, and perceptions of parental involvement.

After briefly explaining the search methodology for this review, we begin the chapter by defining the various school settings in which the research reviewed has taken place. We then operationally define the concept of *parental involvement*, providing parent demographics and parent rationales for enrolling children in online or blended school settings. Next, we describe relevant theories. We conclude the chapter with implications for policy and practice and recommendations for continued research.

Search Methodology

A systematic process was used to conduct a search for literature and research concerning parental involvement in K-12 online learning. This process involved using a number of online tools, such as Google, Google Scholar, ERIC Clearinghouse, ProQuest, Academic Search Premier, and the University of Hawai‘i's Voyager Library tool to access refereed journals, conference proceedings, dissertation indices, and reports available from governmental organizations. Terms used in the searches included: parental involvement and/or familial involvement combined with learning coaches, virtual schools, K-12 online learning, cyber schools, cyber charter schools, and online charter schools.

Research Synthesis

Settings Defined

In general, the term K-12 online learning refers to online learning for elementary and secondary school students. The term virtual schooling describes programs that allow students to supplement their brick-and-mortar schools' courses with one or two online courses (Hasler Waters, Barbour, & Menchaca, 2014). Cyber schools represent schools which serve students who are primarily enrolled online (Watson, Murin, Vashaw, Gemin, & Rapp, 2012). Online charter schools, also called cyber charter schools, are defined as K-12 online publicly funded schools, which are governed by state charter policies and rely on online learning and teaching for a significant portion of delivery and which may also involve home and traditional school practices (Hasler Waters, et al., 2014). Finally, the most recent definition emerging from the Clayton Christensen Institute for Disruptive Innovations concerning blended learning is defined as a formal education program in which a student learns: (a) at least in part through online learning, with some element of student control over time, place, path, and/or pace; (b) at least in part in a supervised brick-and-mortar location away from home; and (c) the modalities along each student's learning path within a course or subject are connected to provide an integrated learning experience (Christensen, Horn, & Staker, 2013).

Specific to blended learning, the Christensen Institute has categorized learning practices into four models: (a) Rotation, (b) Flex (c) A La Carte, and (d) Enriched Virtual. Within blended learning contexts, Rotation occurs when students rotate between various modalities and at least one modality involves online learning. A Flex approach includes online learning as a main modality but may include offline activities. A La Carte may have students take entirely online courses or experiences while still relying on brick and mortar experiences. Finally, Enriched Virtual has students divide time between immersed online and brick and mortar experiences, but with the primary model being virtual. While these terms are significant and occur in the literature often, they primarily relate to blended environments versus completely online ones. However, because of the popularity of the terms, some authors use them beyond blended learning environments.

Thus, a significant challenge to identifying and categorizing online and blended schooling is that these areas continue to evolve. However, since the purpose of this chapter is to examine parental involvement in the broadest spectrum of K-12 online learning, a comprehensive taxonomy is used to describe K-12 online learning. Table 1 defines typical terms found in the research and how these are defined.

Table 1. Terms and Definitions for K-12 Online Learning

Term	Practice
Virtual Schooling	Supplemental online learning; sometimes identified as A La Carte
Cyber Schooling	Full time online learning, with little to no brick and mortar schooling experiences; sometimes identified as Flex model
Online Charter Schooling	Full time online learning with brick and mortar practices; sometimes identified as Enriched Virtual
Blended Learning	Primarily brick and mortar based schooling with some online work; sometimes identified as Rotational

Parental Involvement Defined

Parental involvement usually refers to the practices of parents, caregivers and guardians when they support their school-aged children. Familial involvement is another term used to identify parents, caregivers and guardians who support children enrolled in some form of virtual schooling (Black, 2009). Learning coaches is a term some education management organizations (EMOs) use to refer to parents, caregivers, and guardians who are the primary supporters of children enrolled in cyber and online charter schooling.

Within this chapter, the term parent refers to any parent, caregiver, or guardian who is the primary support person for any student engaged in K-12 online learning, The term parental involvement is used to refer to the practices engaged in by these parents to support their own children who are enrolled in any of these forms of K-12 online learning. Three additional parameters help to describe the parent in these schools: the parent (a) is responsible only for her/his own children enrolled in one of these schools, (b) is not an employee of the school, and (c) often provides student support away from a brick-and-mortar campus.

Two frameworks have also identified and defined different types of parental involvement: Epstein's (1987) framework of parental involvement and Hoover-Dempsey and Sandler's (1995, 2005) model of parental involvement. Epstein (1987) explained that parents are first responsible to provide for student's basic physiological (e.g. food, clothing, and shelter) and academic (e.g. a place to study and school supplies) needs. Second, parents should participate in school-to-home communications. Third, parents should assist with school activities and attend extra-curricular events. Lastly, parents should be involved in learning activities at home and help their students to develop the academic and social skills they need to be successful (Epstein, 1987). Hoover-Dempsey and Sandler's (1995, 2005) model of parental involvement identified two types of parental involvement (involvement at school and involvement at home) as well as four mechanisms used by parents when they are involved (encouragement, reinforcement, modeling, and instruction).

It is important to note that these frameworks were originally developed in traditional face-to-face settings, which limits their usefulness in identifying and defining parental responsibilities in online settings which are likely different than those face-to-face. For instance, some researchers have suggested that parents have greater responsibilities online than they do in face-to-face courses (Beck et al., 2013; Hasler Waters, 2012). For example, Hasler Waters (2012) found that the face-to-face frameworks did not capture the full range of behaviors parents engaged in when supporting their students in the online charter schools.

The Challenge with Demographics

To date, most studies focus on online student demographics and little attention has been paid to the demographics of parents whose children are studying online. Some researchers have suggested that compared to brick and mortar school enrollment, cyber and online charter schools serve a less diverse population. Welner, Hinchy, Mathis and Gunn (2013) found that these schools serve relatively few students who are African-American or Hispanic, lower income, or need special education services.

When the demographic profiles of parents were examined from the research reviewed for this chapter, most parents had at least some college education and were of middle-income families. However, these demographics could not be generalized because not all of the studies sought broad representation of the family populations for the schools involved in their study.

Reasons Why Parents Enroll Their Students

Students who enroll in supplemental virtual courses are typically doing so to recover credits, or to take advanced placement courses, which may not be offered at their brick and mortar schools. Students in blended learning classrooms are involved in these types of learning environments as a result of the school's choice to blend learning in their classrooms. However, students and their parents typically make an active choice to enroll in these alternative schools (Beck, Maranto, & Lo, 2013; Erb, 2004).

Current research indicates parents choose to enroll their students in cyber or online charter schools for a variety of reasons. Erb (2004) discovered that sometimes there are “push” factors that drive parents and their students away from brick and mortar school settings. She described these factors as negative incidents that occur at brick and mortar campuses, such as bullying or health and safety. Parents may also enroll their students in these alternative schools because they offer increased learning opportunities, serve rural and otherwise isolated areas, and/or offer flexible schedules to accommodate students who may be young professional actors or athletes (Ahn, 2011; Erb, 2004) . Some choose these schools because they are convenient for students whose health may prevent them from traveling to and from a campus (Ahn, 2011). In the case of online charter schools, Carr-Chellman (2009) discovered that some parents choose these schools because they provide access to customizable education for free and because they align to parental values. Others might enroll their students because they may have been struggling at brick and mortar campuses or may have come from at-risk backgrounds (Darrow, 2010; Hubbard & Mitchell, 2011). Home school parents may also enroll their students in online courses because they want their students to continue learning from home but need the support that an online teacher can provide. This may explain why research at a cyber charter school found that a large portion of students were formerly homeschooled (Borup, Graham, & Davies, 2013).

In their study concerning parental involvement, Beck, Maranto and Lo (2013) concluded that because parents who enroll their children in these alternative schools have to make an active choice, they represent a population that differs in important ways from their traditional school counterparts. These differences and reasons are worth examining and may provide important clues concerning how to affect student achievement in K-12 online schooling.

Three Significant Research Themes

Although new research is continually emerging, currently there is a limited amount of research concerning parental involvement in K-12 online schooling and the most current research is found within dissertations. In this chapter, we examined the few existing studies and identified three significant themes regarding parental involvement: (1) a continuum of parental involvement, (2) parental involvement and links to student achievement, and (3) parental behaviors, roles, and perceptions.

Continuum of Involvement

The level or amount of parental involvement in K-12 online schooling may be thought of along a continuum: The left side of the continuum represents little parental involvement while the right side reflects full involvement. Studies that have explored the levels of parental involvement point to several factors which tend to influence their involvement in these schools. These factors include (a) school policies, (b) parent demographics, (c) student perceptions, and (d) student needs.

(A) School Policies. A study conducted by Cavanaugh, Barbour, Brown, Diamond, et al. (2009) set out to discover whether online schools had written policies regarding communications with parents among other stakeholders. They collected responses from 108 K-12 online schools and found that 43 out of 81 responders had school policies in place regarding the amount and content of teacher communications with parents. The researchers found that the teachers in these schools had substantial responsibility for communicating and enforcing these policies. Importantly, they also learned that in some schools, not all parents were aware of the policies. They emphasized the importance of ensuring clear and frequent communications between the school and parents.

Likewise, some researchers found that parents of students enrolled in K-12 online schools were not well informed of the level of involvement they were expected to undertake (Boulton, 2008; Hasler Waters & Leong, 2014; Litke, 1998). These researchers surmised that parents' lack of understanding may have led to some student challenges and teacher frustrations as they attempted to work with parents in these alternative settings. For instance, in Litke (1998), teacher participants identified school weaknesses as lack of parental involvement and lack of opportunity to build relationships with parents, while a school strength was student success attributed in part to supportive parents. Curiously, both Litke (1998) and Hasler Waters and Leong (2014) found that parents expected more from teachers, and teachers expected more from parents. Neither school seemed to fully communicate details of responsibilities that were to be carried out by both parties.

Boulton (2008) asserted that schools needed to provide parents with clear policies detailing expectations for parental support, without which parents would fail to understand the level of commitment required.

(B) Parent Demographics that Might Influence Involvement. As previously mentioned, limited research exists regarding parent demographics. Further, national centers for school demographics, such as the National Center for Educational Statistics, do not have specific demographic profiles of parents whose students attend virtual, cyber or online charter schools, or blended learning classrooms. Of the little research available, one study found some evidence suggesting parent demographics might also influence level of involvement. Beck et al. (2013) conducted a level of satisfaction study of 232 parents and 269 students in a grade 7 to 12 cyber school. They discovered that similar to traditional school settings, more parental involvement led to increased satisfaction with school between parents and students. However, because parents had to make an active choice to attend the school, they may differ from traditional school parents. This may explain why some of the factors, like gender, special education, and race did not have predicted impact on parental involvement and were contrary to those found in prior traditional setting studies. Latino parents in the cyber charter school were significantly more actively involved than White parents. Ultimately, the results indicated that the cyber charter school setting presented unique conditions for which prior findings of parental involvement may not be the same. The need for further research on parent demographics is evident.

(C) Student Perceptions. Three studies examining student perceptions of parental involvement suggested that students highly valued their parents' involvement and found it motivational. In Litke (1998), students ranked the level of their own parents' involvement in their schooling. There were three types: absentee, supportive, and participatory. Absentee meant that parents were minimally involved, while participatory meant that parents were fully engaged. Two of the students who rated their parents' involvement as absentee eventually dropped out of the cyber school and returned to traditional school, primarily because they were failing. The third student who ranked his parent as absentee went on to complete the program with better than average grades. Litke summarized that while student success rates appeared to improve when they ranked their parents' involvement as either supportive or participatory, "success was not guaranteed in any category" (p. 7) because he also discovered that teachers, parents, and students agreed that when students assumed responsibility for their learning, they did well academically.

Boulton (2008), nearly a decade later, noted similarly that students who did not complete virtual courses reported a lack of continued support from their parents. Likewise, Borup, et al., (2013) measured learner-parent interaction between high school-aged students enrolled in an online charter school and their parents and discovered that students in fact viewed interactions with their parents more motivational than their parents indicated. Borup et al. (2013) concluded that this was a possible indication that parents did not fully understand the impact that their involvement had on their student's learning.

All three studies suggested that parents might not have fully understood the motivational value of their involvement for their children. These studies implied that for students, their parents' involvement was important. More research should be conducted to better understand how to persuade parents to be more involved in their children's schooling in these alternative settings.

(D) Student Needs. Studies concerning student need suggest that parents tend to increase their level of involvement when a student is struggling or failing. In his study of virtual school students and parental involvement, Black (2009) found intriguing evidence that might explain this phenomenon. From the research of 435 parents and their students enrolled in virtual school courses that he conducted for his dissertation, he discovered a significant negative correlation between parental instructional support and student achievement and posited one explanation that suggested when students struggled academically their parents tended to offer them more support. Similarly, Borup, et al. (2013) suggested that a large majority of parent-learner interactions reported in their study were focused on content. At the same time, these interactions were not significantly correlated with student course outcomes. Like Black (2009), the researchers indicated that because school policy required teachers to contact parents when students were struggling academically, parents were more compelled to be involved.
The results from two qualitative studies further underscore that when students struggle parents tend to become more actively engaged (Curtis, 2013; Hasler Waters, 2012). These findings are consistent with research in traditional schooling settings (Fan & Chen, 2001; Zellman & Waterman, 1998). These compelling results suggest that further research in parental involvement and student achievement could reveal how parents might be able to more effectively support their children's academic achievement.

Student Achievement and Parental Involvement
While there is a dearth of research concerning student achievement among the various forms of K-12 online learning, the literature that does exist is varied. Research on student achievement in virtual and blended schooling suggests similarity to traditional school student achievement levels (Means, Toyama, Murphy, Bakia, & Jones, 2009). However, more recent investigative reports and state audits have shown that students enrolled in cyber and online charter schools are not faring as well academically compared to their traditional school counterparts and are dropping out at higher rates (Barth, Hull, & st. Andrie, 2012; CREDO, 2011; Glass & Welner, 2011; Layton & Brown, 2011; Ryman & Kossan, 2011; Saul, 2011). Overall, there is scant research concerning the impact of parental involvement and student achievement in K-12 online schooling.

One early study concerning parental involvement and middle school students enrolled in a cyber school indicated there may be a link between parental involvement and student success

(Litke, 1998). However, Litke warned that student success was also linked to other important factors, such as whether students accepted responsibility for their own learning and that a combination of student and parent commitment was ultimately the best anecdote for student success. Litke (1998) posited an inverse relationship between the amount of responsibility students accepted for their own learning and the amount of parental involvement required for student success. Over a decade later, Curtis (2013) corroborated this by finding that parents of successful online students reported they did not need to spend as much time monitoring their students once they had established good working routines.

Black (2009) conducted a quantitative study to measure parental involvement in virtual schooling. He found a positive relationship between parental praise of their children's schoolwork and student performance. Conversely, he found a significant negative relationship between parents' reported level of engagement in instructional activities and student grades. Black hypothesized that parents lacked the knowledge and skills to adequately aid their students' learning, or, as previously discussed, they increased their involvement only following poor academic performance by the student.

When Borup et al. (2013) studied student and parent perceptions of interactions they learned that students reported spending over 300% more time interacting with their parents on school matters than with their teachers. The researchers asserted that this pointed to parents' crucial role in their online student's education. Additionally, the study found the majority of parental interactions were not significantly correlated with student course outcomes, and in fact, most were negatively correlated. This finding corroborated Black's (2009) findings: however, Borup et al (2013) surmised that it is "simplistic to assume that a high level of parental involvement is required for high student achievement," a caveat reflected in Litke's (1998) conclusions that parental involvement should not be the only measure of student achievement in K-12 online schooling.

Overall, these studies suggest that parental involvement and student academic achievement may be linked. Moreover, these studies suggest parents need support in developing skills and knowledge to effectively support their students in online settings. Further, parents need to understand that their involvement could have a positive effect on their children's academic achievement.

There were no specific studies found concerning blended settings and parental involvement linked to student achievement, and research should be conducted in this area.

Parent Behaviors of Support and Perception of Their Roles
Unlike studies concerning parental involvement in traditional schooling, there are few in depth studies concerning how parents engage in supporting their cyber students. To date, two doctoral dissertations from (Curtis, 2013) and (Hasler Waters, 2012) have looked specifically at parent roles and behaviors of support in online schools for students in grades K through 12. Both studies involved parents of students enrolled in online charter schools and aimed at capturing more in depth understanding of perceptions they held of their roles and the types of behaviors parents engaged in when they supported their students.

Existing literature describes some of the tasks typically performed by parents whose students are involved in K-12 online learning. In general, parents help students to organize their work, guide them through schoolwork, and motivate them to make progress. Table 2.0 summarizes what the literature and research has thus far described about the task parents perform in these school settings.

Table 2.0 What we do know

Parent Role	Description
Organizer	Plans daily schedule, lesson plans, activities; gathers/ collects materials, etc.
Instructor (guide)	Provides one-on-one instruction; tutoring; shares educational experiences with students to help them learn and work through content; constructs knowledge with student
Motivator	Motivates student to progress and to work through problems
Manager	Keeps track of student progress; manages student's time/schedule; discipline; monitors student progress

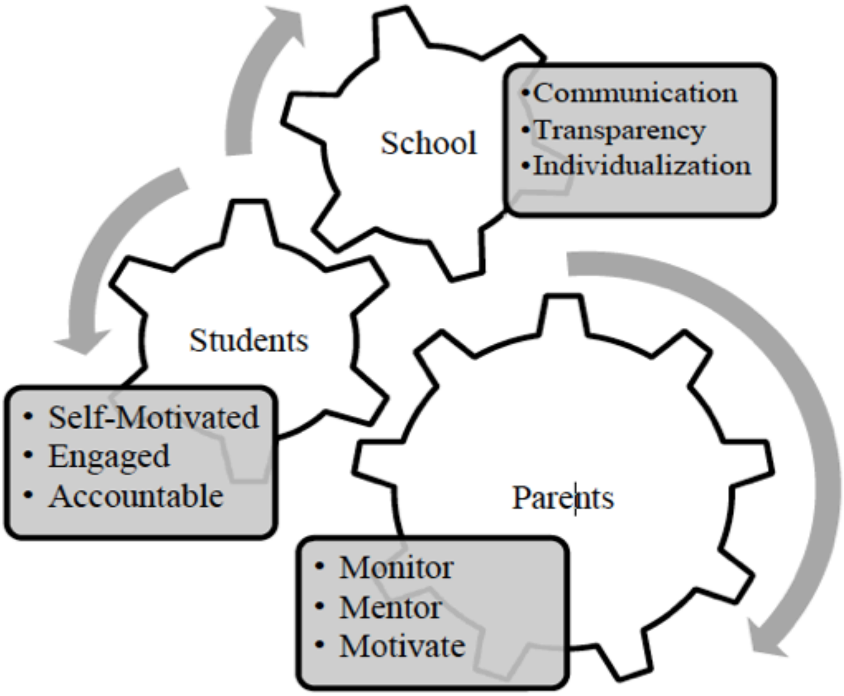
Table 1.0 provides an overview of what types of tasks are typically associated with parents whose students are enrolled in K-12 online learning. Hasler Waters (2012) analyzed the depth of parent behaviors in an online charter school in order to better understand effective parental involvement practices. In her exploratory case study of five parents whose children attended an online charter school, she relied on the Hoover-Dempsey Sandler Model for Parental Involvement (Hoover-Dempsey, et al., 2005a) , a framework used to measure parent behaviors of support in traditional school settings, as a guide for exploring the behaviors of parents of online charter school students. She surmised that parents, referred to in her study as learning coaches,

engaged in the four mechanisms of behavior as described by the HDS Model of Parental Involvement. The four behaviors included encouragement, reinforcement, modeling, and instruction. Moreover, she indicated that there were two other parent behaviors that revealed important practices for supporting student-centric learning environments, adapting and leveraging. Adapting was described as a behavior in which parents adjusted instructional strategies, learning environments, daily schedules, and even their own belief-systems to accommodate their children's learning needs. Leveraging resources was defined as the behavior in which parents would access support and materials from a variety of sources to meet their children's learning needs. Ultimately, the study revealed that parents created learner-centric environments. In such an environment, technology was absolutely instrumental in helping parents perform their roles and enabling them to provide flexible learning.

Hasler Waters (2012) discovered that the intensity of parental involvement was made possible by the unique school environment. Because parents were intimately aware of their own children's needs and interests they could use that knowledge to their advantage to support their students. Yet, she also learned that these coaches faced significant challenges including: shortage of time, complexity of the role, and lack of immediate access to teachers. Furthermore she discovered parents sometimes did not feel qualified to help students due to their unfamiliarity with the subject matter or when their students struggled with the content. This discovery seems to underscore the findings made by Borup et al. (2013) and Black (2009), who found negative association to student outcomes when there was an over-reliance on parents for instructional support. While each of the parents in her study acknowledged that training or instructional tips were provided to them by the educational management organization, they did not find these resources sufficient. One parent referred to the training as "remedial," and others suggested they wanted more support concerning pedagogy and student motivational tactics. Hasler Waters posited that this could have been due in part because each of the parents in her study were highly educated and may have expected a certain level of training and support to match their own educational levels, and that differentiated training for parents in these roles was needed. Additionally, she concluded that in order to help parents overcome some of the challenges they faced, more support from the school would be needed, including improvement in systems to enable parents to engage in more timely feedback and communication from teachers.

Curtis (2013) conducted a mixed methods study to investigate student achievement in a full-time, online learning environment and the effect parents have on student success. From the qualitative portion of her study, which collected and analyzed the data from eight parents, she learned that parents perceived multiple facets of student success in the online environment. These facets included the school, the student, and the parents. The school could provide support to families by communicating, being transparent with tools, and individualizing instruction. Students must be participating in and accountable for their own learning. Parents should be available to monitor, mentor, and motivate students. She illustrated these themes in a model to represent the interlocking connection between the themes (see Figure 1).

Figure 1. Themes of Parental Involvement, Curtis (2013)



She noted that with increased communication, transparency, and individualization, schools could help students be more successful online. Further, she reported that students have a role in their own education and that the parent role in this full-time, online school was to monitor, mentor, and motivate. Overall, her study revealed that the parents who reported that their children were successful in this environment perceived that success was due in part to the fact that their students were responsible for their own learning, were self motivated, and were engaged and accountable for their work. Conversely, the parents who reported that their children were unsuccessful in this environment perceived that this was due to the fact their students were not self motivated and did not organize their workload well.

Such research suggests that parental roles and supportive behaviors are amplified in full-time cyber or online charter school settings because parents will fill in when the teacher is absent or at a distance from the student. Parents can provide the motivating physical presence that instructors, who may be only virtually present, cannot. Both studies showed the depth of parental involvement and revealed that parents were nurturing in the way they supported their students, and parents found that because they were intimately aware of their students, they could provide learner-centric support, which created a positive learning environment for both the students and their parents.

There were no studies found which concerned virtual schooling or blended learning school settings and parental involvement behaviors or perception of the,ir roles and research is recommended in this area.

Implications Policy to Practice

Liu et al. (2010) suggested that parental involvement in virtual schools could help students persevere through the challenges of learning in an online environment and boost their ability to acquire and practice the skills necessary to be successful. Others have suggested that when there is a lack of teacher presence in K-12 online settings, parents may play an even more important role than in traditional school settings (Russell, 2004; Weiner, 2003). The implications arising from the research presented in this chapter suggest that policy could be developed to help encourage and improve the effectiveness of parental involvement in K-12 online schooling.

Policy concerning parental involvement in K-12 online learning should focus on issues that would enrich student academic achievement, increase high school graduation rates, and prepare students for college and their careers. For instance, policy-makers, school administrators, teachers, and parents need to support policies which would: (a) provide effective training and support for parents as educational facilitators for their own students, especially concerning instructional support for students; (b) encourage effective parental involvement to support, guide, and motivate their own students; and (c) articulate and communicate guidelines concerning parental roles and responsibilities.

A number of the studies found within this chapter have suggested that parents may need training on pedagogical strategies to support their own students (Black, 2009; Borup, et al., 2013; Curtis, 2013; Hasler Waters, 2012). Some of the more current research emerging from audits, investigations, and research concerning full-time, online schools is troubling. Students in these schools are falling behind their traditional school counterparts and dropping out at high rates (Barth, et al., 2012; Darrow, 2010; Glass & Welner, 2011; Hubbard & Mitchell, 2011). While these studies do not link parental involvement to these troubling outcomes, we suggest that policy that supports the effectiveness of parental involvement in these schools could prove to be one strategy for improving student opportunities for success. Further, we believe that policy should tend to improve school-parent communications in order to guide parents along the continuum of parental involvement in various K-12 online settings.

Implications for Research

There are a number of pressing concerns surrounding K-12 online learning for younger students. These concerns provide compelling evidence that the field needs to engage in more research in order to better understand how to help students achieve in these unique environments. To this end, the authors recommend eight areas of research:

1. *Exploring the continuum of parental involvement* – Research discussed in this chapter has shown that the amount of time a parent is involved supporting the K-12 online student is not as important as the quality of support the parent lends (Borup et al., 2013; Litke, 1998). Further, some studies in the chapter contend that parents increase their level of involvement when students struggle or fail. More research needs to be conducted to understand what type of assistance students need over the course of their K-12 online experiences and how to support, engage, and encourage parents to effectively support their students as they traverse the continuum of involvement.
2. *Exploring how parents can encourage their children to practice techniques associated with online learning success* – Several of the studies included in this chapter asserted that part of the equation leading to student success requires that students take responsibility for their own learning (Boulton, 2008; Curtis, 2013; Litke, 1998). Research should be conducted to evaluate how parents can encourage and support students in taking responsibility and practice the skills necessary for learning successfully online.
3. *Examining the links between parental involvement and student academic achievement* – Two quantitative studies in this chapter found significant links between parental involvement and student outcomes (Black, 2009; Borup et al., 2013). However, in both instances, the researchers recommended that more research needed to be conducted that included broader and larger participant populations. The authors of this chapter agree and recommend more qualitative studies should be conducted in order to understand the deeper, more complex connections between parental involvement and student achievement.

4. *Understanding the nature of parent-student interactions* – Several studies alluded to the importance of examining parent-student relationships in order to better understand the dynamics of these interactions and how they impact student achievement (Borup et al., 2013; Boulton, 2008; Curtis, 2013; Hasler Waters, 2012). The authors of this chapter agree and recommend that future research examine this dynamic, multi-dimensional topic through longitudinal and qualitative studies.
5. *Examining parental involvement in blended and flipped classrooms* – It has been suggested that these relatively new schooling practices should be studied to determine if the distance between teacher and student could be mitigated with parental involvement (Curtis, 2013). The authors agree and recommend that future research include a focus on blended and flipped classrooms to discover how parental involvement would be most effective within classrooms that include teacher presence.
6. *Examining links between parent demographics and student support* – The authors of this chapter noted that very little research has been done concerning the demographics of parents whose children are enrolled in K-12 online learning. Additionally, one study concerning an online charter suggested that the unique nature this school and the active choice parents made to enroll their students in this school skewed what is typically found of parental involvement in traditional schooling (Beck et al., 2013). More research needs to be conducted concerning the demographics of parents whose children attend these alternative schools and the links between their demographics and involvement.
7. *Capturing student perceptions of parental involvement* – Three studies captured student perceptions concerning parental involvement and found evidence that students attribute part of their school success to their parents and value their involvement (Beck et al., 2013; Borup et al., 2013; Curtis, 2013). The authors of this chapter believe that capturing student voice is vitally important to understanding how parents can most effectively support their own children and urge researchers to more closely examine student perceptions.
8. *Developing frameworks that explain and hypothesize* – The current body of research has yet to clearly identify and define variables associated with parental involvement in K-12 online learning. Although this is typical of research examining a relatively new phenomenon, researchers should begin to establish theoretical frameworks that not only define relevant variables but also present a testable structure that hypothesizes how the different variables are related--similar to frameworks found in more established domains (Graham, Henrie, & Gibbons, 2013; Whitten, 1998). Although two frameworks have been created that provide a testable structure (Hoover-Dempsey & Sandler, 1995, 2005; Borup et al. 2014), little empirical research has been conducted to test these hypotheses.

Conclusion

This chapter mostly focused on K-12 supplemental and full-time online learning and parental involvement and how the parent might serve to close the gap when the teacher and student are separated by distance. However, research in this area of K-12 online learning is only beginning to surface. The authors of this chapter urge researchers to continue to examine, investigate, and explore parental involvement in these unique school settings in order to add to the body of knowledge and inform policy and practices to improve student achievement with K-12 online environments.

While research in this nascent field is still emerging, much of the research contained within this chapter provides a solid foundation from which to understand the fundamentals of parental involvement in K-12 online learning. For instance, the research has examined how parental involvement can be viewed along a continuum of support, where some parents are more involved than others. The research has posited that this could be explained in part because some parents get more involved when they see their students struggling with the content or when they have received failing grades (Black, 2009; Borup, 2013). Others have suggested that since parents must proactively choose to place their students in these schools they may be motivated to increase their involvement by factors other than those faced by parents of traditional school students (Beck et al., 2013). Some research also has found that parents, whose students who are self-motivated, responsible, engaged, and well organized, believe that they can ease off their support (Curtis, 2013; Litke, 1998). However, it is difficult to generalize the findings from any of these studies because they involved small, less diverse participant populations than might be found within the larger population of students in K-12 online schooling.

Research conducted by Black (2009) and Borup et al. (2013) begins a much-needed examination of how parental involvement in these unique settings may contribute to student academic success. For instance, these researchers have found that some types of parental involvement, such as instructional support, have not yet been proven to be as effective for student achievement as others, such as student encouragement and student reinforcement. Because both studies were limited in scope, the findings were not generalizable. More work needs to be done to develop a comprehensive understanding of the types of parental involvement that lead to student academic success or how to measure the quality of support parents are lending to their own students. We still cannot say with certainty what type of training and support parents may need to be more effective at supporting their own students.

Some of the research contained within this chapter has explored the less tangible aspects of parental involvement through qualitative studies (Curtis, 2013; Hasler Waters, 2012; Litke, 1998). These studies have shed light on the complex nature of parent and student interactions by exploring the behavior, roles, and perceptions of parents whose children attend online charter schools and hint at how parents might fill in a much-needed gap when teachers are not present. Yet, in each case, the participant populations investigated were small and did not fully represent the broad spectrum of parents and students in these schools. Furthermore, the studies were conducted over relatively short periods of time, and so may not have accounted for the full range of experiences parents and their students have over the extent of a school year or school career.

Finally, there is a dearth of research concerning parental involvement in blended learning environments. Some believe that this newly-formed practice of schooling could supplant full-time online learning because traditional schools can take advantage of employing this model within their existing practices (Christensen et al., 2013). Curtis (2013) surmised that blended and flipped classrooms could mitigate the distance between teacher and student found in purely virtual school settings. We agree, but caution that these school settings are still untested and require more research in order to best understand how to affect student achievement.

References

Ahn, J. (2011). Policy, technology, and practice in cyber charter schools: Framing the issues. *Teachers College Record, 113*(1), 1-26.

Barth, P., Hull, J., & st. Andrie, R. (2012). *Searching for the reality of virtual schools: Center for Public Education.* National School Boards Association.

Baumrind, D. (1971). Current patterns of parental authority. Developmental Psychology Monograph, 4(1-101).

Beck, D., Maranto, R., & Lo, W.-J. (2013). *Parent Involvement And Student/Parent Satisfaction In Cyber Schools.* Paper presented at the Society for Information Technology & Teacher Education International Conference 2013. Retrieved from http://www.editlib.org/p/48099

Black, E. W. (2009). *An evaluation of familial involvements' influence on student achievement in K–12 virtual schooling.* Unpublished Dissertation, University of Florida, Gainesville, FL.

Borup, J., Graham, C. R., & Davies, R. S. (2013). The nature of parental interactions in an online charter school. *American Journal of Distance Education, 27*(1), 40-55.

Borup, J., West, R. E., Graham, C. R., & Davies, R. S. (2014). The Adolescent Community of Engagement: A framework for research on adolescent online learning. *Journal of Technology and Teacher Education, 22*(1), 107–129.

Boulton, H. (2008). Managing e-learning: What are the real implications for schools? *The Electronic Journal of e-Learning, 6*(1), 11-18.

Carr-Chellman, A. A. (2009). An introduction to this special issue of TechTrends. *TechTrends, 53*(4), 3-4.

Cavanaugh, C., Barbour, M. K., Brown, R., Diamond, D., Lowes, S., Powell, A., et al. (2009). *Research committee brief: Examining communication and interaction in online teaching.* Retrieved January 26, 2014, from http://www.academia.edu/229089/Examining_Communication_and_Interaction_in_Online_Teaching

Center for Research on Education Outcomes (CREDO). (2011). *Charter school performance in Pennsylvania.* Stanford University.

Christensen, C. M., Horn, M. B., & Staker, H. (2013). *Is K-12 blended learning disruptive? An introduction of the theory of hybrids.* Clayton Christensen Institute for Disruptive Innovation.

Curtis, H. (2013). *A mixed methods study investigating parental involvement and student success in high school online education.* Unpublished Dissertation, Northwest Nazarene University.

Darrow, R. (2010). *A comparative study between online charter high schools and traditional high schools in California.* Fresno State University, Fresno, CA.

Dornbusch, S. M., Ritter, P. L., Leiderman, H., Roberts, D. F., & Faraleigh, M. J. (1987). The relation of parenting style to adolescent school performance. *Child Development, 58,* 1244-1257.

Eccles, J. S., & Harold, R. D. (1993). Parent-school involvement during the early adolescent years. *Teachers College Record, 94*(3), 568-587.

Epstein, J. L. (1987). Parent involvement: What research says to administrators. *Education and Urban Society,* 19(2), 119–136. doi:10.1177/0013124587019002002

Epstein, J. L. (1986). Parents' reactions to teacher practices of parent involvement. *The Elementary School Journal, 86*(3), 277-294.

Epstein, J. L. (1995). School, family, community partnerships: Caring for the children we share. *Phi Delta Kappan, 76*(9), 701-713.

Erb, R. E. (2004). *From traditional public school to cyber charter: How parents decide*. Pennsylvania State University, Pennsylvania.

Fan, X., & Chen, M. (2001). Parental involvement and students' academic achievement: A meta-analysis. Educational Psychology Review, 13(1), 1-22.

Glass, G. V., & Welner, K. G. (2011). *Online K-12 Schooling in the U.S.: Uncertain private ventures in need of public regulation*. Boulder, CO: National Education Policy Center.

Graham, C. R., Henrie, C. R., & Gibbons, A. S. (2014). Developing models and theory for blended learning research. In A. G. Picciano, C. D. Dziuban, & C. R. Graham (Eds.), *Blended learning: Research perspectives, volume 2* (pp. 13-33). New York, NY: Routledge.

Hasler Waters, L. (2012). *Exploring the experiences of learning coaches in a cyber charter school: A qualitative case study*. Unpublished Dissertation, University of Hawaii, College of Education, Honolulu, HI.

Hasler Waters, L., Barbour, M. K., & Menchaca, D. M. P. (in press). The nature of online charter schools: Evolution and emerging concerns. *Educational Technology & Society.*

Hasler Waters, L., & Leong, P. (2014). Who is teaching? New roles for teachers and parents in cyber charter schools. *Journal of Technology and Teacher Education, 22*(1), 105-128.

Hoover-Dempsey, K. V., & Sandler, H. M. (1995). Parental involvement in children's education: Why does it make a difference? *Teachers College Record, 97*(2), 311–331.

Hoover-Dempsey, K. V., Walker, J. M. T., Sandler, H. M., Whetsel, D., Green, C. L., Wilkins., A. S., et al. (2005a). *Final performance report for OERI Grant #R305T010673: The social context of parental involvement: A path to enhanced achievement.* Institute of Educational Sciences, U.S. Department of Education.

Hubbard, B., & Mitchell, N. (2011). Troubling questions about online education. *EdNews Colorado*. Retrieved from http://www.ednewscolorado.org/2011/10/02/25310-analysis-shows-half-of-online-students-leave-programs-within-a-year-but-funding-stays see also: http://www.inewsnetwork.org/special-reports/online-k-12-schools/

Jeynes, W. H. (2010). *Parental involvement and academic success.* New York, NY: Routledge.

Lareau, A. (2011). *Unequal Childhoods: Class, Race and Family Life (2nd ed.)*. Berkeley, CA: University of California Press.

Lareau, A., & Horvat, E. M. (1999). Moments of social inclusion and exclusion race, class and cultural capital in family-school relationships. *Sociology of education, 72*(1), 37-53.

Layton, L., & Brown, E. (2011, November 26, 2011). Virtual schools are multiplying but some question their educational value. *The Washington Post.* Retrieved from http://www.washingtonpost.com/local/education/virtual-schools-are-multiplying-but-some-question-their-educational-value/2011/11/22/gIQANUzkzN_print.html

Litke, D. (1998). Virtual schooling at the middle grades: A case study. *The Journal of Distance Education, 13*(2), 33-50.

Means, B., Toyama, Y., Murphy, R., Bakia, M., & Jones, K. (2009). *Evaluation of evidence-based practices in online learning: A meta-analysis and review of online learning studies.* U. S. Department of Education

Russell, G. (2004). Virtual schools: A critical view. In C. Cavanaugh (Ed.), *Development and Management of Virtual Schools: Issues and Trends* (pp. 1-26): Idea Group, Inc.

Ryman, A., & Kossan, P. (Producer). (2011) The race to online: Arizona experiments with virtual K-12 schools. Will they work for your child? *Arizona Republic*. retrieved from http://www.azcentral.com/news/education/online-school/ and http://www.azcentral.com/news/articles/20111111arizona-online-schools-growing-part1.html

Saul, S. (2011, December 12, 2011). Profits and questions at online charter schools. *The New York Times.*

Sui-Chu, E. H., & Willms, J. D. (1996). Effects of parental involvement on eighth-grade achievement. *Sociology of Education, 69*(April), 126-141.

Watson, J., Murin, A., Vashaw, L., Gemin, B., & Rapp, C. (2012). *Keeping pace within K-12 online and blended learning: An annual review of policy and practice*: Evergreen Education Group.

Weiner, C. (2003). Key ingredients to online learning: Adolescent students study in cyberspace. *International Journal on E-Learning, 2*(3), 44-50.

Welner, K. G., Hinchey, P. H., Mathis, W., & Gunn, E. (2013). *Virtual schools in the U.S. 2013: Politics, performance, policy, and research evidence.* Boulder, CO: National Education Policy Center.

Whetten, D. A. (1989). What Constitutes a Theoretical Contribution? *The Academy of Management Review, 14*(4), 490–495. doi:10.2307/258554

Zellman, G. L., & Waterman, J. M. (1998). Understanding the impact of parent school involvement on children's educational outcomes. *The Journal of Educational Research, 91*(6), 370-380.

Chapter 15

On-site and Online Facilitators: Current and Future Direction for Research

Jered Borup, *George Mason University, jborup@gmu.edu*
Jeff Drysdale, *Brigham Young University, jndrysdale@gmail.com*

Abstract

Although K-12 online enrollments continue to grow, student attrition rates remain high. Some have suggested that K-12 students lack the metacognitive and self-regulation ability to succeed in highly autonomous online learning environments. In response, many programs have begun to implement facilitator models to provide students with the support that they need. This chapter reviews the existing literature on two of those facilitator models: on-site and online facilitators. The existing research has identified and described some facilitator roles: fostering relationships, monitoring, and instructing. Although research examining the actual impact of facilitators on learning outcomes is limited, the emerging research indicates a positive effect—especially when facilitators receive professional development. The chapter concludes with implications for future research and policy.

Introduction

Although the estimated number of K-12 online students can vary greatly, one thing remains clear—K-12 online student enrollments have grown dramatically over the past decade (iNACOL, 2012; Queen & Lewis, 2011; Watson, Murin, Vashaw, Gemin, & Rapp, 2013; Wicks, 2010). This growth has not come without some apprehension. The concern that has garnered the most attention is online learning's high student attrition rates (Carr, 2000; Patterson & McFadden, 2009; Hawkins & Barbour, 2010; Rice, 2006). Although the cause is unknown and likely complex, some have hypothesized that the high attrition rates are a reflection of K-12 learners' low levels of self-regulation and meta-cognitive abilities which are necessary to succeed in flexible and autonomous online environments (Cavanaugh, 2007; Moore, 1993, 2007; Rice, 2006; Hartley & Bendixen, 2001). Students' lack of meta-cognitive skills can also make it difficult for them to adapt to new online learning models which require different learning skills than those needed in face-to-face environments (Cavanaugh, 2009; Ronsisvalle & Watkins, 2005). In addition, some programs have high teacher-student ratios making it difficult for teachers to interact with students on a personal level (Hawkins, Barbour, & Graham, 2011) which can result in students feeling isolated and unmotivated to learn (Palloff & Pratt, 2007). Some online programs have attempted to lower student attrition and increase student learning by utilizing course facilitators (also referred to as learning coaches, mentors, and shepherds) who provide additional support to that which is already provided by online teachers and course designers (Drysdale, Graham, & Borup, 2014; Harms, Niederhauser, Davis, Roblyer, & Gilbert, 2006). In a face-to-face environment the designer, teacher, and facilitator roles are typically fulfilled by the same individual (Davis & Ferdig, 2009). Harms et al. (2006) explained that in online and blended learning environments these roles can be individual positions: instructional designers who create course content and learning activities, teachers who provide content expertise and assess student learning, and facilitators who provide students with auxiliary and affective support. However, Harms et al. (2006) also acknowledged that there is "considerable overlap" between the roles and explained that a single individual could fulfill multiple roles in an online course. Ferdig et al. (2009) added that this type of division of labor is less common in smaller or newer programs and is more likely to develop after programs become more established.

Roles Defined

Although the focus of this chapter is on facilitators, it is important that we also clearly define the roles of the designer and instructor to help distinguish them from facilitators. Harms et al. (2006) explained that designers produce instructional materials and learning activities that are organized within a learning management system (LMS). The course instructor can then make modifications to the course to meet student needs within the context of their course (Borup, Graham, & Drysdale, 2014). Instructors monitor and direct learners' content-related discussions (Harms et al., 2006). Instructors also engage in individualized interactions with students regarding the content and provide tutoring support when needed (Harms et al., 2006). While technology can be used to grade objective assessments, instructors still need to grade and provide feedback on subjective work (Wicks, 2010).

Unlike online teachers, facilitators are typically not content experts. Rather, facilitators provide students with auxiliary support and ensure "everything is working smoothly and order is maintained" (Hannum, Irvin, Lei, & Farmer, 2008, p. 213). More specifically, Harms et al. (2006) explained that facilitators should:

- understand students on a personal level and act as a mentor and friend;
- aid students in the development of study, organization, and self-regulation skills;
- encourage communication between students, parents, and instructors;
- monitor student grades and overall course progress; and
- counsel students on course enrollments.

Wicks (2010) added that facilitators should assist students "on items such as study skills, social issues, attendance, and school events" (p. 31). This type of support is especially important because the transition from a face-to-face to an online learning environment can be difficult for K-12 students who lack some of the academic skills that online learning requires. For instance, younger students tend to have low self-regulation and metacognitive abilities making it difficult for them to learn in the more autonomous and student-centered online learning environment. As a result, in order to be successful online, students must not only learn the content but also need to master a new approach to learning.

As listed above, facilitators are charged with developing close student-facilitator relationships. These relationships are especially important because they can be foundational for cognitive outcomes (Garrison, Anderson, & Archer, 2000) and can deter academic dishonesty (Harms et al., 2006). Facilitators who share the same physical space with students can more easily motivate students and can be a valuable resource for teachers to contact when students' course activity is low (Murphy & Rodriguez-Manzanares, 2009). When these facilitators simultaneously work with multiple students in the same environment, they may have the added responsibility of classroom management and facilitating learner-learner interactions (Staker, 2011). Facilitators may also be asked to help students troubleshoot technological problems (de la Varre, Keane, & Irvin, 2011; Hannum, et al., 2008). However, some programs view assistance with technological problems as beyond the scope of the facilitator's responsibilities (Barbour & Mulcahy, 2004).

Consistent with these roles, Borup et al. (2014) summarized three broad facilitating responsibilities: (1) nurturing, (2) monitoring and motivating, and (3) encouraging communication. First, nurturing was defined as developing caring relationships with the students and helping to ensure that the learning environment is safe and secure. Second, monitoring and motivating responsibilities include the need to monitor student engagement with the content and motivate students to more fully engage when necessary. Lastly, Borup et al. (2014) explained that facilitators have the responsibility to encourage communication between all members of the learning community, including parents.

Facilitator Models

Three primary facilitator models have been employed in K-12 settings: (1) on-site facilitators, (2) online facilitators, and (3) parent facilitators. This chapter will focus on the on-site and online facilitator models and Waters, Mechaca, and Borup's chapter in this handbook will discuss the parent-facilitator model. One primary difference between the on-site and online facilitator models is the location of the facilitator. Online facilitators are physically separated from students while on-site facilitators share the same physical space with students—typically at the student's brick-and-mortar school. Ferdig et al. (2009) acknowledged both of these models when when they said, '[facilitators] may interact with students online or may facilitate at the physical site where students access their online course" (p. 487). This section will describe both models, beginning with on-site facilitators.

Harms et al. (2006) proposed a model that blended students' interactions with an online teacher and face-to-face interactions with an on-site facilitator located in the student's brick-and-mortar school. The roots of this model can be found in early distance education programs that mailed or faxed learning materials to a student's brick-and-mortar school. The school would then provide the student with a scheduled time to learn and an adult to supervise and facilitate the student's learning (Barbour & Mulcahy, 2004; Russell, 2004). This blended model is used primarily for students who are enrolled in a brick-and-mortar school and supplement their face-to-face courses with one or two online courses. This allows the facilitator roles to be fulfilled by those working at the student's brick-and-mortar school such as administrators, secretaries, librarians, counselors, and athletics coaches (de la Varre et al., 2011; Hannum et al., 2008; Harms et al., 2006). This is also a popular option for rural schools because "it enables a school to have a certified teacher available when one is not locally present, while still providing students with the structure and opportunities afforded by regular class meetings" (O'Dwyer, Carey, & Kleiman, 2007, p. 291).

An increasing number of students are enrolling in full-time online programs and study almost exclusively at home—never stepping foot in a brick-and-mortar school (Watson, Murin, Vashaw, Gemin, & Rapp, 2012). Although full-time online students do not have the opportunity to work with an on-site facilitator in a brick-and-mortar setting, their needs remain the same. As a result, some online schools have attempted to provide these students with on-site facilitators by creating physical centers where students and facilitators can gather (Cavanaugh, 2009). However, these types of centers can be expensive and impractical for some online programs (Roblyer, Davis, Mills, Marshall, & Pape, 2008). For these programs the use of an online facilitator model is a more practical option. Online facilitators provided by the school are commonly used for high school students; whereas, elementary online programs rely more heavily on the parent-facilitator model (Wicks, 2010). At times online teachers are asked to fulfill the roles of the facilitator in addition to their instructional responsibilities (Kennedy, Cavanaugh, & Dawson, 2013; Borup, Graham, & Davies, 2013a). However, fulfilling both roles for all of their students can be burdensome and some schools have created more formal online-facilitator programs using paraprofessionals or teachers to act as facilitators for a more manageable number of students (Drysdale et al., 2014; Drysdale, Graham, & Borup, in press).

Research Synthesis

Guided by the identified facilitator roles discussed above, in this section we will discuss the literature that has explored how facilitators fulfill their roles and their impact on learning outcomes.

Encouraging Interactions and Fostering Relationships

Research has found that online teachers can form close relationships with their students. For instance, Velasquez and her colleagues' (Borup, Graham, Velasquez, 2013b; Velasquez, Graham, & West, 2013a; Velasquez, Graham, & Osguthorpe, 2013b) qualitative research at an online charter school found that deep caring learner-instructor relationships could be formed through sustained and attentive interactions. Similarly, Borup et al. (2014) conducted a case study research in the same setting and found that of the nine teacher participants who had pervious face-to-face teaching experience, eight found that they had more opportunities to interact with their online students on an individual level than was possible in a face-to-face classroom environment. However, quantitative research examining the impact of learner-instructor interactions on cognitive course outcomes has been mixed (see Borup, et al., 2013a and Hawkins, Graham, Sudweeks, & Barbour, 2013).

Although it is possible for online teachers to form close relationships with students, research has also found that high teaching loads and other demands on their time can make it difficult to do so (Drysdale et al., 2014; Hawkins, Barbour, Graham, 2012). For instance, Hawkins et al. (2012) qualitatively analyzed interviews with eight online teachers at a large virtual high school with high teacher-to-student ratios and found that teacher time was largely spent grading assignments and providing students with feedback, leaving little time for relationship building activities. Similarly, O'Dwyer et al.'s (2007) found that the majority of the 231 online students who they surveyed indicated that their interaction with the online teacher was lacking and felt like “it should have been a lot more” (p. 301). As a result, some online programs have implemented facilitator models in an attempt to provide students with the personal relationships that they need while allowing the instructor to focus on their job responsibilities that require content expertise.

Methods used to encourage interactions and foster relationships can vary for on-site and online facilitators. Online facilitators rely primarily on asynchronous text communication that is absent of non-verbal cues, making it more difficult to establish facilitator-student relationships and can leave students feeling isolated (Palloff & Pratt, 2007). On-site facilitators engage largely in face-to-face communication that contains a high level of social and non-verbal cues that can make forming relationships easier (Graham, 2006; Pettyjohn, 2012). In her dissertation research, Charania (2010) found that on-site facilitators’ physical presence “can add a personal touch, otherwise missing in distance education” (p. 85). Murphy and Rodriguez-Manzanares (2008) explored the differences between online and face-to-face interactions by interviewing 13 teachers and seven management/support personnel at a Canadian virtual high school whose students were also enrolled in brick-and-mortar schools. All of the online teachers had previous face-to-face teaching experience ranging from 11-33 years allowing them to make comparisons between the two models of education. Participants described their face-to-face interactions as spontaneous and informal, often occurring outside of the classroom. These interactions had a high level of immediacy that allowed them to easily form rapport with students and help them to feel at ease and comfortable requesting help when needed. In contrast, teachers’ online communications tended to be more planned and formal making it difficult to form trusting relationships with students. However, the private nature of their online communications appeared to benefit shy and self-conscious students by helping them feel more comfortable asking questions and seeking help (Murphy & Rodriguez-Manzanares, 2008).

In rural settings the on-site facilitators are also more likely to have preexisting relationships with students and their families. For instance, de la Varre et al. (2011) interviewed five online advanced placement (AP) English teachers and 58 on-site facilitators--many of whom were also certified teachers--located in small rural schools. The researchers found that many of the facilitators had preexisting relationships with students who they had known or taught previously. The course instructors found these pre-existing facilitator-student relationships to be beneficial and believed that the facilitators’ knowledge of the students and their families allowed them to better advocate for the students and facilitate their learning (de la Varre et al., 2011).

Research indicates that close facilitator-student relationships can also be formed online through sustained interactions (Borup, Graham, & Velasquez, 2013b; Drysdale et al., 2014; Velasquez, Graham, & Osguthorpe, 2013). For instance, Drysdale et al. (2014) qualitatively examined a facilitator program at an online charter school that assigned 20 students to each teacher who then worked to facilitate their learning across all of their courses. Facilitators were asked to regularly contact their students and engage in "non-course-specific or social interaction" (p. 18). It was hoped that these types of interactions would provide students with an "anchor adult" whom students could trust and would feel comfortable asking questions or soliciting advice. The researchers' analysis of focus groups and interviews found that the facilitators felt largely successful at developing strong relationships with their students. However, Drysdale et al. (2014) found that facilitators became frustrated when students did not respond to their inquiries. Although on-site facilitators may also have some non-responsive students, Borup et al. (2014) explained that students can more easily ignore teachers and facilitators when they are physically separated.

The technology that online facilitators use to communicate with students can also impact their ability to develop relationships. Velasquez, Graham, and West's (2013) case study research at an online charter school found that communication tools which allow for quick responses are best for relationship building. Teachers also found video communication tools to be especially helpful because they could see students' non-verbal communication cues. However, students tended to prefer text-based communication such as text-chat tools because they were somewhat uncomfortable talking with teachers on the phone or using video. However, the research indicated that students were more open to video communication once a relationship had been established.

Facilitators are also asked to communicate regularly with the course teacher and facilitate students' interactions with the course teacher. For instance, de la Varre et al. (2011) found that on-site facilitators were asked to communicate student needs to the course teacher and encourage timid students to communicate with their instructor. Similarly, Drysdale et al. (2014) found that online facilitators acted as a "communication link" (p. 21) between their students and their other teachers in the school. For instance one student contacted her facilitator and said, "I am failing a math class. I don't know what to do." The facilitator then arranged for a meeting for the three of them to "work out a plan to help [the student] be more successful" (p. 21). This may help to explain why teachers in DiPietro, Ferdig, Black, and Preston's (2008) research identified teacher-facilitator relationships as an important contributor to student success.

Monitoring

Facilitators are required to monitor student course activity and to motivate students when student engagement is low (Borup et al, 2014). In an evaluation report of an online program that utilized on-site facilitators Roblyer, Freeman, Stabler, and Scheidmiler (2007) stated:

> Student ability to handle distance education courses appears to depend more on motivation, self-direction, or the ability to take responsibility for individual learning. Because of these determinants of success, facilitators that are directly working with students day by day are key to the success of the program. (p. 11)

Furthermore, de la Varre et al. (2011) found that when students worked in the same room as other students, the on-site facilitators were required to maintain classroom discipline and ensure that students remained on task, supporting Harms et al.'s (2006) claim that unmonitored online students could spend their learning time on off-task behavior.

On-site facilitators' physical proximity allows them to easily monitor students' learning behavior and help to motivate students when needed. For instance, de la Varre et al. (2011) found that some students' could become unmotivated to learn because they wanted more personable and timely communication from their online teachers. As a result their on-site facilitators used their physical presence to motivate students to engage in learning activities (de la Varre et al., 2011).

Although online facilitators do not share the same physical space as their students, they can still easily monitor students more demonstrative online behavior such as submitting assignments and online communications. However, not all types of student engagement are as easily observable by online facilitators. Online facilitators can obtain a better understanding of students' level of engagement by communicating with them directly, but Zhang and Almeroth (2010) explained that this can be time consuming and inaccurate because students have difficulty recalling what they have done or exaggerate their activity. Murphy and Rodriguez-Manzanares (2009) conducted and analyzed interviews with 42 online high school teachers and found student-tracking programs proved helpful "to monitor presence or pages visited, or verify what students are doing, if they are struggling in a certain area" (p. 10). Borup et al. (2014) also found that all 12 interviewed teachers at an online charter school found students' activity reports helpful in monitoring students' engagement in learning activities. One teacher stated that although she was physically separated from her students, this data allowed her to "track [students'] little footprints through everything they do" (Borup et al., 2014, p. 801). However, the educational community—unlike the business sector—has been slow to make advances in these types of tools (Davis and Roblyer, 2005) and little is known about how or if facilitators use this data to make decisions.

Instructing

Facilitators are not typically content experts and are not expected to teach the content to students. However, Barbour and Mulcahy (2004) qualitatively examined on-site facilitator behavior and found that in many cases the on-site facilitator regularly went beyond their contractual responsibilities by engaging in instructional activities. This was especially true when the facilitators had experience teaching in the course content area. Similarly, de la Varre et al.'s (2011) examination of on-site facilitators for AP English courses found that facilitators engaged in direct instructional activities, especially when they were certified English teachers. However, some facilitators still engage in instructional activities even when they are not certified teachers in the content area. O'Dwyer et al. (2007) surveyed 231 High School algebra students regarding their interactions with on-site facilitators who were not certified to teach math and found that over 76% of the students asked the on-site facilitator about the course content at least once a week with 33.3% doing so every lesson. Similarly, Barbour and Hill's (2011) research examining rural students who were supplementing their face-to-face learning with an online course found that when challenges arose students were more likely to ask their on-site peers and facilitators than their online instructor, even when their on-site facilitator was not a content expert.

de la Varre et al. (2011) found that these types of instructional activities also occurred when the facilitator perceived weaknesses in the course curriculum or the pedagogical strategies employed by the course teacher and that teachers were somewhat unaware of the extent that facilitators engaged in direct instructional activities. Some teachers seemed to welcome these instructional activities, and others believed that their role as the course teacher was being undermined. In some cases facilitators went beyond direct instructional activities and actually modified the course design or timetables. These types of facilitator interventions appeared to especially undermine teachers' authority. One teacher described his relationship with a facilitator as adversarial because the facilitator was openly critical toward the instructor and the course design. As a result, de la Varre et al. (2011) explained that teachers and facilitators would be more likely to coordinate their efforts if they engaged in an "in-depth instructor-facilitator conversation at the outset of the course regarding communication preferences, the extent of content support by the facilitator, and local school factors that potentially conflict with the course timetable" (para. 26). Wicks (2010) added that while the "crucial assessment decisions remain the professional teacher's to make," regular teacher-facilitator communication would allow the facilitator to provide the teacher with important information that would help them in their decision making.

Impact of Facilitators

Although the use of facilitators is commonly cited as a means for increasing learning outcomes, little research has actually examined their ability to do so, and the research that does exist largely relies on self-report data, which limits our ability to generalize the findings. However, there are some encouraging research findings that have indicated the use of facilitators to be effective at improving affective and cognitive course outcomes. For instance, Roblyer et al. (2008) found that providing online students with a monitored class period to work is especially important for K-12 students. In fact, their analysis of survey responses from 2,880 virtual school students found that students who had an assigned class period to work were nearly twice as likely to pass their course than those who did not have an assigned class period. Drysdale and his colleagues' "(Drysdale et al., in press; Drysdale et al., 2014) analysis of facilitator focus groups and interviews with students and facilitators similarly indicated that online facilitators could have a motivational and stimulating effect on students. However, these benefits came with some costs. Facilitators found that fulfilling their responsibilities required "consistent effort" and placed demands on their already busy teaching schedule. Frid's (2001) case study examining 28 online students who ranged from 7 to 12 years of age, also found that on-site facilitators who actively organized and monitored student work were "crucial to the degree to which [students] maintained engagement in activities" (p. 18).

Some have suggested that facilitators can have an especially large impact on at-risk students (Archambault et al., 2010). In their site coordinator handbook, Colorado Online Learning (2012) recognized this need and explained to their facilitators that while some students require little support, at-risk students "will need a much higher degree of on-site support" (p. 4). Pettyjohn's (2012) dissertation research provides some insights as to why at-risk students are especially susceptible to a facilitator's support. The at-risk students who participated in Pettyjohn's research were prone to distractions and were unmotivated to engage in learning activities. This lack of motivation possibly stemmed from students' "limited perspective and future outlook" (p. 167) as well as low parental support—some parents were deceased, incarcerated, or deployed overseas. Pettyjohn summarized,

> "A relationship with a trusted staff member was a key component of at-risk students' success in supplemental online learning for credit recovery. There is an affective part of supporting at-risk students that cannot be minimized or ignored" (p. 174).

Ferdig's (2010) mixed method case study also examined a credit recovery program at the Michigan Virtual School. Students in the program were provided with the flexibility in where they worked but were required to visit a center and work with an on-site mentor twice a week. All of the students reported that they "felt accepted by their face-to-face mentor" (p. 18) and appreciated the support they provided. Although the at-risk student completion rate was lower than the general student population, all of the at-risk students successfully completed at least one online course despite being at the "point of expulsion or dropping out of traditional school" (p. 16). Wicks (2010) also described an online program instituted by the Cook County (Illinois) Sheriff's Department that provided facilitators to 17-21 year-old inmates who were enrolled in online high school courses. The program also established off-site classrooms where students in their Day Reporting Program could receive support from facilitators. This model of instruction "show[s] promise as a very effective solution to serving this group of students" (p. 21).

Facilitators' impact on learning outcomes also appears to be somewhat dependent on the training that they receive. Hannum et al. (2008) used a cluster-randomized control trial to examine the impact of job training on facilitators' effectiveness. Students in the treatment group worked with a trained on-site facilitator, and students in the control group worked with an untrained on-site facilitator. Researchers found that students in the treatment group completed the course at a significantly higher rate. Similarly, Staker (2011) reported that Florida Virtual School's courses with on-site facilitators who were trained regarding course navigation, technological assistance, and improving student motivation experienced greater success than those courses with students who study from home.

In summary, empirical research examining facilitator models is limited but emerging. The majority of the existing research has focused on on-site facilitators and research examining online facilitators is especially limited. The existing research has primarily identified and described three functions of online and on-site facilitators: fostering relationships, monitoring, and instructing. The majority of research is also descriptive in nature. Few researchers have actually examined facilitators' ability to impact learning outcomes and the research that does exist tends to rely on self-report data—limiting our ability to make generalizations. However, the emerging research has found that facilitators can have a positive impact on learning outcomes. This is especially true of at-risk students and when facilitators have been formally trained on their responsibilities.

Implications for Policy and Practice

Davis et al. (2007) explained that facilitators would be more effective if they were formally trained regarding their responsibilities. Similarly, Roblyer (2006) explained that effective "facilitators are made, not born" (p. 34). This sentiment is supported by research that has found trained facilitators to be more effective than facilitators that received little or no training (Hannum et al., 2008; Staker, 2011). Policy makers need to better recognize the important role of the facilitator and work to ensure that they receive the necessary training. The lack of facilitator training may stem in part from school administrators' lack of understanding. Lewis (2011) explained that many face-to-face administrators view online learning as a cost saving measure, and a report by the U.S. Department of Education (2008) found that some administrators were resistant to provide on-site facilitators due to their cost. Lewis (2011) added that some school administrators ask school personnel and teachers to act as on-site facilitators without providing them with time or compensation for fulfilling their roles. As a result, many on-site facilitators lack the time and incentive to be an effective support to students. While this is not an exhaustive list, researchers have recommended facilitators receive additional training in the following areas:

- effective communication strategies that provide students with social and emotional support (de la Varre et al., 2011),
- technology use (Lewis, 2011),
- classroom management (Roblyer et al., 2007),
- preventing late or dishonest work (Roblyer et al., 2007),
- skills and strategies to meet the needs of at-risk students (Archambault et al., 2010),
- facilitating students with disabilities (Repetto, Cavanaugh, Wayer, and Liu (2010).

Little is known about effective strategies for training facilitators, yet policy makers can learn from observing how other institutions have been proactive in this area. Cavanaugh (2009) explained that some school districts rely on the course providers to provide their on-site facilitators with the training they need. For instance, Roblyer (2006) described one virtual high school that had ambassadors who traveled to meet with on-site facilitators and administrators to discuss student needs. However, Lewis' (2011) dissertation research found that "most facilitators received little or no training for their role and had little contact with the online instructors or other facilitators" (p. 110). Montana has attempted to provide their online students with qualified on-site facilitators by requiring them to be licensed and endorsed teachers (Watson, Murin, Vashaw, Germin, & Rapp, 2011). However, it is unknown if this type of policy will be effective. In general, teacher preparation programs have not addressed the unique skills and knowledge that teachers need for the online environment (Kennedy & Archambault, 2012; Repetto et al., 2010). Similarly, it is likely that certified teachers lack the unique skills to be on-site or online facilitators. As a result, policies that require facilitators to be licensed teachers ignore the unique role of the facilitator and can make providing facilitators more expensive without the confidence that the facilitators will adequately understand and fulfill their roles. The Chicago Public Schools (CPS) has taken a different approach. CPS partnered with community organizations to provide students with on-site facilitators. Facilitators received 10 hours of training prior to beginning and 20 additional hours over the course of the academic year (Staker, 2011). Facilitators also needed to be at least 21 years old, hold at least an associate's degree, and pass a background check. Two facilitators then worked in a classroom with 30 students and were paid $15.00 per hour. Approaches like this may provide students with the support they need while still keeping costs low.

Similar to Smith, Clark, and Blomeyer's (2005) recommendation that all new online teachers receive mentoring from a more experienced teacher, new facilitators may benefit from being mentored by more experienced facilitators. These types of relationships could have several benefits. For instance, Keane et al. (2008) described one program where on-site facilitators at 112 rural high schools across the United States were provided with scenario-based training materials and encouraged to participate in discussions with other facilitators in the program. Although participation in these discussions began high and slowly tapered off as the year progressed, facilitators were able to share advice and strategies and it appeared that they were able to establish a sense of community among the facilitators and prevent feelings of isolation. Initial findings also suggested that students who had facilitators who were trained in this manner were more likely to persist and complete the course. Lewis (2011) recommended that course developers consider providing facilitators with avenues to contact other facilitators. O'Dwyer et al. (2007) also examined one model where on-site facilitators in math courses received close mentoring from the online teacher. This model provided unique professional development opportunities to the on-site facilitators, most of whom were certified teachers in other subject areas or were in the process of earning their math teaching certificate. In addition to the need for policy makers to increase the quality and quantity of facilitator training, research also suggests that facilitators and policy makers should recognize students have a variety of needs. Although all students likely need some support from facilitators, Roblyer et al. (2008) explained that not all students' needs are the same. This sentiment was also expressed by online facilitators who felt that some students needed the facilitator's support more than others (Drysdale et al., 2014). As a result Roblyer et al. (2008) suggested that school resources would be better utilized if schools identified at-risk students for "special tracking and support" (p. 106). Kim, Kim, and Karimi (2012) reasoned that students who were unsuccessful in traditional environments are unlikely to succeed online unless they are provided with a high level of support and encouragement whereas other students may be better apt to self-maintain a higher level of motivation. However, policy makers and facilitators alike need to recognize that students in advanced placement courses may not be fully aware of the rigors of these types of course and also need a high level of facilitator support (de la Varre et al., 2011; Offir, Barth, Lev, & Shteinbok, 2003).

Implications for Research

While research on facilitators in online schooling is growing, several important gaps in the literature need to be addressed. First, much of the current research focuses on the roles and experiences of on-site facilitators, with little research indicating that fully online programs have successfully implemented online facilitators. Ferdig (2010) called for "more research to help practitioners understand the role of . . . online mentoring" (p. 20). We believe this gap is significant in light of the raising demand for fully online K-12 schools (Watson et al., 2013) and the challenges associated with building relationships online rather than face-to-face (Harms et al., 2006; Hawkins et al., 2012; Murphy & Rodriguez-Manzanares, 2009). More research is needed on how facilitators can provide the same level of support when meeting with their students online rather than on-site.

Second, additional research is needed that examines the impact of facilitators on attrition rates for K-12 online schools. Scholars have consistently linked the roles of facilitators as part of the solution to curbing student attrition (Harms et al., 2006), however, little research substantiates this relationship (Keane et al., 2008). Studies need to explore how much, and how consistently, facilitators impact student attrition rates. Additionally, it would be interesting to learn which facilitator roles are most influential when students are deciding whether to drop-out or complete their courses. Understanding these relationships would enable teacher education programs, online schools, and facilitators to focus their efforts on the areas that will most significantly reduce student dropout.

Third, researchers should seek to use a greater variety of methodologies. Most of the research on facilitators in K-12 online learning has been exploratory in nature, often in the form of case studies. This is consistent with what Moore (2004) and Graham, Henrie, and Gibbons (2014) said about developing areas of research. In order to strengthen the current body of facilitator research, scholars need to seek generalizable studies that will explain relationships between variables in a variety of settings.

Fourth, grounding studies in theoretical frameworks could provide helpful insights and form a foundation for a more coordinated research effort. Four frameworks may be especially helpful and have already been used in facilitator research: (1) Garrison et al.'s (2000) Community of Inquiry framework (used by de la Varre et al., 2011), (2) Rovai's (2002) Sense of Community framework (used by Drysdale, 2014), (3) Nodding's (1984; 1992) Ethic of Care (used by Borup et al., 2013b and Velasquez et al., 2013), and (4) Borup, West, Graham, and Davies' (2014) Adolescent of Community of Engagement framework.

Fifth, existing research that focuses on teacher experiences needs to be balanced with an understanding of how students perceive their experiences with their facilitators. Such an understanding would provide direction for teacher education programs and facilitators as they seek to understand the most effective and meaningful ways to support their students.

Sixth, researchers should seek to explain the advantages and disadvantages of various models for on-site and online facilitation. Exposure to an analysis of a variety of models would help practitioners as they seek to identify what would work best for their program. For example, one dimension worth exploring would be how to determine if a program should have their teachers take on the role of facilitator in addition to their other responsibilities (Drysdale et al., 2014), or if they should have a separate person who acts exclusively as a facilitator (Ludwig-Hardman & Dunlap, 2003).

Finally, consideration should be given to how on-site or online facilitators can fit into a variety of blended learning models. A number of blended learning models are being developed that require varying levels of facilitator support (Staker & Horn, 2012). As students have their learning experiences divided between face-to-face and computer mediated instruction, there will be opportunities for facilitators to vary their online or face-to-face interactions with students. Perhaps blended programs will be able to optimize the effectiveness of facilitators as they have the ability to customize the type of interaction (online or in person) facilitators have with their students according to student needs and preferences. We see significant opportunity for research in this area.

Conclusion

K-12 online enrollments are growing dramatically despite the higher attrition rates than those found in face-to-face environments. Many programs have attempted to lower attrition rates by providing students with facilitators. Although facilitators are typically not content experts, they can provide important affective and academic support. For instance, facilitators can focus on building relationships with students, monitoring student engagement levels, and helping to build students capacity to be successful online. There are three primary facilitator models: (1) on-site facilitators, (2) online facilitators, and (3) parent facilitators. This chapter reviewed the research concerning on-site and online facilitators. Although emerging, research is limited. The majority of research has been exploratory in nature, attempting to describe facilitators' actions and how they are received by students. Some researchers have also examined the impact of facilitators on learning outcomes, but this research has relied primarily on self-report data. Research is especially lacking concerning online facilitators. Researchers and policy makers should work together to identify effective on-site and online facilitator practice and preparation strategies.

References

Archambault, L., Diamond, D., Brown, R., Cavanaugh, C., Coffey, M., Foures-Aalbu, D., Richardson, J., et al. (2010). *Research committee issues brief: An exploration of at-risk learners and online education.* (D. Scribner & M. Barbour, Eds.). Vienna, VA: iNACOL. Retrieved from http://www.eric.ed.gov/PDFS/ED509620.pdf

Barbour, M. K., & Hill, J. (2011). What are they doing and how are they doing it? Rural student experiences in virtual schooling. *Journal of Distance Education, 25*(1). Retrieved from http://www.jofde.ca/index.php/jde/article/view/725/1248

Barbour, M., & Mulcahy, D. (2004). The role of mediating teachers in Newfoundland's new model of distance education. *The Morning Watch, 32*(1). Retrieved from http://www.mun.ca/educ/faculty/mwatch/fall4/barbourmulcahy.htm

Borup, J., Graham, C. R., & Davies, R. S. (2013a). The nature of adolescent learner interaction in a virtual high school setting. *Journal of Computer Assisted Learning, 29*(2), 153–167. doi:10.1111/j.1365-2729.2012.00479.x

Borup, J., Graham, C. R., & Drysdale, J. S. (2014). The nature of teacher engagement at an online high school. *British Journal of Educational Technology, 45*(5), 793-806. doi:10.1111/bjet.12089

Borup, J., Graham, C. R., & Velasquez, A. (2013b). Technology-mediated caring: Building relationships between students and instructors in online K-12 learning environments. In M. Newberry, A. Gallant, & P. Riley (Eds.), *Advances on Teaching: Vol. 18. Emotions in school: Understanding how the hidden curriculum influences relationships, leadership, teaching, and learning* (pp. 183–202). Bimgley, UK: EmeraldBooks.

Borup, J., West, R. E., Graham, C. R., & Davies, R. S. (2014). The Adolescent Community of Engagement: A framework for research on adolescent online learning. *Journal of Technology and Teacher Education, 22*(1), 107–129.

Carr, S. (2000). As distance education comes of age, the challenge is keeping the students. *Chronicle of Higher Education, 46*(23).

Cavanaugh, C. (2007). Student achievement in elementary and high school. In M. G. Moore (Ed.), *Handbook of distance education* (2nd ed., pp. 157–168). Mahwah, NJ: Lawrence Erlbaum Associates.

Cavanaugh, C. (2009). *Getting students more learning time online.* Washington, D.C.: Center for American Progress. Retrieved from http://www.americanprogress.org/issues/2009/05/pdf/distancelearning.pdf

Charania, A. K. (2010). *Preparing future teachers for virtual schooling: Assessing their preconceptions and competence.* (Doctorial dissertation). Iowa State University. Retrieved from http://lib.dr.iastate.edu/etd/11447

Colorado Online Learning. (2012). *Site Coordinator Handbook*. Colorado Online Learning. Retrieved from http://www.coloradoonlinelearning.org/educators/SCHandbook.pdf

Davis, N. E., & Roblyer, M. D. (2005). Preparing teachers for the "schools that technology built": Evaluation of a program to train teachers for virtual schooling. *Journal of Research on Technology in Education, 37*(4), 399–410.

Davis, N., & Ferdig, R. E. (2009). Editorial: What is special about teacher education for virtual schooling? *Journal of Technology and Teacher Education, 17*(4), 425–435.

Davis, N., Roblyer, M. D., Charania, A., Ferdig, R., Harms, C., Compton, L. K. L., & Cho, M. O. (2007). Illustrating the "virtual" in virtual schooling: Challenges and strategies for creating real tools to prepare virtual teachers. *The Internet and Higher Education, 10*(1), 27–39. doi:10.1016/j.iheduc.2006.11.001

de la Varre, C., Keane, J., & Irvin, M. J. (2011). Dual perspectives on the contribution of on-site facilitators to teaching presence in a blended learning environment. *Journal of Distance Education, 25*(3). Retrieved from http://www.jofde.ca/index.php/jde/article/viewArticle/751/1285

DiPietro, M., Ferdig, R. E., Black, E. W., & Preston, M. (2008). Best practices in teaching K-12 online: Lessons learned from Michigan Virtual School teachers. *Journal of Interactive Online Learning, 7*(1), 10–35.

Drysdale, J. S., Graham, C. R., & Borup, J. (2014). An online high school "shepherding" program: Teacher roles and experiences mentoring online students. *Journal of Technology & Teacher Education, 22*(1), 9–32.

Drysdale, J., Graham, C. R., & Borup, J. (in press). Teacher and student perspectives on facilitating a sense of community through an online high school's "shepherding" program. International Journal of e-Learning

Ferdig, R. E. (2010). *Understanding the role and applicability of K-12 online learning to support student dropout recovery efforts.* Lansing, MI: Michigan Virtual University. Retrieved from http://www.mivu.org/LinkClick.aspx?fileticket=uiE%2FCGL-Yj2g%3D&tabid=373

Ferdig, R. E., Cavanaugh, C., DiPietro, M., Black, E., & Dawson, K. (2009). Virtual schooling standards and best practices for teacher education. *Journal of Technology and Teacher Education, 17*(4), 479–503.

Roblyer , M. D., Freeman, J., Stabler, M., & Schneidmiler, J. (2007). *External Evaluation of the Alabama ACCESS Initiative Phase 3 Report*. Eugene, OR: International Society for Technology in Education. Retrieved from http://accessdl.state.al.us/2006Evaluation.pdf

Frid, S. (2001). Supporting primary students' on-line learning in a virtual enrichment program. *Research in Education, 66*, 9–27.

Garrison, D. R., Anderson, T., & Archer, W. (2000). Critical inquiry in a text-based environment: Computer conferencing in higher education. *The Internet and Higher Education, 2*(2-3), 87–105. doi:10.1016/S1096-7516(00)00016-6

Graham, C. R. (2006). Blended learning systems: Definition, current trends, and future directions. In C. J. Bonk & C. R. Graham (Eds.), *Handbook of blended learning: Global perspectives, local designs* (pp. 3–21). San Francisco, CA: Pfeiffer Publishing.

Graham, C. R., Henrie, C. R., & Gibbons, A. S. (2014). Developing models and theory for blended learning research. In A. G. Picciano, C. D. Dziuban, & C. R. Graham (Eds.), *Blended learning: Research perspectives, volume 2* (pp. 13–33). New York, NY: Taylor & Francis.

Hannum, W. H., Irvin, M. J., Lei, P., & Farmer, T. W. (2008). Effectiveness of using learner-centered principles on student retention in distance education courses in rural schools. *Distance Education, 29*(3), 211–229. doi:10.1080/01587910802395763

Harms, C. M., Niederhauser, D. S., Davis, N. E., Roblyer, M. D., & Gilbert, S. B. (2006). Educating educators for virtual schooling: Communicating roles and responsibilities. *The Electronic Journal of Communication, 16*(1-2). Retrieved from http://www.cios.org/EJC-PUBLIC/016/1/01611.HTML

Hartley, K., & Bendixen, L. D. (2001). Educational research in the Internet age: Examining the role of individual characteristics. *Educational Researcher, 30*(9), 22–26.

Hawkins, A., & Barbour, M. K. (2010). U.S. virtual school trial period and course completion policy study. *American Journal of Distance Education, 24*(1), 5–20. doi:10.1080/08923640903529295

Hawkins, A., Barbour, M. K., & Graham, C. R. (2011). Strictly business: Teacher perceptions of interaction in virtual schooling. *The Journal of Distance Education, 25*(2).

Hawkins, A., Barbour, M. K., & Graham, C. R. (2012). "Everybody is their own island": Teacher disconnection in a virtual school. *The International Review of Research in Open and Distance Learning, 13*(2), 124–144.

Hawkins, A., Graham, C. R., Sudweeks, R. R., & Barbour, M. K. (2013). Course completion rates and student perceptions of the quality and frequency of interaction in a virtual high school. *Distance Education, 34*(1), 64–83. doi:10.1080/01587919.2013.770430

International Association for K-12 Online Learning (iNACOL). (2012). *Fast facts about online learning.* Vienna, VA: INACOL. Retrieved from http://www.inacol.org/press/docs/nacol_fast_facts.pdf

Keane, J., de la Varre, C., Irvin, M. J., & Hannum, W. (2008). Learner-centered social support: enhancing online distance education for underserved rural high school students in the United States. In N. Whitton & M. McPherson (Eds.), *Rethinking the Digital Divide: Research Proceedings of the 15th Association for Learning Technology Conference (ALT-C 2008)* (pp. 39–48). Retrieved from http://repository.alt.ac.uk/435/1/ALT_C_2008_rp_keanej_delavarrec_irvinm_hannumw.pdf

Kennedy, K., & Archambault, L. (2012). Offering preservice teachers field experiences in K-12 online learning: A national survey of teacher education programs. *Journal of Teacher Education, 63*(3), 185–200. doi:10.1177/0022487111433651

Kennedy, K., Cavanaugh, C., & Dawson, K. (2013). Preservice Teachers' Experience in a Virtual School. *American Journal of Distance Education, 27*(1), 56–67. doi:10.1080/08923647.2013.756757

Kim, P., Kim, F. H., & Karimi, A. (2012). Public online charter school students: Choices, perceptions, and traits. *American Educational Research Journal, 49*(3), 521–545. doi:10.3102/0002831212443078

Lewis, S. (2011). *Local Implementation of Online High School German Courses: The Influence of Local Support on Student Achievement.* (Doctorial dissertation). Oklahoma State University.

Ludwig-Hardman, S., & Dunlap, J. C. (2003). Learner support services for online students: Scaffolding for success. *International Review of Research in Open and Distance Learning, 4*(1).

Moore, M. G. (1993). Three types of interaction. In K. Harry, M. John, & D. Keegan (Eds.), *Distance education: New perspective* (pp. 19–24). New York, NY.

Moore, M. G. (2004). Editorial: Research worth publishing. *American Journal of Distance Education, 18*(3), 127–130.

Murphy, E., & Rodríguez-Manzanares, M. A. (2008). Contradictions between the virtual and physical high school classroom: A third-generation activity theory perspective. *British Journal of Educational Technology, 39*(6), 1061–1072. doi:10.1111/j.1467-8535.2007.00776.x

Murphy, E., & Rodríguez-Manzanares, M. A. (2009). Teachers' perspectives on motivation in high school distance education. *Journal of Distance Education, 23*(3), 1–24.

Noddings, N. (1984). *Caring: A Feminine Approach to Ethics and Moral Education.* Berkeley, CA: University of California Press.

Noddings, N. (1992). *The challenge to care in schools: An alternative approach to education.* New York, NY: Teachers College Press.

Offir, B., Barth, I., Lev, Y., & Shteinbok, A. (2003). Teacher–student interactions and learning outcomes in a distance learning environment. *The Internet and Higher Education, 6*(1), 65–75. doi:10.1016/S1096-7516(02)00162-8

O'Dwyer, L. M., Carey, R., & Kleiman, G. (2007). A study of the effectiveness of the Louisiana algebra I online course. *Journal of Research on Technology in Education, 39*(3), 289–306.

Palloff, R. M., & Pratt, K. (2007). *Building Online Learning Communities: Effective Strategies for the Virtual Classroom* (2nd ed.). San Francisco, CA: Jossey-Bass.

Patterson, B., & McFadden, C. (2009). Attrition in online and campus degree programs. *Online Journal of Distance Learning Administration, 7*(2). Retrieved from http://www.westga.edu/~distance/ojdla/summer122/patterson112.html

Pettyjohn, T. J. (2012). *Stakeholders' perceptions of supplemental online learning for credit recovery.* (Doctorial dissertation). Georgia Southern University. Retrieved from http://digitalcommons.georgiasouthern.edu/cgi/viewcontent.cgi?article=1402&context=etd

Queen, B., & Lewis, L. (2011). *Distance Education Courses for Public Elementary and Secondary School Students: 2009–10.* Washington, D.C.: National Center for Education Statistics.

Repetto, J., Cavanaugh, C., Wayer, N., & Liu, F. (2010). Virtual high schools: Improving outcomes for students with disabilities. *Quarterly Review of Distance Education, 11*(2), 91–104.

Rice, K. L. (2006). A comprehensive look at distance education in the K-12 context. *Journal of Research on Technology in Education, 38*(4), 425–449.

Roblyer, M D, Davis, L., Mills, S. C., Marshall, J., & Pape, L. (2008). Toward practical procedures for predicting and promoting success in virtual school students. *American Journal of Distance Education, 22*(2), 90–109.

Roblyer, M. D. (2006). Virtually successful: Defeating the dropout problem through online programs. *The Phi Delta Kappan, 88*(1), 31–36.

Ronsisvalle, T., & Watkins, R. (2005). Student success in online K-12 education. *Quarterly Review of Distance Education, 6*(2), 117–124.

Rovai, A. P. (2002). Building sense of community at a distance. *International Review of Research in Open and Distance Learning, 3*(1), 1–16.

Russell, G. (2004). Virtual schools: A critical view. In Catherine Cavanaugh (Ed.), *Development and Management of Virtual Schools: Issues and Trends* (pp. 1–25). Hershey, PA: Information Science Publishing.

Smith, R., Clark, T., & Blomeyer, R. L. (2005). *A synthesis of new research on K-12 online learning. Research Studies.* Naperville, IL: Learning Point Associates.

Staker, H. (2011). T*he rise of K-12 blended learning: Profiles of emerging models. Learning.* Innosight Institute. Retrieved from http://www.innosightinstitute.org/innosight/wp-content/uploads/2011/05/The-Rise-of-K-12-Blended-Learning.pdf

Staker, H., & Horn, M. B. (2012). *Classifying K – 12 Blended Learning.* Innosight Institute. Retrieved from http://www.christenseninstitute.org/wp-content/uploads/2013/04/Classifying-K-12-blended-learning.pdf

U.S. Department of Education. (2008). *Evaluating online learning: Challenges and strategies for success.* Washington, D.C.: U.S. Department of Education Office of Innovation and Improvement. Retrieved from http://www2.ed.gov/admins/lead/academic/evalonline/evalonline.pdf

Velasquez, A., Graham, C. R., & Osguthorpe, R. D. (2013a). Caring in a technology-mediated online high school context. *Distance Education, 34*(1), 97–118. doi:10.1080/01587919.2013.770435

Velasquez, A., Graham, C. R., & West, R. E. (2013b). An Investigation of Practices and Tools that Enabled Technology-Mediated Caring in an Online High School. *The International Review of Research In Open and Distance Learning, 14*(5), 277–299. Retrieved from http://www.irrodl.org/index.php/irrodl/article/view/1465/2758

Watson, J., Murin, A., Vashaw, L., Gemin, B., & Rapp, C. (2011). *Keeping pace with K-12 online learning: An annual review of policy and practice. Learning.* Evergreen Education Group. Retrieved from http://kpk12.com/cms/wp-content/uploads/KeepingPace2011.pdf

Watson, J., Murin, A., Vashaw, L., Gemin, B., & Rapp, C. (2012). *Keeping pace with K-12 online and blended Learning: An annual review of Policy and practice.* Evergreen Education Group. Retrieved from http://kpk12.com/cms/wp-content/uploads/KeepingPace2012.pdf

Watson, J., Murin, A., Vashaw, L., Gemin, B., & Rapp, C. (2013). *Keeping pace with K-12 online & blended learning: An annual review of policy and practice.* Evergreen Education Group. Retrieved from http://kpk12.com/cms/wp-content/uploads/EEG_KP2013-lr.pdf

Wicks, M. (2010). *A national primer on K-12 online learning* (2nd ed.). Vienna, VA: iNACOL. Retrieved from http://www.inacol.org/research/bookstore/detail.php?id=22

Zhang, H., & Almeroth, K. (2010). Moodog: Tracking student activity in online course management systems. *Journal of Interactive Learning Research, 21*(3), 407–429.

Chapter 16

The Role of the School Psychologist in K-12 Online & Blended Learning

P. Dawn Tysinger,
Georgia Southern University, dtysinger@georgiasouthern.edu
Jeffrey A. Tysinger,
Georgia Southern University, jtysinger@georgiasouthern.edu
Terry Diamanduros,
Georgia Southern University, tdiamanduros@georgiasouthern.edu

Abstract

With the appropriate preparation and training, school psychologists are uniquely suited to provide support within the K-12 online learning environment for students, teachers, administrators, and families. The preparation and training needs at the level of graduate training and professional development are highlighted. Specific emphasis is placed on the adaptation of the school psychologist's functions in the areas of consultation, intervention, assessment, and counseling. Additionally, the development of better credentialing models for interstate service delivery and the need for empirical research related to school safety are discussed.

Introduction

In the United States, there are currently over 28,000 individuals practicing in the field of school psychology. School psychologists generally work in school-based settings offering services to preschool through high school-aged students, families, teachers, and administrators. The primary goal of the school psychologist is to help youth succeed academically, socially, emotionally, and behaviorally. Their functions include problem-solving consultation with teachers, parents, or administrators to intervene with struggling students in the aforementioned domains. School psychologists also conduct both formal and informal assessment to evaluate student functioning and/or determine eligibility for special services. In their mental health role, they often serve as therapists or counselors for individual students or groups of students struggling with similar issues. When necessary, school psychologists also provide crisis intervention services at the individual, group, or school-levels. Additionally, school psychologists frequently engage in efforts to design and implement programs (often through a Response-to-Intervention [RtI] framework) for the prevention of academic and behavioral problems common to school-age youth. Thus, school psychologists are specially-trained professionals who apply psychological knowledge and principles to those in or around the school setting.

Before embarking on practice, the school psychologist must undergo extensive training to be credentialed. Beyond the typical four-year undergraduate degree, a school psychology candidate must apply to and be accepted in a graduate-level training program for school psychologists. Although school psychologists are commonly trained at both the doctoral and non-doctoral level in the US, the entry-level degree is that of the Education Specialist (although the name of the degree may vary in some states). This degree or its equivalent is typically conferred after the candidate has completed a minimum of 60 graduate credit hours and a 1200-hour internship.

As with most education professionals, the roles and functions of the school psychologist traditionally have been tied to the brick-and-mortar school. However, as noted by Tysinger, Tysinger, Diamanduros, and Kennedy (2013), the K-12 online learning environment is replete with opportunities for the practice of school psychology that will enhance the functioning of the students, faculty, and families affiliated with this burgeoning educational medium. Additionally, research supports that many students seeking online enrollment would be considered at-risk, including students with disabilities, students who have been removed from traditional schools due to behavioral challenges, and students who are adjudicated in detention centers or house arrest (Ahn, 2011; Dickson, 2005; Huerta, Gonzalez, & d'Entremont, 2006). Furthermore, dropout rates are higher among students in online learning programs than their peers in traditional schools (Cyrs, 1997; Lynch, 2001; Tuck, 2013). Experts in this area have suggested that at-risk students in the online environment may need additional supports (Roblyer, Davis, Mills, Marshall, & Pape, 2008). Thus, the need for school psychological support within K-12 online learning is clear.

Tysinger et. al, (2013) and Kennedy, Tysinger, LaFrance, and Bailey (2012) have addressed the need for graduate education programs to prepare school psychologists for practice within and addressing the unique needs of K-12 online learning environments. In relation to personal characteristics and previous experiences, it may be necessary for the school psychologist who practices in an online learning environment to disregard his/her notions about limitations of K-12 online learning to embrace the strengths of the medium [as is recommended in teacher preparation literature (Teclehaimanot & You, 2013)]. Therefore, when new or experienced school psychologists attain the necessary competency for practice within K-12 online learning environments, the medium offers opportunity for delivering the services of the school psychologist in innovative ways to improve the functioning of students and faculty in the virtual school. School psychologists' skills in consultation, intervention design, assessment, and counseling are particularly amenable and critical within K-12 online learning (Tysinger et al., 2013).

Consultation is a primary function of the school psychologist (Curtis & Zins, 1981; Fagan & Wise, 2007), and one that is both necessary within and adaptable to the online learning environment (Tysinger et al., 2013). This practice involves the collaboration of a school psychologist with a teacher, administrator, or parent to apply psychological knowledge and principles to an academic, behavioral, social, or emotional challenge being experienced by a student. The goal of the consultation is two-fold: the school psychology consultant helps the consultee apply new skills to the current issue, but they also desire for the consultee to increase his/her skill set in a way that he/she can apply the new knowledge in similar situations in the future (Brown, Pryzwansky, & Schulte, 2006). School psychologists often refer to this aspect of consultation as "giving psychology away."

The literature within the field of school psychology is well-developed in the area of consultation and supports the practice as effective for promoting positive change as an indirect service of the school psychologist. The service is considered indirect because the school psychologist is working through a third party (teacher, administrator, or parent) to intervene upon the student. By utilizing the indirect approach of consultation, the school psychologist can potentially impact a much greater number of students with his/her skills (Fagan & Wise, 2007).

There are numerous models for consultation that have garnered empirical support including mental health consultation and behavioral consultation. For a full explanation of consultation models see Brown et al. (2006) or Erchul and Martens (2012). In order to facilitate consultation within the K-12 online learning environment and adhere as closely as possible to the models of consultation, the school psychologist would need to use the available technology that most closely resembles face-to-face interaction such as Skype or ooVoo web-conferencing tools. While other technologically-facilitated means (e.g. instant messaging or email) might be used for consultation purposes, these are less ideal in that the school psychologist will not have access to the consultee's body language or intonation as sources of data for gaining insight into the more psychological elements of the case (Tysinger et al., 2013).

Most approaches of school psychological consultation involve progression of the process through four phases: problem identification, problem analysis, intervention design, and evaluation. The emotional investment, level of frustration, and commitment to change of the consultee are particularly important variables for the school psychologist to take into consideration in the problem identification and problem analysis phases. Thus, the need for the use of web-conferencing tools within those phases increases since the school psychologist and consultee are working together to arrive at a specific, measurable, operational definition of the issue of concern for the student, taking into account all variables that may be contributing to the issue, and developing a hypothesis from which to approach the problem-solving process (Erchul & Martens, 2012). Tysinger et al. (2013) have suggested that the school psychologist's knowledge and expertise may be particularly helpful in consultation with teachers to target concerns with student assignment completion and motivation within the K-12 online learning environment.

As the school psychologist and consultee move into phases three and four of consultation (intervention design and evaluation), the pair are actually merging into the interventionist function of the school psychologist. Prior to intervention design for any academic, behavior, social, or emotional student concern, the school psychologist works with the teacher to design a plan to collect data on the issue of concern. In traditional schools, this typically involves one or both parties using a systematic observation process to collect baseline data. This baseline data is subsequently compared to that of a typically functioning student to determine if the targeted issue is outside the norm for that age/grade student and the extent of severity of the issue. Additionally, these data are used to determine whether the issue of concern represents a skill deficit or a performance deficit for the student. A skill deficit means that the student has not learned the requisite skill for success; a performance deficit is when a student has the requisite skills for success but is choosing not to use the skill. Therefore, the data typically collected through observation is critical to the development and success of the problem-solving process.

In the case of blended online learning programs, the school psychologist could conceivably have the opportunity to directly observe a target student during any face-to-face content delivery. Despite the importance of observational data, direct observation of the student is unlikely in the fully online K-12 learning environment. However, Tysinger et al. (2013) have recommended strategies for utilizing the strengths of the online environment and its associated technologies for the collection of data. The systematic observation techniques of event recording, latency recording, and duration recording could easily translate into the online environment, and the techniques of partial interval recording and time sampling could be utilized during any synchronous online activity. Additionally, the authors have noted that submitted assignments and archived discussions are rich sources of information. The school psychologist should analyze those written products for consistency and inconsistency in the student's demonstration of the targeted issue/response. The school psychologist could also utilize content analysis techniques from the field of instructional technology in these data sources (Yang, Richardson, French, & Lehman, 2011). During any synchronous lesson or activity, the school psychologist could "observe" the student's behavior. Finally, Tysinger et al. (2013) indicate that technologically-facilitated interviews with the student, teacher, and parent can provide further sources of data on which to base problem-solving efforts.

When the resulting data have been compiled and analyzed, the school psychologist and consultee work collaboratively to design the intervention to address the issue of concern. Whether practicing in a traditional or technologically-enhanced format, the intervention is designed to either build a skill or increase probability of the performance of a skill, dependent on the previous determination of its etiology as a skill or performance deficit. The school psychologist and consultee mutually determine acceptable and feasible methods for intervention, progress monitoring, and finally evaluation of intervention success. The interventions are designed to utilize empirically-validated techniques, training, modeling, and positive reinforcement for demonstration of replacement behaviors to the issue of concern. Throughout the process, the school psychologist and consultee continue to track the sources of data for monitoring impact and effectiveness of the intervention.

Similar to consultation and intervention design, another role of the school psychologist reliant on data-based decision-making is that of assessment. File review, interviews, and observation are key components in the assessment process that can be adapted to the K-12 online learning environment as described above. The component of assessment that may be more difficult for the school psychologist to deliver is that of testing for eligibility for special services. In a traditional school, this testing takes place in a face-to-face session between the school psychologist and referred student. In fact, many school psychologists who are currently serving K-12 online students continue to utilize this model by meeting at a mutually agreed upon location in order for formal assessment to take place, and many blended online learning programs offer the opportunity for face-to-face assessment methods as well. However, Tysinger et al. (2013)

are challenging school psychologists to investigate and take advantage of sources of assessment information unique to the online learning environment. Common assessment decisions including classroom accommodations, assignment modifications, and need for adaptive technology can be made for the compilation and analysis of multiple sources of data. Tysinger et al. (2013) also note that work habit information as measured by student log-in data (time spent online, time of day of assignment completion, etc.) and comment patterns can be useful to the assessment and decision-making process.

At the intersection of the school psychologists' functions within assessment and intervention is their role within the RtI process. Brown-Chidsey and Steege (2005) define RtI as "…an assessment-intervention model that allows schools to deliver sound instructional methods to students….who might fall through the cracks" (p. 2). In the RtI model, the school psychologist utilizes his/her aforementioned consultation, assessment, and intervention skills to assist school personnel with moving students through tiered levels of support to enhance their academic or behavioral performance. Again, the school psychologist is uniquely trained and suited to aid the implementation of RtI in the K-12 online learning environment.

Another direct service role of the school psychologist with potential for enhancing student functioning within K-12 online learning environments is that of counseling. Although data are presently unavailable for children and adolescents in virtual school settings, studies of adult learners show that over 22% of those engaged in online learning environments have self-identified as having mental health diagnoses (Leonhard, 2010). Additionally, it has been noted that nearly 20% of children in the population at large has a diagnosable mental disorder (Huang, Stroul, Friedman, Mrazel, Friesen, Pires, & Mayberg, 2005). However, it is estimated that only one-third of those students will receive the necessary mental health treatment (Whelly, Cash, & Bryson, 2003). Thus, Tysinger et al. (2013) have charged that school psychologists affiliated with K-12 online learning environments must be prepared to provide mental health supports necessary for students to succeed, as they do within traditional school environments.

The role of counseling for the school psychologist often includes individual, group, and/or crisis counseling (Fagan & Wise, 2007). Depending on the nature of the issue being targeted, the school psychologist may choose to intervene with a psychoeducational, counseling, or therapeutic focus. Psychoeducational interventions are those that target typically-developing students and may address social skill building, information provision, and/or performance issues. Counseling interventions target students who are facing issues with development or adjustment, and therapeutic interventions are those more intensive supports for psychological-ly-oriented challenges (Schectman, 2002). The empirical research on technologically-facilitated counseling is growing rapidly and will be critical to the practice of school psychology within K-12 online and blended learning.

Research Synthesis

To date, there are no empirical studies that examine the practice of school psychology in K-12 online learning and blended environments in any regard. However, existing research can be applied to the roles and functions of the school psychologist providing service delivery in online learning environments as previously described. Of particular relevance to the school psychologist would be empirical studies of student engagement data in online learning formats and the burgeoning research on the effective delivery of counseling services through online means.

With regard to student engagement, research suggests that measuring student engagement through the use of learning analytics could be a correlate to or predictor of academic success. As such, the school psychologist may focus academic interventions on increasing student engagement through lessons, activities, or assignments when appropriate. Dickson (2005) indicated that the quantity of data on student performance in online settings actually surpasses that of students in traditional settings since every mouse click, key stroke, and comment is potentially accessible for analysis within the learning management system. Student engagement as measured by clicks is correlated with academic success (Dickson, 2005; Hamane, 2014).

In relation to counseling, a recent meta-analysis suggests the promise associated with counseling conducted through online chat despite the small number of empirical studies to date (Dowling & Rickwood, 2013). The literature on technologically-facilitated counseling indicates that there are many challenges in this form of service-delivery, including ethical considerations related to confidentiality (Mallen, Vogel, & Rochlen, 2005) and counseling process issues. Some of those issues include lack of nonverbal cues (Williams, Bambling, King, & Abbott, 2009), time management concerns, and session progress (Bambling, King, Reid, & Wegner, 2008; Chardon, Bagraith, & King, 2011). Despite these concerns, the empirical studies of online counseling sessions also offer techniques for the counselor for overcoming the limitations of the technology, including the use of overt thought and feeling statements from both the counselor and client and the targeted use of emoticons (Mallen et al., 2005; Trepal, Haberstroh, Duffey, & Evans, 2007).

While research from related fields offers direction for the school psychologist practicing in an online medium, the dearth of research from the field itself is alarming and must be addressed to ensure high-quality, professional, competent, and ethical practice across all the roles and functions of school psychological practice. The uniqueness of K-12 fully online and blended learning environments require extensive empirical study to move toward best practice models for service delivery.

Implications for Policy and Practice

At present, K-12 online learning represents a new medium of practice for the school psychologist with far-reaching implications for service delivery. Both policy and practice will be impacted by the necessary changes in graduate education, professional development, and credentialing to ensure high quality school psychological services are provided for students, teachers, families, and administrators affiliated with K-12 fully online and blended learning environments. Although Fagan and Wise (2007) were not referring specifically to work within K-12 online learning, they may have foreshadowed school psychology's continued evolution with their contention that, "School psychology is expanding outward from center, away from its past of traditional roles, functions, and settings. Almost every conceivable type of school psychologist will exist in the coming decades. Roles and functions may be defined more by setting than in the past" (p. 391).

With regard to school psychology preparation for working within the K-12 online learning environment, very few training opportunities (i.e., curriculum content, assignments, experiential learning) exist at the graduate education or professional development levels (Kennedy et. al, 2012). Yet, the National Association of School Psychologists (NASP) has emphasized that technology use and impact (like that inherent in online education) is a critical domain for school psychological practice (NASP, 2006), and NASP has started an interest group called School Psychology in Virtual Schools for the purpose of providing a space for those interested in this area. Additionally, the NASP's *Principles for Professional Ethics* (NASP, 2010a) requires that school psychologists engage only in practices for which they are trained and seek supervision and/or consultation with other professionals when the need arises to expand their skill sets. Thus, the demand for high-quality preparation is clear to positively influence both policy and practice, and Kennedy et al. (2012) have issued a call-to-action in this regard.

In the context of graduate education, NASP determines the national-level standards for the training of school psychologists as outlined in the *Standards for Graduate Preparation of School*

Psychologists (NASP, 2010b). Specifically, the ten domains of education and practice are as follows: Data-Based Decision Making and Accountability, Consultation and Collaboration, Interventions and Instructional Support to Develop Academic Skills, Interventions and Mental Health Services to Develop Social and Life Skills, School-Wide Practices to Promote Learning, Preventive and Responsive Services, Family-School Collaboration Services, Diversity in Development and Learning, Research and Program Evaluation, and Legal, Ethical, and Professional Practice (NASP, 2010b). The NASP conducts a thorough review of every training program seeking national approval to ensure that the aforementioned domains are addressed extensively across the program's curriculum, assessed directly by its faculty, and attained by its graduate candidates. Although the NASP has yet to address the training needs specific to online school psychological practice, the aforementioned training domains could all apply to the practice in this area, and certainly, current graduate training programs will need to supplement their programs of study with more online instructional design and pedagogy for school psychologists to work effectively within K-12 online learning environments.

Undergraduate and graduate training for education professionals to work within K-12 online learning remains in its infancy; the most progress seems to be in teacher preparation programs where approximately 2% of programs nationwide are offering coursework and/or field experiences specific to teaching within an online environment (Kennedy & Archambault, 2012). Despite the limited presence of content for online learning environments within higher education, Tysinger et al. (2013) recommended that the preparation of school psychologists to work within this relatively new educational medium should follow the models set forth by the teacher education programs that have embraced K-12 online learning within their coursework and field experiences. As such, Tysinger et al. (2013) recommend that, "…school psychology training programs should incorporate knowledge-based content within the course sequence to address each role and function of the school psychologist and his or her adaptation to the online learning environment." They further suggest that those in training to become school psychologists should experience online learning from the student perspective. Taking a graduate-level class that is offered fully online would help the school psychology candidates conceptualize the uniqueness of that learning environment and its associated challenges and opportunities for learners. Finally, supervised field experiences in the form of course projects or practica within K-12 online learning environments (commensurate with those found in teacher education programs) are essential from a pragmatic and ethical perspective (Tysinger et al., 2013). In fact, Standard IV (Responsibility to Schools, Families, Communities, The Profession, and Society) of the NASP *Principles for Professional Ethics* (2010a) includes provision IV.1.1, which details that:

> To provide effective services and systems consultation, school psychologists are knowledgeable about the organization, philosophy, goals, objectives, culture, and methodologies of the settings in which they provide services. In addition, school psychologists develop partnerships and networks with community service providers and agencies to provide seamless services to children and families.

In addition to the needs for training within the school psychology graduate education programs, practitioners who are already working within the field may exhibit knowledge and/or skill deficits with regard to the application of their practice to K-12 online learning environments. According to Kennedy et al. (2012), the school psychologists who are currently working within K-12 online learning environments are assigned to the role as a part of district-level online learning initiatives or are private practitioners who have contracted with online schools for the provision of school psychological services.

In order to gain the necessary competencies for practice in this unique environment, Tysinger et al. (2013) recommend supervised experiences with another professional. This is consistent with Standard II.1.1 of the *Principles for Professional Ethics* (NASP, 2010a), which states the following:

> School psychologists recognize the strengths and limitations of their training and experience, engaging only in practices for which they are qualified. They enlist the assistance of other specialists in supervisory, consultative, or referral roles as appropriate in providing effective services.

Given that few school psychologists have received any formal training or professional development for practice in K-12 online learning environments, school psychologists desiring to work there may need to rely on the expertise from practitioners in closely-related fields with better established training protocols for service delivery in online environments like counseling or social work (Kennedy et al., 2012). Fortunately, utilizing the online medium for supervisory purposes may serve the dual-role of increasing the practitioner's facility with online communication and allow for feedback from experts who are not limited by geographic distance. This supervision could take the form of online review of the school psychologist's interactions within the learning platform and/or supervision sessions that are facilitated through the use of technological tools (Tysinger et al., 2013).

A second and equally complex issue of policy and practice for school psychological service delivery in K-12 online learning environments is that of credentialing and/or licensure. For school-based practice, school psychologists are typically credentialed by their state's Department of Education. At the doctoral-level, school psychologists may also be licensed by their state's Board of Examiners in Psychology for work in private practice settings within that state (Fagan & Wise, 2007). For K-12 online learning programs that are district- or state-based initiatives, these credentials should be sufficient for the practice of school psychology within that medium (Tysinger et al., 2013).

However, many current K-12 online learning opportunities for students actually cross the borders of states or even nations. In these cases, the issue of appropriate credentialing becomes more difficult. School psychologists are bound by NASP's *Principles for Professional Ethics* (2010a) to hold the appropriate practice credential for the state within which they work. When the enrollment of an online learning environment crosses borders, a school psychologist would need to hold practice credentials for each of the states/nations of the student body in order to legally and ethically offer his/her services.

NASP offers the Nationally Certified School Psychologist (NCSP) credential for school psychologists who demonstrate training and knowledge/practice consistent with the criteria set out by that organization for attainment of the credential. One of the benefits of holding the NCSP credential is that 31 states offer credentialing reciprocity for those practitioners with the NCSP. While this could potentially ease some issues of practice across state borders, it would continue to be exceedingly cumbersome and expensive for the school psychologist to acquire and maintain practice credentials for multiple states. Additionally, an ever-changing student body would create an ongoing issue for the school psychologist engaging in K-12 online practice across state borders. Other potential solutions to the issue of interstate practice include the Interjurisdictional Practice Certificate from the Association of State and Provincial Psychology Boards and guest licensure provisions offered by some states. However, both of these practice allowances are temporary and would likely be unavailable to non-doctoral school psychologists at this time (DeAngelis, 2012).

The American Psychological Association (APA) recently formed the APA Task Force on the Development of Telepsychology Guidelines and adopted the work from that group in July 2013 (APA, 2013). Telepsychology is defined as, "…the provision of psychological services using telecommunication technologies. Telecommunication technologies include but are not limited to telephone, mobile devices, interactive videoconferencing, email, chat, text, and Internet (e.g., self-help websites, blogs, and social media) (APA, 2013). These telepsychology guidelines recommend that "… because of the rapid growth in the utilization of telecommunication technologies, psychologists strive to keep abreast of developments and changes in the licensure and other interjurisdictional practice requirements that may be pertinent to their delivery of telepsychology services across jurisdictional boundaries" (p. 3). Further, the guidelines note the probability of a credential for interjurisdictional practice in the future, like that operating in the field of nursing.

Tysinger et al. (2013) contend that the laws designed to ensure appropriate service delivery in traditional models are quickly becoming outdated with the rapid changes in technology and education like that of K-12 online learning environments. In fact, those laws may now be creating barriers by limiting access to services that could otherwise be delivered electronically. Since credentialing for psychological services is based at the state level, the process of updating and change is likely to be slow and laborious.

Implications for Research

Currently, the most pressing need for research with regard to school psychological service is in relation to school safety issues. Addressing school safety issues in K-12 online and blended learning environments is a critical need in the literature base for both theoretical and practical implications (Tysinger et al., 2013). Research by Adamson and Peacock (2007) indicates that 93% of their respondents in traditional schools "had experienced and responded to serious crises" (p. 756). Corresponding data are unavailable for K-12 online learning and blended environments; however, it is unlikely that the technologically-based schools would be immune to a problem that is reported so extensively in traditional educational environments. Crises involving student-to-student or student-to-faculty harm are likely eliminated as a concern in the fully online learning environment due to the lack of physical proximity. However, across their online communications with students, teachers may suspect suicidal ideation, homicidal ideation, and/or child abuse/neglect, which are not unlike the conditions in traditional learning environments. Also similar to the brick-and-mortar school, the fully online school community could be impacted by death of a student, death of a teacher, natural disasters, or acts of terrorism (Tysinger et al., 2013). The challenges of geographic distance in fully online learning make the typical school-based crisis intervention models inefficient or impossible to carry out due to their reliance on physical proximity and local response agencies. While many crisis intervention techniques could be applied in a face-to-face format for students in a blended learning program, a model for crisis response that is tailored to the various virtual learning environments would fill a significant gap in education research and practice.

Through their research, Forthun and McCombie (2011) demonstrated that when educators are trained to respond in crisis situations, it decreases negative emotional reactions overall and increases their willingness to help students in times of crisis. As such, it is critical that faculty members receive training for addressing crises in the online learning environment. However, as the previous paragraphs have highlighted, there is currently no empirically-based model on which to base training and crisis response for this growing educational medium. From the literature in traditional schooling models, crisis response proceeds through the evaluation of the individual's threat perception related to the crisis, his/her emotional and physical proximity to the crisis, his/her internal and external vulnerability factors, and his/her reaction to the crisis (Brock, 2011).

There is consensus from experts in the field of school crisis for traditional learning environments that lack of planning for crises contributes to greater harm to students and the environment when crises do occur (Aspiranti, Pelchar, McCleary, Bain, & Foster, 2011; Cornell & Sheras, 1998; Forthun & McCombie, 2011; Low, 2010; Morrison, Russo, & Ilg, 2006). Failure to plan and train for crises can lead to greater threats to physical safety and mental health, including anxiety, depression, and post-traumatic stress disorder (Brock, Nickerson, Reeves, and Jimerson, 2008). Consequently, the physical and mental health concerns impact learning outcomes including attention, memory, retention, and retrieval of academic content (Brock et al., 2008; Eaves, 2001). Although school safety is featured prominently in professional and popular media as a critical need, at present, there are few resources that address school safety issues outside the brick-and-mortar, traditional school.

Beyond the research needs related to crisis prevention and intervention, another need for research in the area of school safety relates to the issue of cyberbullying. The most common definition for cyberbullying comes from the work of Hinduja and Patchin (2010) who define it as the "willful and repeated harm inflicted through the use of computers, cell phones, and other electronic media" (p. 1). While cyberbullying has garnered significant attention in the popular media and has a steadily growing research base, to date, no studies have addressed this issue in the context of K-12 online learning. The need for the research within K-12 fully online and blended learning environments is clear and significant given that cyberbullying has been associated with many negative outcomes for students including sadness, anger, frustration (Hinduja & Patchin, 2007), and even suicide (Hinduja & Patchin, 2009). Future areas of research should include cyberbullying policies within virtual school environments, prevalence rates, online intervention effectiveness, and the mental health and social outcomes associated with cyberbullying.

Conclusion

K-12 fully online and blended learning is proliferating in the United States. The wide range of students attracted to and enrolling in these educational environments matriculate with diverse needs with regard to academic, behavioral, and social-emotional constructs. School psychologists are uniquely suited for applying psychological principles to the educational environment. In fact, many school psychologists have already transitioned their services into online practice. However, as with many rapidly developing initiatives, the practice has outpaced the training, research, and literature in the field.

Tysinger et al. (2013) have published the most thorough information to date on the training needs for school psychologists to work within K-12 online and blended learning environments. They have highlighted technologically-facilitated opportunities for the functions of the practicing school psychologist along with some of the ethical considerations of practice within this domain. However, it is hoped that as training programs and professional development opportunities incorporate the specific needs of school psychologists in K-12 online and blended learning environments, the research will flourish to develop empirically-based best practice models for service-delivery in these unique environments, particularly with regard to school safety issues like crisis prevention, crisis intervention, and cyberbullying. Finally, it is critical that credentialing agencies address the new realities of interstate practice to allow greater access and equity for all K-12 students to needed school psychological services.

References

Ahn, J. (2011). Policy, technology, and practice in cyber charter schools: Framing the issues. *Teachers College Record, 113*, 1 – 26.

American Psychological Association, Task Force on the Development of Telepsychology Guidelines for Psychologists. (2013). Guidelines for the Practice of Telepsychology. Retrieved from: http://www.apapracticecentral.org/ce/guidelines/telepsychology-guidelines.pdf

Aspiranti, K. B., Pelchar, T. K., McCleary, D. F., Bain, S. K., & Foster, L. N. (2011). Development and reliability of the Comprehensive Crisis Plan Checklist. *Psychology in the Schools, 48*(2), 146 – 155.

Bambling, M., King, R., Reid, W., & Wegner, K. (2008). Online counseling: The experience of counselors providing synchronous single-session counseling to young people. *Counselling and Psychotherapy Research, 8*, 110 – 116.

Brock, S. (2011). WS2: PREPaRE: *Crisis Intervention & Recovery (2nd Ed): The Roles of the School-Based Mental Health Professional.* Bethesda, MD: National Association of School Psychologists,

Brock, S. E., Nickerson, A. B., Reeves, M. A., & Jimerson, S. R. (2008). In A. Thomas and J. Grimes (Eds.), *Best practices in school psychology V* (pp. 1487 – 1505). Bethesda, MD: National Association of School Psychologists.

Brown, D., Pryzwansky, W. B., & Schulte, A. C. (2006). *Psychological consultation and collaboration: Introduction to theory and practice, 6th edition*. Boston, MA: Pearson.

Brown-Chidsey, R., & Steege, M. W. (2005). *Response to Intervention: Principles and strategies for effective practice*. New York City, NY: Guilford.

Chardon, L., Bagraith, K. S., & King, R. J. (2011). Counseling activity in single-session online counseling with adolescents: An adherence study. *Psychotherapy Research, 21*, 583 – 592.

Cornell, D. G. & Sheras, P. L. (1998). Common errors in school crisis response: Learning from our mistakes. *Psychology in the Schools, 35*(3), 297 – 307.

Curtis, M. J., & Zins, J. E. (1981). *The theory and practice of school consultation*. Springfield, IL: C.C. Thomas.

Cyrs, T. E. (1997). *Teaching and learning at a distance: What it takes to effectively design, deliver, and evaluate programs.* San Francisco, CA: Jossey-Bass.

DeAngelis, T. (2012). Practicing distance therapy, legally and ethically. *APA Monitor on Psychology, 43*(3), 52.

Dickson, W. P. (2005). *Toward a deeper understanding of student performance in virtual high school courses: Using quantitative analyses and data visualization to inform decision making.* Lansing, MI: Michigan Virtual University. Retrieved from http://www.mivu.org/LinkClick.aspx?fileticket=15uq2DZ7Y%2BI%3D&tabbid=373.

Dowling, M. & Rickwood, D. (2013). Online counseling and therapy for mental health problems: A systematic review of individual synchronous interventions using chat. *Journal of Technology in Human Services, 31*, 1 – 21.

Eaves, C. (2001). The development and implementation of a crisis response team in a school setting. *International Journal of Emergency Mental Health, 2*, 25 – 46.

Erchul, W. P., & Martens, B. K. (2012). *School consultation: Conceptual and empirical bases of practice, 3rd edition.* New York City, NY: Springer.

Fagan, T. K. & Wise, P. S. (2007). *School psychology: past, present, and future, 3rd Edition.* Bethesda, MD: National Association of School Psychologists.

Forthun, L. F. & McCombie, J. W. (2011). The efficacy of crisis intervention training for educators: A preliminary study from the United States. *Professional Development in Education, 37*(1), 39 – 54.

Hamane, A. C. (2014). *Student engagement in an online course and its impact on student success*. (Unpublished doctoral dissertation), Pepperdine University, Malibu, CA.

Hinduja, S., & Patchin, J. W. (2007). Offline consequences of online victimization: School violence and delinquency. *Journal of School Violence, 6,* 89 – 112.

Hinduja, S., & Patchin, J. W. (2009). *Bullying beyond the schoolyard: Preventing and responding to cyberbullying.* Thousand Oaks, CA: Sage.

Hinduja, S., & Patchin, J. W. (2010). *Cyberbullying: Identification, prevention, and response.* Cyberbullying Research Center. Retrieved from http://www.cyberbullying.us/Cyberbullying_Identification_Prevention_Response_Fact_Sheet.pdf.

Huang, L., Strouls, B., Friedman, R., Mrazek, P., Friesen, B., Pires, S., & Mayberg, S. (2005). Transforming mental health care for children and their families. *American Psychologist, 60*, 615 – 627,

Huerta, L. A., Gonzalez, M. F., & d'Entremont, C. (2006). Cyber and home school charter schools: Adopting new policy to new forms of public schooling. *Peabody Journal of Education, 8,* 103 – 139.

Kennedy, K., & Archambault, L. (2012). Offering preservice teachers field experiences in K-12 online learning: A national survey of teacher education programs. *Journal of Teacher Education, 63,* 185 – 200.

Kennedy, K., Tysinger, P. D., LaFrance, J., & Bailey, C. (2012). Preparing education professionals for K-12 online learning. In M. Orey, S.A. Jones, & R.M. Branch (Eds.), *Educational media and technology yearbook*. New York, NY: Springer.

Leonhard, K. A. (2010). *Do consumers of mental health services favor pursing online education as opposed to education in more traditional settings?* (Unpublished doctoral dissertation), Capella University, Minneapolis, MN.

Low, L. (2010). You don't know what you don't know: Choices for school administrators when crisis hits. *CAPEA Education Leadership and Administration, 20*, 101 – 108.

Lynch, M. M. (2001). Effective student preparation for online learning. *The Technology Source,* November/December 2001. Retrieved from http://ts.mivu.org/default.asp?show=article&id=1034.

Morrison, J. Q., Russo, C. J., & Ilg, T. J. (2006). School-based crisis intervention: Its effectiveness and role in broader crisis intervention plans. *International Journal of Educational Reform, 15*(3), 331 – 343.

National Association of School Psychologists, (2006). *School psychology: A blueprint for training* *and practice III.* Bethesda, MD.

National Association of School Psychologists, (2010a). *Principles for professional ethics.* Bethesda, MD: Author. Retrieved from http://www.nasponline.org/standards/2010standars/1_%20Ethcial%20Principles.pdf

National Association of School Psychologists, (2010b). *Standards for graduate preparation of school psychologists.* Bethesda, MD: Author. Retrieved from http://www.nasponline.org/standards/2010standards/1_Graduate_Preparation.pdf

Roblyer, M. D., Davis, L., Mills, S. C., Marshall, J., & Pape, L. (2008). Toward practical procedures for predicting and promoting success in virtual school students. *The American Journal of Distance Education, 22*, 90 – 109.

Teclehaimanot, B., and You, P. (2013). Best Practices in Teaching at K-12 Virtual Schools. *World Conference on E-Learning in Corporate, Government, Healthcare, and Higher Education,* 2131 – 2137.

Trepal, H., Haberstroh, S., Duffey, T., & Evans, M. (2007). Considerations and strategies for teaching online counseling skills: Establishing relationships in cyberspace. *Counselor Education & Supervision, 46,* 266 – 270.

Tuck, A. R. (2013). *The use of virtual school to improve at-risk student retention: An action research study.* (Unpublished doctoral dissertation), Capella University, Minneapolis, MN.

Tysinger, P. D., Tysinger, J. A., Diamanduros, T. D., & Kennedy, K. (2013). K-12 Online learning and the training needs for school psychology practitioners. *School Psychology Forum: Research in Practice, 7*(3), 76 – 88.

Whelley, P., Cash, G., & Bryson, D. (2003). *The ABC's of children's mental health: Information for school principals.* Bethesda, MD: National Association of School Psychologists.

Williams, R., Bambling, M., King, R., & Abbott, Q. (2009). In-session processes in online counseling with young people: An exploratory approach. *Counselling and Psychotherapy Research, 9*, 93 – 100.

Yang, D., Richardson, J. C., French, B. F., & Lehman, J. D. (2011). The development of a content analysis model for assessing students' cognitive learning in asynchronous online discussions. *Educational Technology Research and Development, 59*, 43 – 70.

Chapter 17

K-12 Online and Blended Learning, School Libraries, and School Librarians

Brenda Boyer, *Kutztown Area School District, boyer.brenda@gmail.com*
Rebecca Kelly, *Quakertown Community School District, bekcilib@gmail.com*

Abstract

Despite the proliferation of K-12 online learning options and the strides school libraries have made toward virtualization of resources and online information fluency instruction, there is not a significant body of research specific to libraries in K-12 online environments. The stage is set, however, for this research to occur. The shifting library landscape, evidence of the connection of school libraries to student achievement, and foundational instructional design concepts aligned to the incorporation of libraries in digital learning environments all support the necessity for research in this area. Extant research discussed in this chapter includes studies exploring the need for and formats of embedded library services, as well as those probing the role of librarians in online environments. Comparing this emerging body of research with early strides school libraries have made toward online embedded efforts suggests multiple paths for new research in this field.

Introduction

School libraries, while a common and essential expectation in brick-and-mortar institutions, are not yet commonplace within K-12 online schools. At the time of this writing, there does not exist a significant body of research specifically related to K-12 online school libraries. A 2009 review of open access literature describing research and practice for K-12 online learning by Cavanaugh, Barbour, and Clark contained no discussion of library services. An April 2014, search of the Research Clearinghouse for K-12 Blended and Online Learning offered by the Michigan Virtual Learning Research Institute and iNACOL for the term "librar*" yielded zero results. What does exist, however, is research that informs the growth and development of library services embedded in online learning environments. This research is indexed under terms such as virtual libraries, digital curation, embedded librarian, information fluency instruction, collaboration, virtual learning commons, and digital resources. Before exploring these converging concepts, we offer a current snapshot of libraries in K-12 online learning.

There are two main paths to K-12 online learning - the commercial markets and growth emerging from the brick-and-mortar world. According to the annual Keeping Pace Report (Evergreen Education Group, 2013), single and multi-district "blended and online learning are the fastest-growing segment of online and blended learning" (p. 17). In order to remain a relevant part of K-12 learning, librarians must incorporate their shifting skills, resources, and instruction into these new environments. In 2012, Rob Darrow, a former teacher librarian and retired principal of the Clovis Online School wrote, "Today, I am not aware of one teacher librarian employed full or part time in any K-12 online school in the U.S. in the job of teacher librarian" and went on to proclaim, "...there really is not a need for a 'traditional' school librarian in an online school" (p. 15). Darrow's point was that the role of librarians in the digital realm requires a new set of competencies that go beyond those needed in the traditional brick and mortar settings and involve a blending of "the craft of librarianship and teaching" (p. 16). While Darrow predicted that unlike online universities, K-12 online schools would not be employing librarians, the services he outlined for college systems nonetheless are reasonable expectations and potential needs of K-12 learners. These services included instructional materials such as pathfinders and tutorials, research assistance, information literacy modules, and leadership for design of library support (p.17). These types of services are no less needed by K-12 students, and, to varying degrees are slowly beginning to emerge in blended forms in this market.

Just as there are two paths to the growth of online learning, there are also two components to school libraries online: virtual library portals and library information fluency instruction. School librarians are responding to the shifting needs of their learners and growing their practices to meet responsibilities for both the development of online resource collections as well as offering online courses in information fluency and research skills (Buerkett, 2014; Lincoln, 2012). In increasing numbers, schools are adopting 1:1 devices (e.g. iPads, Macbooks, ChromeBooks, etc.) or promoting B.Y.O.D (bring your own device) programs. School libraries are responding by virtualizing libraries, and by increasing the numbers of e-books, subscription online databases, digital pathfinders, and online library instruction available 24/7 for independent learners, or as “flipped” instruction in which learners independently prepare for the next day’s in-class work by learning content in lieu of traditional homework (Valenza, Luhtala & Boyer, 2013). These librarians are providing an array of services to meet the needs of face-to-face and blended students, as well as increasingly producing fully online courses for students enrolled in their school’s online academies.

Instructional Design Foundations

Libraries have always been centers of learning how to learn. Constructivist tenets of online learning match those of inquiry and problem-based learning associated with information fluency and library instruction. In the quest for nurturing agile, lifelong learners with skills that will transfer to their wider world, schools of all types are looking to incorporate heutagogical, or ”learning how to learn” competencies as described by Blaschke (2012). Standards from the American Association of School Librarians (AASL, 2007), International Society for Technology in Education (ISTE, 2007), and Common Core State Standards (National Governors Association for Best Practices, Council of Chief State School Officers, 2010) all promote competencies supporting lifelong learning. Models for inquiry learning and research such as Big6 (Eisenberg & Berkowitz, 1990), Guided Inquiry (Kuhlthau, Caspari & Maniotes, 2007), and the Stripling Inquiry Model (Stripling, 2003) have been widely utilized by librarians for instruction corresponding to these standards. As the shift to online learning continues to grow in the K-12 market, librarians will need to build upon and leverage the collaboration and instructional capital they have developed in brick-and-mortar settings. These standards and instructional models provide the strong foundation necessary for the development of successful online library instruction.

Shifting library landscape

The necessity for the virtualization of school libraries has grown organically along with the digital shift. While a multitude of digitized collections, resources, and learning object repositories exist, their integration with information fluency skill instruction and embeddedness into online schools is just beginning. Roberts (2012) described the shift for libraries as moving “from content to facilitation” of individual learning, calling for libraries to move to “integrated services, one stop shop information points” (p. 156). Stemming from the Loertscher, Koechlin, and Rosenfeld (2011) conceptualization of the library as a learning commons, the virtual learning commons has now emerged (Loertscher & Koechlin, 2012). As a “digital learning community in which the whole school participates,” the virtual learning commons model conceptually bridges the traditional physical library spaces to blended and online environments (p.20). In addition to ensuring that the library has a virtual presence, school librarians must also plan for the shift of their own instruction to online environments. Lincoln (2012) explored options for building online school library courses within various learning management systems and provided a model for the planning, implementation, and dissemination of these courses. Shifting roles of librarians and the subsequent necessity of updating pre-service librarian education has also been present in the literature, with deGroot and Branch (2011) stating that in order to meet AASL information fluency requirements, librarian education programs need to "emphasize the teaching, technology, and leadership skills" (p. 289), and specifically need to provide "more opportunities…to explore and discuss the issues arising from the proliferation of new technologies" (p. 294).

School libraries and achievement

A body of research exists connecting the presence of strong K-12 school library programs to achievement. This research has been succinctly summarized by Deb Kachel and the graduate students at Mansfield University (2011). Thirty-four individual studies were reviewed, providing overwhelming evidence of the critical need for school libraries and librarians in relation to student achievement. It is logical this correlation is likely to extend to online K-12 settings. The challenge is how best to ensure that the gains made in brick and mortar can also occur in online school settings. In addition to these K-12 achievement studies, Smalley (2004) found that "students whose high schools include librarians and library instruction bring more understanding… to their college experiences" (p. 197), and "achievement is substantially higher" for these students (p. 193). This body of research can inform decision-makers as to why school librarians are essential to the success of online learning.

Examples of current practice

Janet Hallstrom, curriculum designer for the Clay Virtual Academy in Florida, posited, "every accomplished 'brick-and-mortar librarian is also part virtual librarian" (2013, p. 23), since the best librarians make keeping pace with changes to the digital information landscape a routine part of their work. Although Clay Virtual has no official librarian, Hallstrom (who is also a school librarian) has built a "virtual media center" as part of her curriculum design work there. Hallstrom's example reinforces the place of vetted resources and an expert to organize them is just as critical in the online realm, regardless of what title the individual holds.

Brick and mortar schools are taking various paths to develop virtual libraries or learning commons. Kutztown (PA) High School's extensive LibGuides serve as a virtual library that coordinates and is embedded within the school's LMS, Moodle. Elements of these guides are custom embedded within individual content courses. Information Fluency courses targeting the needs of learners at each grade level are also available as flipped instruction or independent tutorials students can use. These individual learning objects, courses, and the virtual library itself are designed with the fully online learner in mind, ensuring that as the school grows its virtual academy these online students will have the same level of services as face-to-face students.

Other school librarians are growing their virtual practice by first developing online library and information literacy instruction in the school's LMS, and then building and refining the virtual library to meet the courses offered. Others like Rene deBerardinis at Springside Chestnut Hill Academy (PA) are embedding library resources at the macro level into student portals. Other librarians, like Michelle Luhtala, Head Librarian at New Canaan High School (CT) are leveraging the power of their schools' B.Y.O.D. (bring your own device) policies and making their collections and themselves available via mobile devices. These examples from K-12 schools offer a snapshot of the early inroads school librarians are making toward the development of embedded library services and resources. Despite the lack of formal literature, a look at the current usage of one tool for library virtualization, Springshare's LibGuides, demonstrates that school librarians are, like the examples here, building online portals to serve students. As of this writing, LibGuides is the chosen tool for virtualization for 66,056 librarians in 4,684 libraries. Of this number, 1,111 systems are registered to K-12 schools, with 5,678 individual librarians holding accounts (S. Zivkovic, personal communication, April 24, 2014). At this time, LibGuides does not collect information regarding the type of school using the product. However, this number represents the degree to which librarians in K-12 schools are developing online virtual libraries for their learners, regardless of school format. In addition to Libguides, there are countless Web 2.0 tools that K-12 librarians are leveraging as means to virtualize their libraries, share resources, and provide instruction beyond the physical library space.

The shifting library landscape and growth of virtual school libraries paired with strong evidence of the correlation of school libraries to student achievement collectively point toward the value and necessity of librarians and library resources to play a role in online K-12 environments. At this time, however, research specific to K-12 online and blended school libraries is rather limited. The following section provides a synthesis of this research grouped into three main themes: the need for school libraries and librarians to be embedded in online learning systems, how services and instruction can be embedded, and, the design of online information fluency instruction.

Synthesis of Research

Although still somewhat limited, extant research into school libraries for K-12 online settings provides foundational research to inform future study. Literature presented here includes discussions of the need for school librarians to be embedded like their academic counterparts, how embedded library services can be designed, and how library information fluency instruction can be presented with a "flipped" or blended approach.

Why school libraries and librarians need to be embedded

In a discussion of why school libraries are essential to online learning and how to make the transformation from physical to virtual, Darrow (2009) pointed to Tapscott's (2009) eight norms of the Net Generation as a "guide to transforming library services into what is needed for the 21st century learner" (p.80). Tapscott's norms include: "freedom, customize and personalize, scrutinize, integrity and openness, entertainment and play, collaborate, need for speed, and innovate" (as cited in Darrow, 2009, p. 80). Upon review, however, Darrow (2009) noted at the time, "most virtual library collections that currently exist are primarily a list of links organized by topics" and fell short in terms of customization and interactivity (p. 81), a point also made earlier by Vesey (2004) who stressed that digital libraries must surpass the "web links only" style and instead reflect foundational library strengths by offering students "quality, edited, age-appropriate, verifiable information representing a variety of viewpoints… and formats" (p. 28). To meet learner needs, virtual libraries need to include instruction, collaborative activities, and highly specialized curated content, all of which needs to be easily accessed at a variety of entry points within the LMS. The ultimate goal of virtual libraries is personal knowledge construction that extends beyond the demands and constraints of the online classroom, facilitating both formal and informal learning, and supporting "free agent learners" identified by the 2003 Speak Up Research Project (Smith & Evans, 2010). These libraries can be places of connected learning as described by the Young Adult Library Service Association (YALSA, 2014): "Connected learning is realized when a young person is able to pursue a personal interest or passion with the support of friends and caring adults, and is in turn able to link this learning and interest to academic, career success or civic engagement" (p. 9). To these ends, virtual libraries embedded within the LMS can support formal and informal learning (YALSA, 2014) and become a key to personalization through differentiation of materials to meet the variety of learning needs and interests of students with both just-in-time and just-enough learning (Gunn, 2002). An advantage of these highly-curated spaces, according to Gunn (2002), is that they reduce the overwhelming flow of information to just those materials that carefully match learner needs.

Advantages of inclusion of librarians from the early development stage of online learning systems have been delineated as helping smooth the technological transition for colleagues (Huwe, 2010; Ray, 2014; Rohland-Heinrich & Jensen, 2007), assisting with instructional design issues (Lincoln, 2009), targeting key services for inclusion in the system (Kelly & Boyer, 2012; Ray, 2014), and providing interactive instruction and support (Kachel, Henry & Keller, 2005; Lincoln, 2009; Rohland-Heinrich & Jensen, 2007). Shumaker (2012) stated, "The goal of embedded librarianship is more than service. It is partnership" (p. 18). Huwe (2010) pointed out that for those online schools stemming from existing brick-and-mortar institutions, librarians already have built strong collaborative relationships with faculty and are recognized as helping teachers learn new technologies, making them "instrumental in extending 'buy-in' among this important group of stakeholders" (p. 28), potentially helping to "create and advance new online community services that really work" (p.29). Rohland-Heinrich and Jensen (2007) asserted, "serving as mentors, media specialists ensure that teachers possess the technological and research skills necessary to effectively deliver dynamic and relevant online courses" (para. 20), by providing "essential pedagogical and technological foundations… in the areas of curriculum development, online instruction enhancement, and student-learning support in the virtual environment" (para. 7). In addition, librarians are cognizant of the necessity for this instruction to be interactive and offer authentic research opportunities (Kachel, Henry & Keller, 2005; Lincoln, 2009). Lincoln (2009) asserted that young learners gain technology skills through their everyday use of computing devices, but need online learning experiences that "will require them to complete assignments, meet deadlines, learn appropriate online behavior, and effectively collaborate with others in an instructional setting" (p. 4). In this way, the implementation of online information fluency courses or modules embedded within content area courses helps prepare learners for the level of independent online research they will conduct at university and in everyday adult life.

Embedding library services and instruction

Farmer (2012) reported that the SLJ 2010-11 Spending Survey revealed the top three tasks performed by library media specialists to include teaching classes (89%), tech troubleshooting (60%), and faculty development (52%). Reviewing the 2009 Speak Up research results, Smith and Evans (2010) found librarians to be the educators most likely to be engaged in social networks, use social media, write blogs, and create videos. The tasks identified by these two significant national studies all align well with professional learning, collaborating, and teaching in the online environment.

Lists of key services and design elements for supporting online learning like those delineated by Farmer have frequently appeared in trade publications and include common elements such as the inclusion of pathfinders of curated high quality resources, integration of open source media, instructional materials and tutorials, professional resources and support for instructors, points of contact for assistance and support from librarians, integrated social media, places for collaborative activities, and places to showcase student work (Buerkett, 2014; Johnson, 2013; Lamb and Callison, 2005; Loertscher & Koechlin, 2013; Smith & Evans, 2010). One common form of embedding librarians is to have them become active participants in the courseroom discussion to provide direct interventions as needed (Darrow, 2009). Zmuda (2009) pointed out that librarians working to expand or shift services and instruction to meet the needs of online learners must first discover what students are trying to learn and how they prefer to learn it, ensuring that instruction offered is both relevant and in accessible and appropriate modes. While achievement has been linked to the presence of librarians available to instruct and assist learners (Smalley, 2004; Kachel, 2013), research by Anderson and May (2010) further demonstrated that the method of instruction (whether face-to-face, blended, or online) did not affect levels of retention of information literacy skills (p. 498). Black (2008), pointing to earlier literature that confirmed "the integration of library resources into the learning management system has the potential to significantly enrich the educational experience of students" (p.496), stressed that the question had moved to how to best accomplish this task and recommended a "toolkit" approach, including embedded resources, single authentication for student ease of use of resources, and additional resource pages.

Where and how to embed resources and services

Shank & Dewald (2003) described library/librarian embeddedness as occurring at the macro and micro levels. Micro integration occurs at the course level, and could be as granular as integration into specific activities. Micro integration relies on collaboration between librarian and instructor, each having administration/authorization rights within the course (Black, 2008). Librarians need to be able to embed both resources and themselves (e.g. in discussions, as research assistance, etc.) into courses (Kelly & Boyer, 2012). Macro integration occurs at the LMS level, with one main entry point into the library portal. In 2013, Murphy and Black investigated the efficacy of LibGuides as the key tool to accomplish these tasks. Their findings confirmed that the students using Libguides embedded within their management system found the guides helpful, confirming anecdotal evidence from case studies such as Verbit and Kline (201l).

K-12 Librarians and online instructional roles

Careful, skilled curation of resources for inclusion into online courses and networks is essential. The number of resources linked or embedded into a course is not, however, as important to the learning environment as it is "the quality and relevance of resources used that really leads to enhancements of student learning" (Callison, 2007, p. 16). By its nature, information fluency instruction supports the success of online learners and is tailored to the needs of a citizenry engaged in everyday learning activities online. Understanding how to access and effectively judge what is trustworthy information and knowing how to ethically use this information are core competencies required for online learners. Research is beginning to evidence the success of information fluency instruction embedded into online learning systems (Boyer & Kocis-Westgate, 2014; Tang & Tseng, 2013; Williams, 2010). Particularly, Tang & Tseng (2013) found that college-age online learners who had greater self-efficacy of information fluency also had higher self-efficacy for online learning while Valentine and Bernhisel (2008) posited that secondary students transfer their technological capabilities to their academic experiences. These findings are significant in that they underscore the need for K-12 online learners to have instruction in information fluency long before moving on to university.

Green and Jones (2014) acknowledged that while librarians are well-versed in implementing national AASL Standards in physical libraries, their roles in the online learning environments are just beginning to emerge (p. E11). These authors asserted that school librarians have made headway by establishing virtual libraries as compliments to physical spaces and by engaging learners in flipped instructional experiences. Flipped instruction, a blended learning experience, calls upon students to interact with content so that face-to-face time with the librarian is directed to advancing the students' research and inquiry experiences (Valenza, 2012b). Engaging in these two types of library service prepares librarians to make the leap to the fully online environment where they can best affect learning by partnering with teachers in collaborative instructional designs, underscoring the necessity of online learning to be a part of the school library landscape (Green & Jones, 2014; Jones & Green, 2012). Jones and Green (2012) illustrated how "virtual collaboration… addresses many of the difficulties inherent in traditional, face-to-face collaborative efforts," such as time constraints (p. 27). A benefit to a heightened level of collaboration was identified by Abilock, Harada, and Fontichiaro (2013) who, using case studies, noted that instructional conversations and decisions are facilitated when librarians transcend their role of resource provider and lead instead with instructional expertise (p.11). This level of deep reflection, conversation and planning demonstrates grit and dedication of the instructors involved to student learning and enriches the instructional capital of the collaborative team (Boyer & Kocis-Westgate, 2014). Likewise, built-in instruction and assessment in online environments provides the type of output measures described by Abilock, Harada, and Fontichiaro (2013) that evidence learning. Although they may recognize the need to move into online teaching, many K-12 librarians are not prepared for this challenge. In 2014, Jones and Green conducted a survey of librarians to uncover their attitudes toward online learning and teaching. While 80% had experienced online environments as learners, they did not have instructional experience and "69 percent of the respondents said they had no formal preparation to do so" (p. E14). The necessity for pre-service training of librarians (and K-12 teachers) for teaching online is an issue yet to be fully addressed by institutions preparing new educators.

Implications for policy & practice

Keeping pace with the influx of technology in the K-12 landscape, the field of school librarianship has concentrated on developing and fine tuning the best ways to prepare students for an information-rich world. National and state level school library organizations have built their standards of practice around the outcome of developing effective members of the global community. To this end, school librarians must provide environments that nurture "life-long learning, informed decision-making, a love of reading, and the use of information technologies" (AASL, 2003, para 7). This goal is over-reaching and governs the work of all school librarians regardless of setting. Taking a holistic approach to teaching library skills with the understanding that these skills are necessary in any learning environment allows school library organizations to create frameworks for instruction that librarians can modify, adapt, and utilize to meet the needs of their students. Because library organizations have not specifically designed their frameworks for the online environment, the focus of school librarians has been to educate all students, building instruction based on individual needs.

Organizational research and advocacy for school librarians does not reflect a specific concentration on online environments; instead, it focuses the need for building strong libraries within all K-12 academic settings. While this approach is sound for growth of school librarianship as a field, in order to thrive in the online environment, a three-pronged approach must be employed where school librarians, organizations representing school librarians, and pre-service institutions that prepare school librarians each take a role. First, practicing school librarians must be agile and extend their services beyond the brick and mortar environment to meet the needs of students online. The second prong involves school library organizations such as AASL partnering with organizations like iNACOL who promote best practices in K12 online learning so that the crucial role librarians play in student learning can be translated into the online environment and act as a blueprint instructing online programs how to employ library services as part of their program. The third prong concentrates on the instructional program of preservice librarians, which must be infused with coursework incorporating the skills necessary to build a virtual library environment and teach the skills required to meet the needs of online learners.

School librarians currently in the field need to champion their essential role in the online environment if the field is to flourish as the educational landscape changes, with blended and online learning taking center stage. Some librarians have taken the lead in this area creating online, curated resources that specifically address K-12 curriculum. Additionally, they offer virtual services where they connect with students and faculty through electronic means such as social media and direct messaging to offer research guidance. This type of service that addresses the needs of the online learner must become the norm in the K-12 setting.

Advancing the library and librarians' roles in online environments also requires that organizations that serve the library field investigate the practices of online learning providers to uncover why these roles have been overlooked in their programs. These providers must see that by including the essential services of libraries and librarians, their K-12 academic program will not only grow but flourish. To do this, complete programs of study as well as contents of individual online courses should be evaluated for successful use of all resources, including a librarian. As content from websites, organizations and institutions changes constantly in the virtual environment, critical services such as keeping materials up to date and checking and vetting new resources are glaring needs not fully addressed by many current online providers. Additionally, as students are performing authentic research they require the guidance of a skilled information specialist, in real time, who can provide that instruction. Librarians are uniquely qualified to provide all of these services and currently do so in the brick and mortar setting. This type of widespread provision of library resources and instruction is not as evident in strictly online enterprises and represents an area where such organizations pale in comparison with their brick and mortar counterparts whose programs are very successful (Kachel, 2013). By partnering with those organizations who govern and promote best practices in online and blended learning, school library organizations can begin to establish protocol and procedures for library instruction to be embedded in the online environment, and offer online content providers a road map for developing their courses and program, enabling it to find the same success.

Preparing librarians to meet the needs of all learners should drive the curriculum of pre-service programs. This training must include instruction on meeting the needs of online learners. In addition to traditional collection development, cataloging, genre studies, and researching skills, pre-service librarians must be taught how to navigate the online environment, curate information to meet the demands of rigorous K-12 curriculum, and how to provide researching guidance for inquiry based, online instruction. It is essential that school librarians entering the field are prepared to offer services in the online and blended teaching environments if this field is to continue to grow.

Considering that most undergraduate work now contains online components and that many graduate programs are completely delivered online, it becomes essential that students develop an understanding of what is needed in order to effectively learn in virtual environments before leaving the K-12 setting. Several states now stipulate that students take an online class as part of their high school graduation requirements citing the importance of preparing students for college and career pursuits beyond graduation (Evergreen Education Group, 2013). This fact is a call to action for librarians and their professional organizations. As online learning gains prominence in K-12 learning, library programs must ensure their services extend beyond those already evident in the brick and mortar setting.

There are several steps that should be taken in order to make libraries and librarians essential components of the online environment.

For libraries:

- Create virtual libraries, where curated resources are available to learners regardless of class format
- Brand libraries - establish a presence in social media and areas where students and faculty look to find information
- Create a virtual presence where information assistance can be offered through tutorials, pathfinders, and other communication tools, as well as personal assistance available in real-time

For librarians:

- Connect with other professionals around the world to collaborate on building materials, creating consortiums and other OER-related spaces, and extending programs
- Promote the library program and advocate for it with administration
- Engage in the online environment to meet students where they are

- Build a Professional Learning Network to provide teachers and students extended access to specialists in all fields

For library organizations:

- Engage in conversations with other organizations that specifically work on building blended and online models for education
- Advocate the importance of library and librarian presence in all learning environments, including online, and push for legislation that supports that need
- Build standards for library practice that specifically address the needs of the online learner

For pre-service programs:

- Infuse program with resources and experiences that prepare pre-service librarians to meet the needs of online learners including experience with social media, online databases, curation tools, Web 2.0 tools, and OER resources
- Instruct students in methods of communicating both face-to-face and in the online environment in order to offer reading and researching guidance
- Build pre-service librarians' Professional Learning Networks to include experts in the field who promote best practices in meeting the needs of students in the online and blended environment

Implications for Research

Since little research exists specific to K-12 online school libraries, there are multiple opportunities and avenues of potential investigation that could inform the field going forward. Challenges faced by school libraries making the shift to online instruction and services, the use of digital learning objects and automated scaffolding agents, branding of online school libraries, and assessments of existing models for developing these virtual spaces are areas warranting study.

Challenges inherent in making the shift to online

Online learners prefer to have resources embedded and collaboratively used and shared within the LMS (Li, Fu, Zhao, & Leh, 2009). Brooks-Kirkland (2009) noted that a critical point regarding content and resources included in virtual libraries is that they follow the research workflow. In other words, the layout, design, and access points for online content must be logical according to how a student researcher approaches (or should approach) a research inquiry. When designing virtual library pages containing a variety of content and research tools, readability and organization according to learner workflow ensures that the resources are not only present, but in an efficient, usable order. Embedded database widgets need to be placed strategically to promote a logical search path that is enhanced by the proper tools along the way. For example, search widgets appear next to documentation, note-taking and graphic visualization tools and job aides (documents, checklists, etc.) along with highly relevant, high quality websites, media resources, and the tools for mobility. In addition, learners need to have a menu of curation tools at their disposal in order to extend their learning further, gather other resources they deem relevant, and begin to establish their own niche authority (Valenza, 2012a). Scaffolding resources like tutorials and graphic organizers support the learner's ability to independently learn. When expert assistance is needed, various librarian contact points are strategically placed on the same screens. Contact points range from including phone, email, Twitter, or Google Voice connections to the librarian to scheduled synchronous help sessions via tools like Skype or Google Hangouts. Enabling "maximum flexibility" for individual learning is the goal (Brooks-Kirkland, 2009, p. 44). Research is needed to uncover efficient designs and optimal tools to compliment K-12 learner workflows.

Measuring success

Stephens (2013) posited that as school libraries continue to shift to accommodate and promote individualized learning, the metrics used to measure the success of library programs are also shifting away from traditional "return-on-investment measures" to elements that provide a clearer reflection of online student life and research habits (p. 4). These measures could be comprised of online discussion posts, collaborative documents and presentations, and student-generated resources shared out into the wider physical and virtual communities with which the student actively learns. In addition to resources and services, perhaps the greatest challenge is for librarians to ensure that what they are offering is truly what students need. In their discussion of best practices for academic librarians online, Hartsell-Gundy and Tumbleson (2012) stated, "Online embedded librarians are most effective when they are proactive, perseverant, and patient as they collaborate with faculty and students… Time is needed to establish trust between the embedded librarian and faculty and their students" (p. 60). Just as in the success of traditional school librarianship, collaboration is perhaps even more critical for success in the online school environment. Lindsay and Davis (2013) provide an extensive collection of ideas for collaboration within and beyond the local school and include the Loertscher, Koechlin and Rosenfeld (2011) concept of the learning commons as a critical learning space. Callison (2007) offered a rubric to evaluate such places of learning, and included as exemplary those that serve as a "network hub," offer space and time for discussions, debate, authentic research, open and critical evaluation of information, and multiple paths for knowledge construction (p. 17). Ultimately, learning spaces are judged by how well these affordances meet the needs of stakeholders, a critical design goal for any virtual library. How to best build these online places of learning is another area ripe for investigation.

Branding

Ancillary to embedding librarians, resources, and information fluency instruction into the K-12 online learning is the concept of branding. It is critical for online learners to be able to not only readily navigate the learning management system and individual courses, but also easily access resources or make contact with the librarian. Consistent branding of the online library and librarian presence across the platform helps to ensure this access and establishes a relationship between learners and library (Gall, 2012). Branding the virtual K-12 library may in turn inspire and support ongoing collaborations between instructors and librarians in what Perrault (2007) labeled as the larger "information ecology" (p. 49). How the concept of branding may affect the usage and perceived value of virtual K-12 libraries has yet to be explored.

Digital Learning Object collections, automated tutorials and scaffolding systems

Research into process-oriented scaffolding agents (POSAs) is emerging as means for supporting learners in the performance of independent inquiry including developing metacognitive reflective practices (Miao, Engler, Giemza, Weinbrenner & Hoppe, 2012). The purpose of these tools is to deliver just-in time guidance as learners navigate their way through online inquiry processes. These tools must balance providing learners enough support without hampering those who can move more quickly. Some popular DLOs and scaffolding systems include:

TRAILS - Tool for Real-time Assessment of Information Literacy Skills http://www.trails-9.org/
Developed by Kent State University with the vision of providing school librarians with a tool aligned to the standards of the American Association of School Librarians' and the Common Core State Standards initiative, TRAILS offers a snapshot of students' in grades 3, 6, 9 and 12 understanding of literacy skills through a multiple-choice assessment. This tool will provide librarians and classroom teachers the means "to identify strengths and weaknesses in the information-seeking skills of their students" (Kent State University Libraries, 2014). It is a service provided free of charge.

ResearchReady http://www.researchready.com
Developed by Imagine Easy Solutions, creators of EasyBib, "ResearchReady is a cloud-based instruction and assessment platform that teaches students the entire research process" (Imagine Easy Solutions, 2014). This tool targets the high school to college transition by focusing on the critical thinking research entails and is fully customizable to an individual school's needs.

ProQuest Research Companion http://www.proquest.com/libraries/schools/
Designed to support student research, "ProQuest Research Companion is comprised of nine Learning Modules and seven interactive Tools—all designed to automate the basic parts of the research process. The multimedia-based Learning Modules engage students to think more critically and creatively about their research, while powerful, interactive Tools help students navigate through the research process more quickly to spend more time on the research that interests them most" (ProQuest, 2014).

PRIMO (Peer-Reviewed Instructional Materials Online) database maintained by ACRL(Association of College and Research Libraries) containing peer-reviewed learning objects. PRIMO "promotes and shares peer-reviewed instructional materials created by librarians to teach people about discovering, accessing and evaluating information in networked environments. The PRIMO Committee hopes that publicizing selective, high quality resources will help librarians to respond to the educational challenges posed by still emerging digital technologies" (ACRL, 2014). While these materials are originally designed for the academic level they can serve as inspiration for K-12 librarians designing online instruction.

OER Commons http://www.oercommons.org/search?f.search=information+literacy
Open Educational Resources - international collection of open resources. Gathered since 2007, "Open Educational Resources (OER) are teaching and learning materials that you may freely use and reuse at no cost. Unlike fixed, copyrighted resources, OER have been authored or created by an individual or organization that chooses to retain few, if any, ownership rights" (OER, 2014). An April 23, 2014 search for "information literacy" yielded 245 results - lessons, tutorials and other learning objects, each item clearly displaying usage permissions.

Research is needed to explore how tools such as automated scaffolding systems, tutorials, and learning objects will play a role in online school libraries. First, evaluation studies comparing the relative effectiveness of these items would provide baselines for measurement. It is also unknown how automated process-oriented scaffolding systems such as ResearchReady and Research Companion will play a role in online inquiry and research instruction. Evaluation of the efficacy of existing learning object repositories such as OER and PRIMO and how these may be leveraged for better sharing of best practices is also needed. This path of research would uncover best practices for online information fluency instructional design and virtual library design. Revealing and sharing these practices with the wider community of course developers, online school markets, and individual teachers/librarians would advance future development, enriching the overall instructional design knowledge base.

Studies Assessing Current Needs and Practices

Evaluative studies that assess current models and stakeholder needs are also necessary. Assessment of existing embedded librarianship models at the academic level, the needs of K-12 online schools for library services and personnel, and the quality of established K-12 virtual libraries growing from brick-and-mortar settings would provide practitioners and instructional designers with valuable foundations for future design and development of virtual K-12 libraries. One obvious path of investigation would include testing existing models of embedded librarianship at the academic level to determine if and how these models may be applicable to K-12 environments. Specifically, these existing models should be explored for efficacy of design in terms of: student access to library services, personal assistance from library staff, provision of resources and assistance for using them, and means for providing instruction. Studies grounded in the body of web usability/user experience research may inform the design and development of virtual library spaces and strategic organization of resources to reveal the means to compliment the young learner's workflow and provide wider personalization of these spaces.

Another primary path of research would include a comprehensive inventory of existing commercial K-12 schools to determine the level of need and potential value for the placement of comprehensive library portals at the macro (platform) level, and specific library resources to be available at the micro (individual course) level (Shank & Dewald, 2003). Research is needed to uncover the potential ways macro and micro placement of library resources (including access to librarians) could support learners for both course assignments and individual interests. In addition to researching placement of library portals, existing online K-12 schools should also be explored to determine if and how information fluency instruction is currently being offered. This path of investigation should look for fluency elements such as advanced search strategies on the free web and within proprietary databases; evaluation of information; ethical use, copyright and documentation; media literacy; presentation skills; global collaboration skills; and, leveraging social media for curation and research. This line of investigation would provide the necessary needs assessments upon which library services could be developed and tailored for specific communities of learners.

Parallel to this inventory of existing library needs of K-12 online schools, evaluations of established virtual libraries in K-12 brick-and-mortar schools are needed as these are likely models for K-12 online spaces. Studies should explore the efficacy of these existing libraries for supporting learner completion of course assignments and research/inquiry projects, as well as the quality and effectiveness of available just-in-time instruction (tutorials, graphic organizers, and other learning scaffolds). In addition, investigations into how these virtual school libraries meet curricular needs but also provide various avenues to independent learning interests and connected learning as described by YALSA (2014) would greatly inform designers of virtual library spaces by potentially revealing how deeper personalization of library services for online learners could be designed. Assessments of the efficacy of existing K-12 online instruction for addressing AASL standards (2007) would yield further critical information. This research would determine if and how current online instruction is preparing learners to complete course assignments, conduct age-appropriate inquiry, and transfer information fluency skills to their real life information needs. Another essential question is how to best utilize new metrics for measuring the success of library programs as described by Stephens (2013) and how these compare to the body of research on school libraries and achievement (Kachel, 2013).

Other topics for research

Other instruction-related topics that need investigation include best practices for connecting online learners to those in different online and brick and mortar schools for digital collaborative learning and authentic research. Studies of how new information management strategies such as social media curation could be used to enrich or further extend learners' abilities for personal knowledge management are also essential. This research would point out how transfer of knowledge and overall learning agility could potentially be improved through the efforts of K-12 online librarians. Obviously, the librarian's role in online K-12 learning also warrants investigation. For example, research is needed into how librarians might extend the role of learning facilitator (Lankes, 2012) in novel ways in online environments, and how they could establish collaborative relationships with fellow faculty in these environments. How pre-service preparation of school librarians might become more responsive to all aspects of the digital shift, especially in terms of designing virtual library environments and providing online and mobile services and instruction, also demands consideration.

Conclusion

Despite the lack of a significant body of research specific to school libraries embedded in online learning environments, a wide range of literature exists to inform the growth and development of these environments in K-12 settings. By building upon foundational standards and instructional design models, librarians can build both virtual libraries and online information fluency instruction that meets the needs of young learners. Although not directly addressed in the literature, K-12 librarians are making strides toward full embeddedness by offering a wide variety of online instruction, services, and digital resources in their schools. Most of the growth toward virtualization is emerging from brick and mortar library practice. In some cases, librarians are teaching online courses; in others, they are offering online collections for learners to access 24/7, providing personalized assistance as well as providing on demand, just-in-time tutorials. Regardless of which paths librarians are following, the fact is that libraries must continue to grow and develop into virtual partners to support online instruction, and more importantly, to meet the long-term needs of all learners. The emergence of virtual school libraries has occurred somewhat organically, opening multiple avenues for new research. Progressing library services in online K-12 schools requires systematic research into these varied facets of online education and librarianship as well as new conversations between professional organizations, policy-makers, and stakeholders of all kinds.

References

Abilock, D., Harada, V. H., & Fontichiaro, K. (2013). Growing schools: Effective professional development. *Teacher Librarian, 41*(1), 8-13.

American Association of School Librarians (AASL). (2007). *Standards for the 21st-century learner.* Chicago, IL: American Library Association.

American Association of School Libraries (AASL). (2003). AASL governing documents: Mission & goals. Retrieved from http://www.ala.org/aasl/about/governing-docs#mission

Anderson, K., & May, F. A. (2010). Does the method of instruction matter? An experimental examination of information literacy instruction in the online, blended, and face-to-face classrooms. *The Journal of Academic Librarianship, 36*(6), 495-500.

Association of College & Research Libraries (ACRL). (2014). PRIMO; Peer-reviewed instructional materials online. Retrieved from http://www.ala.org/acrl/aboutacrl/directoryofleadership/sections/is/iswebsite/projpubs/primo

Bell, S. J., & Shank, J. D. (2007). *Academic librarianship by design: A blended librarian's guide* *to the tools and techniques.* Chicago: American Library Association.

Black, E. L. (2008). Toolkit approach to integrating library resources into the learning management system. *The Journal of Academic Librarianship, 34*(6), 496-501.

Blaschke, L. M. (2012). Heutagogy and lifelong learning: A review of heutagogical practice and self-determined learning. *International Review in Open and Distance Learning, 13*(1), 56-71.

Boyer, B. L., & Kocis-Westgate, A. M. (2014). College ready: Improving student research skills through professional collaboration. In K. Kennedy & L. S. Green (Authors), *Collaborative models for librarian and teacher partnerships* (pp. 161-173). Hershey, PA: IGI GLobal.

Brooks-Kirkland, A. (2009). The virtual library as learning hub. *School Libraries in Canada, 27*(3), 43-45.

Bruner, J. (1961). The act of discovery. *Harvard Educational Review, 31*(1), 21-32.

Buerkett, R. (2014). Where to start? Creating virtual library spaces. *Knowledge Quest, 42*(4), E23-E27.

Callison, D. (2007). Evaluation criteria for places of learning. *Knowledge Quest, 35*(3), 14-19.

Cavanaugh, C., Barbour, M. K., & Clark, T. (2009). Research and practice in K-12 online learning: A review of literature. *International Review of Research and Open and Distance Learning, 10*(1).

Darrow, R. (2009). School libraries are essential: Meeting the virtual access and collaboration needs of the 21st-Century learner and teacher. *Knowledge Quest, 37*(5), 79-83.

Darrow, R. (2012). The missing link: Will there ever be a K-12 online teacher librarian? *CSLA Journal, 35*(1), 15-17.

de Groot, J., & Branch, J. L. (2011). Looking toward the future: Competences for 21st-Century teacher-librarians. *Alberta Journal of Educational Research, 57*(3), 288-297.

Driscoll, M. P. (2005). Psychology of learning for instruction (3rd ed.). Boston: Pearson Allyn and Bacon.

Eisenberg, M., & Berkowitz, R. (1990). *Information problem solving: The Big Six skills approach to library & information skills instruction*. Norwood, NJ: Ablex

Evergreen Education Group. (2013). Table 4: States with online learning requirements. Retrieved from Keeping pace website: http://kpk12.com/cms/wp-content/uploads/EEG_KP2013-table-4.png

Farmer, L. (2012, March). Brace yourself. *School Library Journa*l, 38-43.

Gall, D. (2012). Librarian like a rock star: Using your personal brand to promote your services and reach distant users. *Journal of Library Administration, 52*, 549-558. http://dx.doi.org/

10.1080/01930826.2012.707952
Goodwin, B., & Miller, K. (2013). Research says: Evidence on flipped classrooms is still coming in. *Educational Leadership, 70*(6), 78-80.
Green, L., & Jones, S. (2014). Instructional partners in digital library learning spaces. *Knowledge Quest, 42*(4), E11-E17.
Gunn, H. (2002). Virtual libraries supporting student learning. *School Libraries Worldwide, 8*(2), 27-37.
Hallstrom, J. (2013, March/April). Building it together: Life as a virtual school librarian. *Library Media Connection*, 22-23.
Hartsell-Gundy, A., & Tumbleson, B. (2012). Overview, best practices and literature review. In S. W. Alman, C. Tomer, & M. L. Lincoln (Eds.), *Designing online learning: A primer for librarians* (pp. 53-66). Santa Barbara, CA: Libraries Unlimited.
Huwe, T. (2010). New life for long-standing collaborations. *Computers in Libraries, 3*(4), 27-29. Retrieved from ProQuest Education Journals database.
Imagine Easy Solutions. (2014). ResearchReady. Retrieved from http://www.researchready.com
International Association for K-12 Online Learning (iNACOL). (2013, October). *Fast facts about online learning* [Fact sheet]. Retrieved from http://www.inacol.org/cms/wp-content/uploads/2013/11/iNACOL-Fast-Facts-About-Online-Learning-October-2013.pdf
International Society for Technology in Education (ISTE). (2007). NETS for students. Retrieved from ISTE NETS website: http://www.iste.org/standards/nets-for-students/nets-student-standards-2007
Johnson, D. (2013). Head for the edge. *Library Media Connection, 32*(3), 98.
Jonassen, D. (1999). Designing constructivist learning environments. In C. M. Reigeluth (Ed.), *Instructional design theories and models.* Mahwah, NJ: Erlbaum.
Jones, S. A., & Green, L. S. (2012). Transforming collaboration: Student learning - anytime, anywhere. *Teacher Librarian, 40*(2), 26-31.
Kachel, D. (2013). *School library research summarized: A graduate class project.* Mansfield, PA: Mansfield University.
Kachel, D. E., Henry, N. L., & Keller, C. A. (2005). Making it real online. *Knowledge Quest, 34*(1), 14-17.
Kelly, R., & Boyer, B. (2012, October). *Inspiring inquiry and creativity in your online learners: Leveraging the expertise and resources of libraries to maximize the potential of online environments for your students.* Paper presented at INACOL, New Orleans, LA.
Kent State University Libraries. (2014). About trails. Retrieved from Trails: Tools for real-

time assessment of information literacy skills website: http://www.trails-9.org/about2.php?page=about

Kuhlthau, C. C., Caspari, A. K., & Maniotes, L. K. (2007). Guided inquiry: *Learning in the 21st century.* Westport, Conn.: Libraries Unlimited.

Lamb, A., & Callison, D. (2005). Online learning and virtual schools. *School Library Media Monthly, 21*(9), 29-35.

Lankes, R. D. (2012). *Expect more: Demanding better libraries for today's complex world*. R. David Lankes.

Li, S., Fu, Y., Zhao, X., & Leh, A. (2009). Learners' preferences in using online learning resources. *The Quarterly Review of Distance Education, 10*(3), 299-303.

Lincoln, M. (2009). *Introduction to information literacy: An online library media course for high school students.* Retrieved from International Association of School Librarianship (IASL) website: http://www.kzneducation.gov.za/Portals/0/ELITS%20website%20Homepage/IASL%202008/professional%20papers/lincolnpp.pdf

Lincoln, M. (2012). Online education in schools. In S. W. Alman, C. Tomer, & M. L. Lincoln (Eds.), *Designing online learning: A primer for librarians* (pp. 67-89). Santa Barbara, CA: Libraries Unlimited.

Lindsay, J., & Davis, V. A. (2013). *Flattening classrooms, engaging minds: Move to global collaboration one step at a time.* Boston: Pearson.

Loertcher, D. V., Koechlin, C., & Rosenfeld, E. (2011). *The new learning commons where learners win!* Salt Lake City, UT: Learning Commons.

Loertscher, D. V., & Koechlin, C. (2012). The virtual learning commons and school improvement. *Teacher Librarian, 39*(6), 20-24.

Luhtala, M., & Boyer, B. (Presenters). (2014, June 18). *Flippin' library! A year in the life of a flipped library.* Lecture presented online for EdWeb.net.

Miao, Y., Engler, J., Giemza, A., Weinbrenner, S., & Hoppe, H. U. (2012). Development of a process-oriented scaffolding agent in an open-ended inquiry learning environment. *Research and Practice in Technology Enhanced Learning, 7*(2), 105-128.

Murphy, S. A., & Black, E. L. (2013). Embedding guides where students learn: Do design choices and librarian behavior make a difference? *The Journal of Academic Librarianship, 39*, 528-534.

National Governors Association for Best Practices, Council of Chief State School Officers. (2010). *Common Core State Standards*. Washington, D.C.: National Governors Association for Best Practices, Council of State School Officers.

OER Commons. (2014). OER Commons: Open Education Resources. Retrieved from http://www.oercommons.org

Perrault, A. M. (2007). The school as an information ecology: A framework for studying changes in information use. *School Libraries Worldwide, 13*(2), 49-62.

ProQuest. (2014). ProQuest Research Companion. Retrieved from http://www.proquest.com/products-services/rescomp.html

Ray, M. (2014, March). Anytime, anywhere learning: Librarians have key roles in the blended and online learning landscape. *School Library Journal, 20.*

Roberts, S. (2012). Our learning landscape: Opportunities, challenges and possibilities. *Australasian Public Libraries and Information Services, 25*(4), 156-160.

Rohland-Heinrich, N., & Jensen, B. (2007). Library resources: A critical component to online learning. *Multimedia & Internet@Schools, 14*(2), 8-12.

Shank, J. D., & Dewald, N. H. (2003). Establishing our presence in courseware: Adding library services to the virtual classroom. *Information Technology and Libraries, 22*(1), 38-43. Retrieved from ProQuest Education Journals database.

Shumaker, D. (2012). *The embedded librarian: Innovative strategies for taking knowledge where it's needed.* Medford, NJ: Information Today.

Smalley, T. N. (2004). College success: High school librarians make the difference. *The Journal of Academic Librarianship, 30*(3), 193-198.

Smith, L., & Evans, J. (2010). Speak up: Students embrace digital resources for learning. *Knowledge Quest, 39*(2), 20-27.

Stephens, W. (2013, Fall). For every learner, everywhere, all the time: The futures of school libraries. *Young Adult Library Services,* 4-8.

Stripling, B. K. (2003). Inquiry-based learning. In B. K. Stripling & S. Hughes-Hassell (Eds.), *Curriculum connections through the library* (pp. 3-39). Westport, CT: Libraries Unlimited.

Stripling, B. K. (2007). Assessing information fluency: Gathering evidence of student learning. *School Media Activities Monthly, 23*(8), 25-29. Retrieved from ProQuest Education Journals database.

Tang, Y., & Tseng, H. W. (2013). Distance learners' self-efficacy and information literacy skills. *The Journal of Academic Librarianship, 39*(6), 517-521. http://dx.doi.org/10.1037/0002-9432.76.4.482

Valentine, B., & Bernhisel, S. (2008). Teens and their technologies in high school and college: Implications for teaching and learning. *The Journal of Academic Librarianship, 34*(6), 502-512. http://dx.doi.org/10.1016/j.acalib.2008.09.001

Valenza, J. (2011, September 30). Curation is the new search tool [Blog post]. Retrieved from Neverending Search website: http://blogs.slj.com/neverendingsearch/2011/09/30/curation-tools-are-also-search-tools/

Valenza, J., Luhtala, M., & Boyer, B. (2013). *Flipped libraries. The Digital Shift: Reinventing Libraries.* Retrieved from http://www.thedigitalshift.com/tds/reinventinglibraries/

Valenza, J. K. (2012a). Curation. *School Library Media Monthly, 29*(1). Retrieved from http://www.schoollibrarymonthly.com/articles/valenza2012-v29n1p20.html

Valenza, J.K. (2012b). The flipping librarian. *Teacher Librarian, 40*(2).

Verbit, D., & Kline, V. L. (2011). Website resources Libguides: A CMS for busy librarians. *Computers in Libraries, 31*(6), 21-25.

Vesey, K. (2004). Building a better clicks-and-mortar library. *Library Media Connection,* 28-29.

Vygotsky, L. S. (1962). *Thought and language*. Cambridge, MA: Harvard University.

Williams, S. (2010). New tools for online information literacy instruction. *The Reference Librarian, 51*, 148-162. http://dx.doi.org/10.1080/02763870903579802

Walvoord B.E., and Anderson, V.J. (1998). *Effective grading: A tool for learning and assessment.* San Francisco: Jossey-Bass.

Young Adult Library Services Association (YALSA). (2014). *The future of library services for and with teens: A call to action.* Washington, D.C.: Institute of Museum and Library Services.

Zivkovic, S. (2014, April 24). LibGuides users: Breakdown of numbers [E-mail to the author].

Zmuda, A. (2009). Leap of faith: Tale the plunge into a 21st-Century conception of learning. *School Library Monthly, 26*(3), 16-18.

Zurkowski, P. G. (1974). *The information service environment relationships and priorities* (Report No. 5). Washington, DC: National Commission on Libraries and Information Sciences.

VI. Research on Technological Innovations

What's this section about? Technology changes rapidly. Those rapid changes in both hardware, software, and strategies, provide new opportunities for us to think about and practice online and blended learning differently. Those changes then drive the kinds of technologies that get adopted, adapted, and developed. This recursive process of mutual impact has gone on since recorded time. What can we learn about new technologies and how they might impact our research on K-12 online and blended instruction? The chapters in this section delve more deeply into large categories that affect online and blended learning and are in turn impacted by them (e.g. mobile learning, open learning, and personalization).

What's in this section? Cavanaugh, Maor, and MCCarthy discuss the topic of mobile learning and how it contributes to the growth of K-12 online and blended learning, particularly when it comes to a country's GDP. Research shows this is affected by Internet usage and the availability of broadband connectivity. Additionally the authors' review of the research shows student-centered learning as an important pedagogical approach when incorporating mobile learning in K-12 online and blended learning.

Graham, LaBonte, Roberts, O'Byrne, and Osterhout review literature in many open learning concepts, including but not limited to digital literacy, MOOCs, and open education resources.

Some of their implications for policy, practice, and research include creating policy around and studying student safety concerns, ensuring all educators are knowledgeable about open learning strategies and tools, and the design and processes for adopting open learning environments.

Drexler reviews the literature on personalization and those research-based theories, strategies, and tools that have been identified as key in the design and development of personalized learning environments. Research finds that networked learning, student-centered specifically, is the base of personalizing learning for students, and this has great implications for policy and practice guidelines for preparing educators.

What's missing from this section? Future iterations of this book will provide chapters that continue to lay a framework for understanding technological innovations and how they might impact K-12 online and blended environments. There are opportunities for new authors to add to this Handbook by writing about innovations like gaming, social media, wearable technologies, virtual reality, augmented reality, LTI, and video-based communications—technologies that are not necessarily tied to a specific piece of hardware or software but rather represent a shift in the way that we engage with our content and with others.

Chapter 18

K-12 Mobile Learning

Cathy Cavanaugh,
Microsoft Worldwide Education, cathy.cavanaugh@microsoft.com
Dorit Maor,
Murdoch University, D.Maor@murdoch.edu.au
Aidan McCarthy,
Microsoft Worldwide Education, aidan.mccarthy@microsoft.com

Abstract

Mobile devices have been the focus of a push in many nations and internationally as part of efforts to achieve greater literacy and numeracy among students. Research has shown a strong link between Internet usage, the spread of broadband in a country, and its GDP. Those countries that are the highest performing educationally already integrate mobile devices in their education. This paper synthesizes empirical research on mobile devices from 2010 to 2013 in K-12 schools by focusing on studies that demonstrate emerging themes in this area. It is also clear that the pedagogy needed to be successful in creating positive outcomes in the use of technology has to be student-centered with the aim of personalizing the learning experience. Research found that students could become collaborators in designing their own learning process. As students become independent learners, they become more prepared in the skills needed for college and in their careers.

Introduction

Maximizing school learning to best benefit individuals and communities requires individualizing educational experiences and resources for each learner. The key roles of technology in individualizing learning include providing anytime anywhere access to education tools and content, and guiding the use of the tools and content with flexible and responsive path, pace, and pedagogy according to learner needs, interests, and choices. Ubiquitous access to these learning environments is intended to enhance engagement, thereby amplifying knowledge acquisition, skill development, and application of learning in comprehensive tasks. Personalized learning is a promising way to differentiate pedagogy for all students and prepare them for college, career, and community (Weber, Biswell, & Behrens, 2014). Effective personalized learning environments provide tools and learning resources that students use in self-directed and self-paced learning. Because learning is deepest with guidance and interaction, the content and tools should be collaborative (Jonassen, 2012).

This chapter explores anytime anywhere learning by synthesizing recent research in K-12 mobile learning. Operationally defined here, mobile learning or m-learning includes school learning experiences and environments that are accessible to students in and out of school with devices and services that go with students when and where they learn, including in blended and online programs. These environments may include laptop computers; however, they increasingly include tablet devices and mobile phones. We review relevant research across mobile devices, specifying the form when possible.

School age children experience a wide range of physical and cognitive development stages from entry to school leaving. Thus, these stages have implications for learning environments, tools and resources, the roles of teachers, and educator professional development, and these differences should be considered when applying the research findings that follow. Table 1 briefly outlines the differences between categories and implications as they pertain to mobile learning.

Table 1. Learner stages that influence design of mobile learning approaches.

Category of difference	**Early years (age 5-10)**	**Later years (age 11-18)**
Cognitive development (Piaget, 1973)	Concrete thinking is strengthened as the foundation for abstract reasoning.	Abstract reasoning develops and is refined.
Optimizing learning (Papert, 1996)	Cognitive development depends on manipulation of physical and virtual objects. Logo, Turtle, Scratch are examples that bridge physical and virtual.	Conceptual development depends on exploration and manipulations of ideas and principles. Coding and cognitive mapping are examples.
Learning environments (Vygotsky, 1978)	Schooling emphasizes limited social development, real world experiences, and exploration of things and situations. Learning is guided by teacher feedback.	Schooling emphasizes broad social development, pre-professional experiences, and exploration of roles and identity. Learning is guided by peer and expert feedback.
Pedagogical content knowledge (Shulman, 1986)	Teachers emphasize content through alternative forms of representation.	Teachers combine the two domains of knowledge into pedagogical-content knowledge.
Roles of teachers (Mishra & Koehler, 2006)	Teachers guide psychomotor and cognitive skills, and development of close social ties.	Teachers guide conceptual and reasoning skills, and development of social ties.
Educator professional development (Laurillard, 2012)	Professional development focuses on media to present content, tools to create media in application of content, concrete skill development, personalization.	Professional development focuses on data and abstract representations, tools to visualize and explore concepts, systems for collaboration and integration into communities and professions.
Technology affordances (Jonassen, 2012)	Technology must be media-rich with power for knowledge acquisition and demonstration of learning, embedded in story; technology must be an interface with the physical world.	Technology must be data-and collaboration-rich, with powerful tools that connect to the world of ideas, embedded in relationships; technology must be an interface with communities.

In the following section we review learning affordances and limitations of mobile technology for primary and secondary students from empirical studies, national and academic perspectives. Then we offer some implications and recommendations for policy, practice, leadership, and research in order to guide adoption and advancement of K-12 mobile learning.

Research guided policy and practice on Mobile Learning

The design and implementation of a mobile learning program depends on the vision and needs of a school or government. Documented purposes include influencing student achievement (Martin & Ertzberger, 2013; Wu, et al., 2012), increasing student-centered teaching practices (Cochrane, Narayan, & Oldfield, 2013), closing the digital divide (Traxler, 2010), and improving family involvement in education (Kim, Hagashi, Carillo, Gonzales, Makany, Lee, & Garate, 2011). Personalization of learning (Sattler et al., 2011; Melhuish & Falloon, 2010; Peng et al., 2009) is a recent addition to the goals for mobile programs in schools. Past rationales have focused on improving the conditions that influence learning, such as student engagement, motivation, attitude and confidence, and student organization, study skills, and study habits (Gardner, Morrison, & Jarman, 1993; Warschauer, 2006; Benton, 2012). Reasons related to teaching practice now cite collaboration (Park, 2011; Sattler et al., 2011; Pettit & Kukulska-Hulme, 2007; Motiwalla, 2007, Maor, 2008) more commonly than previous goals that included student-centered practices (Fairman, 2004; Cavanaugh, Dawson & Ritzhaupt, 2011), inquiry-based practices (Fisher & Stolarchuk, 1998), cooperative learning and project-based instruction (Warschauer & Sahl, 2002; Fairman, 2004), and differentiated instruction (Fairman, 2004). Academically, with the added emphasis worldwide in measures such as PISA, mobile devices have been associated with student acquisition of 21st century skills (Wakefield & Smith, 2012) and general academic skills (Shin, Norris & Soloway, 2007).

The collaborative capacity of mobile devices and learning environments are very well suited to cognitive development. It is accepted in learning sciences that multiple forms of conversation, interaction, and collaboration amplify learning. Research in mobile learning environments (Ekanayake & Wishart, 2011; Zurita & Nussbaum, 2004) shows significant learning gains with mobile collaboration. Language, mathematics, and academic skills are complex cognitive processes requiring immersion and practice over time. Success can be magnified by mobile learning because learning time and the learning environment can extend far beyond the classroom and class period. Mobile devices, digital resources, and collaborative learning tools give each student continual access to the types of self-directed, personalized learning that expands learning as needed throughout the duration of a course with the teacher's support (Graham, 2006). Among the highly effective learning approaches (Hattie, 2013) that are well-supported by mobile learning are vocabulary programs (language practice, games), creativity programs (drawing, writing, video), meta-cognitive strategies (mind mapping, brainstorming), reflection (journals, portfolios, note taking), feedback on performance, especially formative evaluation (annotation of student work, peer review, polling), spaced practice (flashcards and formative assessment apps), and mastery learning (adaptive lessons and games). In the sciences and social studies, much mobile learning research at K-12 levels applies augmented reality in ways that increases meaningful learning of complex concepts and systems due to authentic opportunities to explore time and space (Cavanaugh, 2011).

Learning language and mathematics with technology is most effective by far when the use of the technology tools are controlled by students and when the technology is flexible and open-ended, such as through the use of mind tools including word processors, digital notebooks, and spreadsheets (Hattie, 2013; Jonassen, 2012). Further, learning with technology is far more effective when peer learning and interaction are optimized, such as with collaborative tools (Hattie, 2013) or assistive technology tools (Maor, Currie, & Drewry, 2011).

The World Bank and Brookings Institute research (Yuki & Kamayama, 2013) indicates that school mathematics results correspond to increased GDP and income. Effective math education must engage and inspire, and equip students with cognitive skills by using compelling mind tools and valuing open-ended explorations (Jonassen, 2012). Mobile learning approaches teach mathematical skills and strategic thinking in primary and secondary level students, as well as expanding learning time in mathematics (van't Hooft, 2013).

Regarding language learning, the strongest impact on reading skills comes from attention to spatial and auditory perception, skills that are well-supported using technology (Hattie, 2013). Writing skills are best developed through strategies and practice in planning and revising, especially in peer groups, activities that are effective in shared text and journal apps (Hattie, 2013). It is through this type of "comprehensible input" that seems to be the most direct path to acquiring the grammar and vocabulary of a language, and to applying the language in real communicative situations (Krashen, 2003; Watson, 2009). Mobile learning environments support classroom and out-of-class comprehensible input through engagement in a receptive stage of reading and listening followed by a productive stage of speaking and writing because all of the tools are easily accessed and learned. A large study involving 10 schools in two US states examining mobile learning and literacy suggests that mobile devices have contributed to students gaining broad skills, knowledge, and abilities that support learning and literacy development (Warschauer, 2006). The study documents shifts toward interdisciplinary, iterative, public, collaborative, purposeful, and authentic writing tasks along with increased range in writing. The study also suggests mobile computing leads to higher quality student work, more autonomy in the writing process, more individualized learning, and development of multimedia literacy that integrates 21st century skills (Warschauer, 2006). Overall writing ability increased significantly, with the largest increases noted in groups who used mobile devices in all stages of the writing process (Warschauer, 2009). Mobile language learning systems were found to be effective and engaging for vocabulary development through spaced practice (Thornton & Houser, 2004). Research showed that reluctant readers were more motivated to read eBooks on mobile devices (Maynard, 2010). In language application, students appear to analyze and synthesize text better with graphic organizer apps than when they use non-technology tools (Garcia, 2011). Language learning has benefited from the anytime capabilities of mobile technology (van't Hooft, 2013).

Assessment of student learning in the mobile environment should be a seamless, developmental, and integrated part of the learning process (Marzano, 2002) using forms such as portfolio, project-based, and other performance assessment aligned with development of academic and 21st century knowledge, skills, and dispositions. Marking rubrics aligned to each assessment approach can be embedded in the collaborative environment shared production tools. Assessment that centers on formative feedback is among the most effective practices (Hattie, 2013). Mobile technology enables frequent feedback, as well as reflection on learning that develops metacognition supported by research in persistence (Dweck, 2006). Shared note taking and journaling apps have been shown to improve student exam performance when they are used to prepare and to reflect on learning (Michaelsen & Mohr, 2010), and to improve note taking quantity and efficiency in students with learning disabilities such as dyslexia (Garbo, Mangiatordi & Negri, 2012).

The following section presents an overview of recent research to ascertain what empirical studies say about K-12 mobile learning environments.

Research Synthesis

What does the research say about m-learning?

Our analysis began with an electronic based search of a number of educational databases of Proquest; Educational Resources Information Centre (ERIC) and A+ Education Informit. The initial search was limited to peer-reviewed documents over the last five years using the key terms “m-learning” and “mobile learning” and yielded 3807 articles. The search was further refined by including more keywords, “peer learning” and “K-12”that yielded 46 studies, and another set of technological terms such as “mobile learning”; “tablet computing” and “school” and “personalized learning” which resulted in 23 studies. In the final cull, abstracts and papers were reviewed, and those papers which were based on empirical research and within a K-12 setting were kept for further consideration. Finally, we selected ten studies from 2010-2013 to identify the major themes in mobile learning research.

The ten-selected research articles illustrate a very interesting scenario about pedagogical models and the teacher’s role in personalizing learning. M-learning in these research studies allowed for flexibility, customization, collaboration, and co-creation. The use of a Mobile Adaptive Learning System in high school (Hus, et al. 2013) or a tailor-made eBook in elementary schools (Yueh-Min Huang, et al. 2012) enhanced personalized learning and enabled students to practice language study anywhere and anytime. An investigation (Huang et al., 2012) into how students’ personalized learning using smartphones in primary science classrooms found that a goal-based approach supported the students in personalizing their learning. Students using mobile phones in a middle school who worked as mathematicians to explore authentic problems (Daher, 2010) resulted in the construction of useful knowledge in mathematics.

When using text-messaging in a secondary school on personal mobile phones (Faure & Orthobr, 2011), the asynchronous nature of texting enabled the students to reflect more although some teachers were reluctant to use mobile phones. Others (Riconscente, 2013; Lan, et al, 2010) explored the use of a fractions game application on iPads to examine students’ fractions knowledge and attitude or the use of tablet PC to learn computational estimation skills. In both cases the use of mobile technologies helped elementary school students develop their mathematical skills.

In a study that involved a cloud-based adaptive learning system that incorporated mobile devices in a year eight science classroom, Nedungadi and Raman (2012) found that through formative assessment the system provided teachers with real-time feedback about individual and group learning. The framework also included pedagogical recommendations to the teachers that were based on the users’ knowledge levels and preferences.

However, the results of using mobile tools were not always positive. According to Fitzsimmons (2011) when the iPad was used as a teaching tool, teachers were required to invest considerably more time in talk related to classroom control and resource management and students’ engagement was lower than for comparable tasks when the iPads were not used. In an empirical study (Kim, et al., 2010) that involved 160 students in urban slum and rural village communities in Mexico, students in the rural village benefitted more from the mobile technologies, but there was no evidence about the teachers' perceptions or preparation of the technology. In this rural community the rapid adoption of mobile learning technology was driven by the students rather than the teachers.

These exemplary studies found that students' personalized and cooperative learning was facilitated through the use of mobile devices. These empirical research studies were conducted mainly in elementary and middle school, and therefore more research is needed at the secondary level to help teachers develop appropriate pedagogies and to create greater understanding on the m-learning potential and its impact on students learning.

National Perspectives for Mobile Learning

Governments and education institutions are under increasing pressure to rationalize new programs financially and educationally (Warschauer, 2009; Perkins & Saltsman, 2010). In many countries, mobile learning is embedded in a broader digital inclusion agenda that is promoted to enable all citizens to fully participate in their communities, benefit from online services, and access learning opportunities that will prepare them for the future workforce. "Some 125 million school children around the world remain illiterate, even after four years of attendance – a waste of $129 billion a year" (United Nations, 2014, np). Worldwide, countries are committed to universal access to quality education as a foundation for vibrant economies and societies. Technology access for students, teachers, and families empowers anyone, anywhere with the opportunity to have a top quality education, in part because its reach and scalability exceed the capacity of many countries to provide universal traditional schooling. For all citizens, access to the global digital society means economic, employment, and social opportunities. For governments, increasing digital inclusion accelerates employment by bringing training in reach of all citizens. Education is the most significant factor correlated with entrepreneurial growth (McKay, Williams, Atkinson & Levin, 2014). Digital access is used to bring young children learning opportunities that speed school readiness, reduce holiday learning slides, and close achievement gaps among groups of students. Access to digital tools and content affords expanded learning time beyond the school day (Cavanaugh, 2009), which increases school engagement and completion.

In addition to the economic benefits, digital inclusion makes possible an array of social benefits. Digitally-empowered teachers and students are being leveraged around the world to alleviate numerous educational problems, including crowded schools, shortages of secondary courses needed by remedial or accelerated students, lack of access to qualified teachers in a local school, students who need to learn at a pace or in a place different from a school classroom (Ferdig & Cavanaugh, 2011; Ferdig, Cavanaugh & Freidhoff, 2012), and students in remote areas such as the outback of Australia (Barbour, 2011). Where a national vision of social and economic benefits from mobile technology aims for a knowledge-intensive economy, a greater premium is placed on cognitive skills and on lifelong learning, adapting, and innovating. Knowledge-intensive activity generates growth and expands exports, and thus may be crucial to national prosperity. Knowledge-intensive activities require application of significant intellectual effort, idea generating, and problem solving of the type that require extensive time with the mind-tools of technology (Mares, et al., 2013). These benefits result in many positive contributions to society. An OECD report (2010) links home computer use to academic success.

Further, the longer a child has an Internet-connected device at home, the stronger are the academic benefits, even stronger than school computer use: according to the Broadband Commission, a joint body of the United Nations Educational, Scientific and Cultural Organization (UNESCO) and the International Telecommunication Union (ITU), every 10 percent increase in broadband penetration results in additional growth of 1.3 percent in national gross domestic product (GDP) (Broadband Commission, 2010).

Education Policy Perspectives on Mobile Learning

As digital inclusion is approached, academic gains are expected. Lessons may be learned from international high performing schools that are benchmarking based on international measures such as PISA as well as UNESCO measures like child well-being and economic competitiveness. This approach was used in an analysis that identified noteworthy examples of educational transformation (Hargreaves & Shirley, 2012). Factors contributing to these successes are summarized in Table 2. Many of these high-performing education systems have already integrated mobile learning into their visions for transformation.

Table 2. Policies and practices of high-performing education systems

Schools	Policies and practices
Finland	Investment in teacher quality, teachers as curriculum developers, communities of educators, autonomy of schools, community participation in education
Singapore	Teaching with technology, school autonomy, learning-centered teaching, iterative innovation, collaboration within and among schools as well as with policy and research agencies, alignment of education strategy with national economic needs, mobile learning days
Alberta, Canada	School innovation and teacher inquiry focused on learning, networks of schools, long term vision and planning, education culture of risk and trust
Ontario, Canada	Education for all policy with differentiation and strategies for learning of all students, professional learning communities, inclusive pedagogy, assistive technology, local authority with integrated strategy and shared accountability
California, USA	Leadership focused on equity, Innovation of school structures to increase engagement and differentiation, inquiry at school level, professionals as intellectuals.

In addition to countries already identified as high-performing, several countries are adopting mobile learning as one of the reform strategies in their focused drives to become high-performing. These countries include the United Arab Emirates, Qatar, Malaysia, Mexico, Thailand, Slovakia, and Japan.

Parents and government leaders understandably focus attention and resources on schooling that will prepare students with core cognitive skills needed for college, higher education, career, and civic participation. Thus, educational initiatives including mobile learning are expected to develop thinking and communication with literacy and numeracy. To answer the question, "In what ways have school mobile learning programs related to improved literacy and mathematics achievement?", we can begin with the most recent Programme for International Student Assessment (PISA) results and map the most-improved countries to their national mobile technology programs (OECD, 2013). Between 2000 and 2012, the countries that have recorded the highest increases in math and reading scores are shown in Table 3, although starting points varied, so growth potential was relative.

Table 3. 2000-2012 PISA improvements

Rank in improvement 2000-2012	Mathematics	Increase in points	Reading	Increase in points
1	Peru	76	Peru	57
2	Brazil	57	Luxembourg	47
3	Poland	48	Albania	45
4	Luxembourg	44	Poland	39
5	Chile	39	Israel	34
6	Israel	33	Liechtenstein	33
7	Portugal	33	Chile	31
8	Italy	28	Latvia	31
9	Latvia	28	Indonesia	25
10	Mexico	26	Germany	24

Among the five countries with the greatest overall academic improvement over the past decade in both Mathematics and Reading, [the] four that instituted national or large-scale mobile learning programs and key policy changes, are shown in Table 4.

Table 4. Mobile learning and policy change in most-improved PISA countries

Country	Mobile learning program	Policy changes
Chile	Eduinnova	Integrated professional development to transform pedagogy
Peru	OLC-Peru, PCs for all students in 500 schools	Focus on rural schools, emphasis on collaboration in teaching and learning
Poland	European Schoolnet, ePoland	National reform integrates ICT
Portugal	Magellan, public private partnership	Math Action plan and Technology Action plan

Policies that high-performing and improving countries have in common support student-centered learning with the affordance of mobile environments, showing the need for holistic planning (OECD, 2013). The key policies included highly qualified teachers, longer school days, technology for all students, and expanding preschool/primary education. Specific policy changes enacted between 2000 and 2013 by the most improved countries included the improvement of data and information on learning accessible to schools, increased student-computer ratios, and increased teacher qualifications and professional development.

Professional Development for Mobile Learning

Time spent in professional development, especially collaborative professional development, is one of the most effective differentiators of high performing schools (Jensen, Hunter, Sonnemann & Cooper, 2014). Internationally and in the US, student academic achievement is linked directly to the time their teachers spend in professional learning, especially collaborative learning. Countries with high PISA results tend to be countries with more time in the teaching day for professional learning (OECD, 2011; Darling-Hammond, Wei & Andree, 2010). A holistic ecosystem of curriculum and content, pedagogical and leadership approaches, and technology-empowered learning environments can bring the vision to life, and points to quality criteria. The following holistic framework (Table 5) has been found to be effective in large-scale mobile learning programs (Cavanaugh, Hargis, Soto & Kamali, 2013).

Table 5. Framework for holistic professional development

Vision for holistic education transformation (Why)		
Pillar 1. Where	Pillar 2. What	Pillar 3. How
What are the elements of the learning environments that will transform education?	What curriculum and content will transform education?	What pedagogical and leadership approaches transform education?
Levels of technology adoption: SAMR model (2012) • Substitution • Augmentation • Modification • Redefinition	21st Century Learning Foundational Knowledge Meta-Knowledge Humanistic Knowledge (Mishra & Kereluik, 2011)	Technology, Pedagogy, and Content Knowledge (TPACK) (Koehler & Mishra, 2009) framework for technology integration
Quality indicators and measures for education transformation		

Research in professional development for mobile learning indicates that educators most value having their individual needs considered, attention to time demands for learning, acknowledgement of their anxieties, and ways to get information on their fundamental questions (Psiropoulos, et al., 2014). These results suggest that ongoing, job-embedded, peer-facilitated approaches to professional development are needed, in keeping with the 4Cs model that follows.

1. **Champions.** The foundation of sustainable professional development for school transformation is local champions who are already innovative teachers, who engage in training on adopted changes and engage in interactive discussions, small group work, and the creation of samples of effective teaching, and who facilitate learning among colleagues.
2. **Create.** Educators and support professionals should identify exemplary student work, media assets, lessons, and assessments to share and refine as "creative commons" property in the learning community.
3. **Communicate.** Using virtual environments along with onground approaches, champions, and leaders facilitate sharing of pedagogical success so it builds quickly and efficiently. These communities connect every teacher to high-impact, personalized, and collaborative, job-embedded learning in iterative cycles of lesson study, looking at student work, creating content, and inquiry into practice (Dawson, Cavanaugh, & Ritzhaupt, 2012).
4. **Celebrate.** A teacher peer-sharing event is an occasion for faculty to share their experiences about using the innovations in teaching and learning. Celebrations should be regular events designed to move the culture of innovation and transformation forward (Cavanaugh, Hargis, Munns, & Kamali, 2013).

Implications for Policy and Practice

To increase the likelihood of education benefits for mobile learning, the following recommendations for implementation are offered. Innovative and effective schools with the attributes needed to envision and enact a successful mobile learning program are associated with a clear and specific vision for education and the role of the school (Jensen & Sonnemann, 2014). These schools recognize the importance of getting buy-in for change from across the system and throughout the school. These schools view technology as one of the tools needed to accomplish their goals, employed to enhance teaching and student learning (Cavanaugh, Dawson, & Ritzhaupt, 2011).

Schools leaders should consider classroom, school, district, and home factors, including policies and conditions that may enable or inhibit program success. These may relate to physical space, security of information and equipment, availability of digital curricula and library materials, and teacher latitude in forms of learning assessments.

They should also include families in planning so they have opportunities to experience technology-empowered learning, understand how children will be protected, know that the teacher is central to facilitating mobile learning, and become advocates for the richness that technology brings to the classroom. Providing as much access to the technology as possible for students and teachers increases the level of control of the learning process and to expand learning time, especially for students at risk of not completing school (Cavanaugh, Repetto, Wayer, 2013). Teachers are encouraged to place instructional focus on interactive and collaborative uses of the technology, such as interactive books for literature circles, student design projects involving capturing and working with media, and engaging apps for practicing skills for mastery as well as deep learning. Integrating technology with curriculum and assessment helps to achieve clear, measurable educational objectives. These collaborations can be increasingly global with new on-the-fly voice and text language translation technology, prompting research opportunities to examine development of authentic 21st century skills. Using technology in ways to show students the process of problem solving and have opportunities to use technology in problem solving develops higher order thinking skills (Ritzhaupt, Dawson, Cavanaugh, 2012).

Implications for Research

With the advance of technology, there has also been an increase in discovering aspects of learning that can be challenged by the technology and in particular there is concern of whether the digital pedagogies enable the teachers to maximize learning using the emerging technologies. Some of the following questions are major foci for future research and educational practitioners: What are the gaps in m-learning research? How affordable is the introduction of mobile technologies in the current classroom environment? How sustainable is the impact of technology on learning? What is the best practice for Professional Development? and To what extent do teachers and students as end-users take a role in planning and implementing this new emerging field? Other questions related to PD include: What is the role of digital pedagogies in helping with PD, and what is the role of the PD in enhancing the use of mobile technologies in the K-12 curriculum? These questions require continuous research in the K-12 m-learning environment.

To address this concern, detailed knowledge is needed for leaders, policymakers, educators, instructional designers, and professional development providers.

- Communities can benefit from research-based models for bridging education divides in places where schooling is not available, not practical for all children, and not enough for adults needing new skills.
- Educators, content developers, and mobile learning product developers can apply refined, research-based guidance on the specific device configurations, features, instructional design approaches, and pedagogical practices that can be expected to be effective for specific learners and learning environments.
- Teacher educators and providers of educator professional learning should have access to evidence-based recommendations on how teachers can best develop their mobile teaching skills. For example, will they lead students better in mobile learning environments if they have had successful learning in these environments? Can pre-service teacher programs embed students in K-12 mobile learning programs in support of this goal? In what ways can mobile learning propel new education approaches, such as collaborative assessment, competency-based learning, and new pedagogies for deep learning?
- Educators and leaders can benefit from research showing how mobile learning can serve student outcomes.

At the macro level, larger scale studies are needed at elementary and high school levels to identify the gaps in our knowledge about mobile learning. In particular, there is a need to identify challenges, limitations, and to document the success stories in schools and in the community. To do this, more authentic research methods that involve teachers in the data collection and analysis processes should yield more sustainable results for the future. This may involve research from different paradigms, such as design-based research, participatory action research, or virtual ethnography. On a micro level, some research showed (Israel et al., 2013) that students collaboratively informed the design process, which enhanced their learning. Therefore, students can engage not only as learners but also as collaborators and designers of the learning process in particular where elements of gamification can be introduced in ways that align K-12 learning environments with professional contexts.

Conclusion

There appears to be a slight shift towards personalized learning and more collaboration among students in the pedagogy used with mobile devices. It would be interesting to discover if this was a result of studies such as PISA that emphasize personal achievements that are then translated into national scores. Mobile tools are uniquely suited to increase collaboration thereby empowering students to personalize each others' learning experiences.

One of the conclusions from the emerging research is that the design of pedagogical models is essential for better adaptation of the mobile devices to maximize learning and to make the environments flexible and accessible anytime anywhere. In particular, these pedagogical models should be based on the needs that teachers and students have expressed regarding personalized and collaborative learning styles. Continuous improvement of professional development for teachers based on rigorous research as well as teachers' lived experiences will contribute to the design of digital pedagogical models.

In the future the aim will be to develop apps that enable teachers and students to move seamlessly from personalized environments to collaborative environments. Another goal will be to design features of assessment activities with the ability to consult with the teacher and to share the results with the students. These apps on mobile devices should provide mobility, flexibility, and creativity in learning.

In this chapter we demonstrated the multidimensional use of mobile devices to enable m-learning environments to challenge students in their learning. Students who use m-learning as their learning hub are prepared to be independent learners who are accomplished in the 21st century skills needed in higher education and workplaces where they adopted them (Beheshti, Jambhekar & Deloney, 2010; Barber, Haque & Gardner, 2009; Scott, 2011; Penciuc, Abel & Van den Abeele, 2012). These tools support knowledge sharing in distributed teams of the type students will join in college and later in their careers (Sharp, Giuffrida & Melnick, 2012). With a diversity of involvement in m-learning from teachers, policy makers, researchers, technologists, and end users; the students for whom this learning experience is aimed, there should be a greater chance that their achievements will result in a successful and sustainable story.

References

Barber, C., Haque, N. & Gardner, B. (2009). One point: Combining OneNote and SharePoint to facilitate knowledge transfer. Drug Discovery Today (14) 17-18, 845-850.

Barbour, M. K. (2011). The Promise and the Reality: Exploring Virtual Schooling in Rural Juristictions. *Education in Rural Australia, 21*(1).

Beheshti, M. V., Jambhekar, K., & Deloney, L. A. (2010). Utility of Microsoft OneNote for the Efficient Aggregation and Dissemination of Learning Materials in Radiologic Education. *Journal of the American College of Radiology, 7*(11), 893-897.

Broadband Commission. (2010). A 2010 Leadership Imperative: The Future Built on Broadband. A report by the Broadband Commission. Paris: ITU and UNESCO.

Cavanaugh, C. (2009). *Getting students more learning time online: Distance Education in Support of Expanded Learning Time.* Washington, DC: Center for American Progress.

Cavanaugh, C. (2011). Augmented Reality Gaming in Education for Engaged Learning. *Gaming and Simulations: Concepts, Methodologies, Tools and Applications, 1*, 45.

Cavanaugh, C., Dawson, K., & Ritzhaupt, A. D. (2011). An evaluation of the conditions, processes and consequences of laptop computing in K-12 classrooms. Journal of Educational Computing Research 45(3) 359-378.

Cavanaugh, C., Hargis, J., Munns, S., & Kamali, T. (December 2012). iCelebrate teaching and learning: Sharing the iPad experience, Journal of Teaching and Learning with Technology 1(2), 1-12.

Cavanaugh, C., Hargis, J., Soto, M., & Kamali, T. (2013). Substitution to augmentation: Faculty adoption of iPad mobile learning in higher education, *Interactive Technology and Smart Education, 10* (4).

Cavanaugh, C., Repetto, J., & Wayer, N. (2013). Online Learning for Students At Risk: A Framework for Success. *Journal of Special Education Technology 28*(1). 1-8.

Cochrane, T., Narayan, V., & Oldfield, J. (2013). iPadagogy: Appropriating the iPad within pedagogical contexts. *International Journal of Mobile Learning and Organization, 7*(1), 48–65.

Daher, W. (2010), Building mathematical knowledge in an authentic mobile phone environment, *Australasian Journal of Educational Technology, 26*(1): 85-104.

Darling-Hammond, L., Wei, R., & Anree, A. (2010). How High Achieving Countries Develop Great Teachers. Stanford, CA: Center for Opportunity Policy in Education.

Dawson, K., Cavanaugh, C. & Ritzhaupt, A. (2008). Florida's Leveraging Laptops initiative and its impact on teaching practices. *Journal of Research on Technology in Education. 41*(2), 143-159.

Dawson, K., Cavanaugh, C. & Ritzhaupt, A. (2012). ARTI: An Online Tool to Support Teacher Action Research for Technology Integration, pp. 375-391. In Hartshorne, C. Heafner, T. & Petty, T. (Eds.) *Teacher Education Programs and Online Learning Tools: Innovations in Teacher Preparation.* Hershey, PA: Information Age.

Dweck, C. (2006). Mindset: The new psychology of success. New York: Random House.

Dynarski, M., Agodini, R., Heaviside, S., Novak, T., Carey, N., Campuzano, L., et al. (2007). Effectiveness of reading and mathematics software products: Findings from the first student cohort. Washington, DC: U.S. Department of Education, Institute of Education Sciences.

Ekanayake, S., & Wishart, J. (January 01, 2011). Identifying the Potential of Mobile Phone Cameras in Science Teaching and Learning: A Case Study Undertaken in Sri Lanka. *International Journal of Mobile and Blended Learning, 3, 2*, 16-30.

Fairman, J. (2004). Trading roles: Teachers and students learn with technology. In Proceedings of the Annual Conference of the New England Educational Research Organization, Portsmouth, NH.

Faure, C. & Orthober, C. (2011), Using Text-Messaging in the Secondary Classroom, *American Secondary Education,* 39(2): 55-76.

Ferdig, R. & Cavanaugh, C. (Eds.). (2011). Lessons Learned from State-Led Virtual Schools: Experiences and Recommendations from the Field. Vienna, VA: iNACOL.

Ferdig, R., Cavanaugh, C. & Freidhoff, J. (Eds.). (2012). Lessons learned from blended programs: Experiences and recommendations from the field. Vienna, VA: iNACOL.

Fisher, D., & Stolarchuk, E. (1998). The effect of using laptop computers on achievement, attitude to science and classroom environment in science. In Proceedings of the Western Australian Institute for Educational Research Forum

Fitzsimmons, B. (2011) Mobile Learning Devices: Changing Pedagogy, *Professional Educator:* 28-30.

Garbo, R., Mangiatordi, A., & Negri, S. (2012). A Computer Based Support to Guided Note Taking: A Preliminary Study on University Students with Dyslexia. *International Journal of Technology and Inclusive Education (IJTIE), 1*(2), 52-59.

Garcia, E. R. (2011). There's an app for that: A study of using Apple iPads in a United States History classroom. Winston-Salem, North Carolina: Wake Forest University, Department of Education.

Gardner, J., Morrison, H., & Jarman, R. (1993). The impact of high access to computers on learning. *Journal of Computer Assisted Learning, 9*(1), 2–16.

Gargiulo, R. M., & Metcalf, D. J. (2013). Teaching in today's inclusive classrooms: A universal design for learning approach. Belmont, CA: Wadsworth Cengage Learning.

Garner, S. (2010). Personal knowledge management and student learning. *Journal of Business & Economics Research (JBER), 8*(12).

Graham, C. R. (2006). Blended learning systems. In C. J. Bonk & C. R. Graham (Eds.), The handbook of blended learning: Global perspectives, local designs. Pfeiffer.

Hargreaves, A., & Shirley, D. (2012). The global fourth way: The quest for educational excellence. Thousand Oaks, Calif: Corwin Press.

Hattie, J. (2013). Visible learning: A synthesis of over 800 meta-analyses relating to achievement. New York, NY: Routledge Press.

Hsu, C.-K., Hwang, G.-J., & Chang, C.-K. (2013), A personalized recommendation-based mobile learning approach to improving the reading performance of EFL students, *Computers & Education*, 63: 327–336.

Israel, M., Marino, M. T., Basham, J. D., Spivak, W. (2013). Fifth graders as apps designers: How diverse learners conceptualize educational apps. Journal of Research on Technology in Education, 46, 1, 53-80.

Jensen, B. & Sonnemann, J. (2014). Turning around schools: it can be done. Carlton, Australia: Grattan Institute.

Jensen, B., Hunter, J., Sonnemann, J. & Cooper, S. (2014). Making time for great teaching. Carlton, Australia: Grattan Institute.

Jonassen, D. (2012). Meaningful learning with technology. Upper Saddle River, NJ: Allyn & Bacon.

Kim, P., Hagashi, T., Carillo, L., Gonzales. I., Makany, T., Lee, B. & Ga`rate, A. (2010), Socioeconomic strata, mobile technology, and education: A comparative analysis, *Educational Technology Research and Development*, 59:465–486.

Koehler, M. J., & Mishra, P. (2009). What is technological pedagogical content knowledge? *Contemporary Issues in Technology and Teacher Education, 9*(1).

Kothaneth, S., Robinson, A., & Amelink, C. (2012). Tablet PC Support of Students' Learning Styles. *Journal of Systemics, Cybernetics & Informatics, 10*(6).

Krashen, S. (2003). Explorations in language acquisition and use. Portsmouth, NH: Heinemann.

Lan, Y.-J., Sung, Y.-T., Tan, N.C., Lin, C.-P., & Chang, K.-E. (2010). Mobile-Device-Supported Problem-Based Computational Estimation Instruction for Elementary School Students. *Educational Technology & Society, 13* (3), 55–69.

Laurillard, D. (2012). Teaching as a Design Science: Building Pedagogical Patterns for Learning and Technology. Routledge, Taylor & Francis Group. Florence, KY.

Maor, D. (2008). Changing relationship: who is the learner and who is the teacher in the online educational landscape? *Australasian Journal of Educational Technology, 24* (5), 627-638. http://www.ascilite.org.au/ajet/ajet24/maor.pdf

Maor, D., Currie, J. & Drewry, R., (2011). The effectiveness of assistive technologies for children with special needs: a review of research-based studies, *European Journal of Special Needs Education, 26*(3), 283-298. http://dx.doi.org/10.1080/08856257.2011.593821

Mares, P., Harrison, C., O'Toole, M., Oberklaid, M., & Hunter, J. (2013). Productive cities: opportunity in a changing economy (No. 2013-5).

Martin, F., & Ertzberger, J. (2013). Here and now mobile learning: An experimental study on the use of mobile technology. *Computers & Education, 68*, 76-85.

Marzano, R. (2002). A comparison of selected methods of scoring classroom assessments. *Applied Measurement in Education, 15*(3), 249-268.

Maynard, S. (2010). The impact of e-books on young children's reading habits. *Publishing Research Quarterly, 26*, 236–248.

McKay, K, Williams, L., Atkinson, A, & Levin, E. (2014). Enhancing Support for Lower-income Entrepreneurs through Major Public Systems. Washington, DC: Corporation for Enterprise Development.

Melhuish, K. & Falloon, G. (2010). Looking to the future: M-learning with the iPad. Computers in New Zealand Schools: *Learning, Leading, Technology, 22*(3).

Michaelsen, A. S., & Mohr, T. C. (2010). Better exam results: how students and school leadership learn when introducing new technology such as OneNote in school.

Mishra, P., & Koehler, M. J. (2006). Technological Pedagogical Content Knowledge: A new framework for teacher knowledge. *Teachers College Record 108* (6), 1017-1054.

Motiwalla, L. (2007). Mobile learning: A framework and evaluation. *Computers & Education, 49*, 581–596.

Nedungadi, P. & Raman, R. (2012), A new approach to personalization: integrating e-learning and m-learning, *Educational Technology Research and Development*, 60:659–678.

Organisation for Economic Co-operation and Development. (2010). Are the New Millennium Learners Making the Grade?: Technology Use and Educational Performance in PISA 2006. Paris: OECD Publishing and Centre for Educational Research and Innovation.

Organisation for Economic Co-operation and Development. (2012). Education at a Glance 2012: OECD Indicators. Paris: OECD Publishing.

Organisation for Economic Co-operation and Development. (2013). PISA 2012 Results. Paris: OECD Publishing.
Ovadia, S. (2012). A Brief Introduction to Web-Based Note Capture. *Behavioral & Social Sciences Librarian, 31*(2), 128-132.
Papert, S. (1996). The connected family: Bridging the digital generation gap. Atlanta, Ga: Longstreet Press.
Park, Y. (2011). A pedagogical framework for mobile learning: Categorizing educational applications of mobile technologies into four types. *International Review of Research in Open and Distance Learning, 12*(2), 78–102.
Penciuc, D., Abel, M. H., & Van Den Abeele, D. (2013). Support for Collaborative Building of a Railway Technical Solution during Tendering. In *Information Systems, E-learning, and Knowledge Management Research* (pp. 301-310). Springer Berlin Heidelberg.
Peng, H., Su, Y., Chou, C., & Tsai, C. (2009). Ubiquitous knowledge construction: mobile learning redefined and a conceptual framework. *Innovations in Education and Teaching International, 46*(2), 171–183.
Perkins, S., & Saltsman, G. (2010). Mobile learning at Abilene Christian University: Successes, challenges, and results from year one. Journal of the Research Center for Educational Technology, 6(1), 47–54
Pettit, J., & Kukulska-Hulme, A. (2007). Going with the grain: Mobile devices in practice. Australasian Journal of Educational Technology, 23(1), 17–33.
Piaget, J., & Inhelder, B. (1973). Memory and intelligence. London: Routledge and Kegan Paul.
Psiropoulos, D., Barr, S., Fletcher, S., Eriksson, C., Hargis, J., & Cavanaugh, C. (in press, 2014). Professional Development for iPad integration in General Education: Staying ahead of the curve. Education and Information Technologies.
Puentedura, R., 2009. *As We May Teach: Educational Technology, From Theory into Practice.* http://tinyurl.com/aswemayteach
Repetto, J., Cavanaugh, C., Wayer, N., & Liu, F. (2010). Virtual High Schools: Improving Outcomes for Students with Disabilities. *Quarterly Review of Distance Education, 11*(2), 91-104.
Riconscente, M. (2013) Results From a Controlled Study of the iPad Fractions Game Motion Math, *Games and Culture, 8*: 186 -214.
Ritzhaupt, A. D., Dawson, K., & Cavanaugh, C. (2012). An investigation of factors influencing student use of technology in K-12 classrooms using path analysis. *Journal of Educational Computing Research 46*(3) 229 – 254.

Sattler, B., Spyridakis, I., Dalal, N., & Ramey, J. (2010, July 7-9th). The learning experience: A literature review of the role of mobile technology. In Proceedings of the IEEE International Professional Communication Conference, Enschede, Nederlands (pp. 38-45)

Scott III, R. H. (2011). Tableau Économique: Teaching economics with a tablet computer. *The Journal of Economic Education, 42*(2), 175-180.

Sharp, H., Giuffrida, R., & Melnik, G. (2012). Information flow within a dispersed agile team: a distributed cognition perspective. In *Agile Processes in Software Engineering and Extreme Programming* (pp. 62-76). Springer Berlin Heidelberg.

Shear, L., Gallagher, L., & Patel, D. (2011). *Innovative Teaching and Learning Research*. Menlo Park: SRI International.

Shin, N., Norris, C., & Soloway, E. (2007). Findings from early research on one-to-one handheld use in K-12 education. *Ubiquitous computing in education*, 19-39.

Shulman, L. S. (1986). Those who understand: Knowledge growth in teaching. *Educational Researcher, 15*(2), 4–14.

Squire, K. (2013). Mobile media learning: Ubiquitous learning environments. In *Emerging Technologies for the Classroom* (pp. 187-202). Springer New York.

Thornton, P., & Houser, C. (2004). Using mobile phones in education. In *Wireless and Mobile Technologies in Education*, 2004. Proceedings. The 2nd IEEE International Workshop on Digital Object Identifier (pp. 3– 52110). IEEE. Available at http://ieeexplore.ieee.org/xpl/mostRecentIssue.jsp?reload=true&punumber=9017 522

Traxler, J. (2010). Will student devices deliver innovation, inclusion and transformation? *Journal of the Research Centre for Educational Technologies, 6*(1), 3–15.

Unesco & UNICEF. (2007). *A human rights-based approach to education for all: A framework for the realization of children's right to education and rights within education*. New York, NY: UNICEF.

UNESCO. (2012). A Place to Learn. Montreal, Canada: Author.

United Nations. (2014). Teaching and learning: Achieving quality for all. Paris: UNESCO Publishing.

van't Hooft, M. (2013). The Potential of Mobile Technologies to Connect Teaching and Learning Inside and Outside of the Classroom. In *Emerging Technologies for the Classroom* (pp. 175-186). Springer New York.

Vygotsky, L.S. (1978). Mind and society: The development of higher mental processes. Cambridge, MA: Harvard University Press.

Wakefield, J., & Smith, D. (2012). From Socrates to satellites: iPad learning in an undergraduate course. *Creative Education*, 3(5), 643–648.

Warschauer, M. (2006). Laptops and literacy: Learning in the wireless classroom. New York, NY: Teachers College Press.

Warschauer, M. (2009). Learning to write in the laptop classroom. *Writing and Pedagogy, 1*, 101–112.

Warschauer, M., & Sahl, K. (2002). Tracing teachers' use of technology in a laptop computer school: The interplay of teacher beliefs, social dynamics and institutional culture. *American Educational Research Journal, 39*(1), 165–205.

Watson, B. (2009). A comparison of TPRS and traditional foreign language instruction at the high school level. *International Journal of Foreign Language Teaching, 5*(1), 21-24.

Weber, C., Biswell, C., & Behrens, W. (2014). *Exploring critical issues in gifted education: A case studies approach.* Waco, TX: Prufrock Press.

Winthrop, R., Smith, M. S., & Brookings Institution. (2012). A new face of education: Bringing technology into the classroom in the developing world. Washington, DC: Global Economy and Development at Brookings.

Wroten, C. (2014, January 16). Gamification Meets Mobile Learning: 4 Best Practices. eLearning Industry. Retrieved from http://learningrush.com/story/featured/gamification-meets-mobile-learning-4-bes/2f39345565664277717436337953773863614735686 73d3d

Wu, W. H., Jim Wu, Y. C., Chen, C. Y., Kao, H. Y., Lin, C. H., & Huang, S. H. (2012). Review of trends from mobile learning studies: A meta-analysis. Computers & Education, 59(2), 817-827.

Yanjie S., Lung-H W., & Chee-K. L. (2012), Fostering personalized learning in science inquiry supported by mobile technologies, *Educational Technology Research and Development,* 60:679–701.

Yueh-M. H, Tsung-H. L., Yen-N. S. & Nian-S. C. (2012) Empowering personalized learning with an interactive e-book learning system for elementary school students, *Educational Technology Research and Development,* 60:703–722.

Yuki, T. & Kameyama, Y. (2013). Improving the Quality of Basic Education for The Future Youth Of Yemen Post Arab Spring. Washington, DC: Brookings Institute.

Zurita, G., & Nussbaum, M. (2004). Computer supported collaborative learning using wirelessly interconnected handheld computers. *Computers & Education, 42*(3), 289-314.

Chapter 19

Open Learning in K-12 Online and Blended Learning Environments

Lee Graham,
University of Alaska Southeast, Roehampton University, lee.graham1@gmail.com
Randy LaBonte,
Vancouver Island University, rlabonte@canelearn.net
Verena Roberts,
Palliser Regional Schools, verena.roberts@canelearn.net
Ian O'Byrne,
University of New Haven, wiobyrne@newhaven.edu
Colin Osterhout,
colin@akgeeks.net

Abstract

Open learning is becoming a critical focus for K-12 technology-supported programs, both those strictly online at a distance and blended classroom practices extending into online learning environments. This chapter reviews the emerging practices influencing open learning in K-12 online and blended environments by examining Open Educational Resources, Digital Literacy, and Massive Open Online Courses. The implications of open learning are examined in relation to policy, practice, and research in K-12 online and blended learning environments. An examination of current literature has led to the authors' call for a new focus on research in open learning practices in K-12 education. A list of possible future research opportunities and alternative academic research is proposed.

Introduction

> Rather than thinking of public education as a burden that schools must shoulder on their own, what would it mean to think of public education as a responsibility of a more distributed network of people and institutions?...what would it mean to enlist help in this endeavour from an engaged and diverse set of publics that are broader than what we traditionally think of as educational and civic institutions? … these publics should include those that are relevant and accessible to kids now, where they can find role models, recognition, friends, and collaborators who are co-participants in the journey of growing up in a digital age.
>
> Ito, Baumer, Bittanti, Boyd, Cody, Herr-Stephenson, Horst, Lange, Mahendran, Martinez, Pascoe, Perkel, Robinson, Sims & Tripp, 2010, p. 353

Open learning is becoming a critical focus for K-12 technology-supported programs, both those strictly online at a distance and blended classroom practices extending into online learning environments. This chapter is intended to connect current peer-reviewed research and emerging practice to provide a foundation for the creation of flexible educational policy in open learning. Open learning is described as learning that occurs in a shared and transparent manner in which others can reuse, revise, remix, and/or redistribute the evidence of learning with others (Wiley, 2009). Open learning encourages collaboration, connections, networked learning, and interdependence between educators and learners. As the quote above suggests, there is the possibility of creating a sustainable open learning ecosystem by promoting interdependence between educators, learners, and society.

Technology offers the capacity for networked and shared open learning; however, current educational policy, practice, and research is facing barriers in their attempts to integrate open learning. This chapter reviews emerging practices influencing open learning in K-12 online and blended environments by examining Open Educational Resources, Digital Literacy, and Massive Open Online Courses. The implications of open learning are examined in relation to policy, practice, and research in K-12 online and blended learning environments. An examination of current literature has led to the authors' call for a new focus on research in open learning practices in K-12 education. A list of possible future research opportunities and alternative academic research is proposed.

Today's education system is constantly barraged with challenges to be innovative, build 21st Century skills for students, to be more personalized, flexible and adapt to individual learner's needs with 'no child left behind'. In public education these demands are situated amidst the turmoil of reduced public funding and constant calls for reform of public education. The very public that the education system is challenged to serve has become alienated, and the discourse created by this alienation deflects the focus from real change. Rhetoric has frozen the public system from its ability to change and adapt to the future world its students are now facing.

The foundation of public education grew from within community; the very community served by the traditional one-room schoolhouses. The schoolhouse served its public well, and was supported by all those who were members of that community. Today the nature of community has rapidly shifted from its small, regional roots growing to become an interconnected, digital world of instant communications and trending topics within a global context. What occurs in one facet of this connected world is no longer isolated to its local community; today social media amplifies and pushes communications and events to the entire world community.

Instead of having this emerging global community be a sideline critic to education, what if it were to be engaged in the very essence of preparing our students for this new world? What if learning was not restricted to a closed room with responsibility left to just one adult: open for students to be engaged in the global community; open for all to see and learn together; open for all to share in a 'global community of open learning'. This chapter examines how open learning in K-12 education can become an important part of meeting the challenges facing public education and how open learning can become part of a solution for issues facing public education. By broadening public education's community and engaging those who may be its most vocal critics in its reform, open learning could be part of the transformation the system seeks so desperately.

The value in open learning lies in its ability to enable educators and students to learn with and from each other through the content they co-create. Open learning requires the ability to collaborate, comment together on materials, or interact with them in some way. Open learning is certainly about more than a useful book or web page that can then be used in one's educational environment. The value of open learning is in its availability for comment, critique, and improvement. Reuse, repurpose, and remix are trademarks of open learning.

Research Synthesis

Current peer reviewed research examined included a review of definitions for open learning, the history of open learning in online and blended environments, and the emerging research on Open Educational Resources, Digital Literacy, and MOOCs (Massive Open Online Courses) in K-12 learning environments. Open learning is difficult to define and describe, as it is dependent upon a multitude of factors influenced by policy, practice, and research focus. At its core, open learning promotes a way to learn that does not necessarily fit into current research contexts. Descriptions of open learning can be found in the research of open educators that includes blogs, wikis, and other digital collaborative action research. Additional case studies and examples of current open learning policy, practice, and research can be found in the chapter author's blogs, the Learning and Technology Policy Framework (Alberta Education, 2013), the 2014 New Media Consortium Horizon Report for K-12 (Adams Becker, Estrada, Freeman & Johnson, 2014), Open Learning and MOOCs in Canadian K-12 Online and Blended Environments (Roberts, 2013), Learner at the Center of a Networked World (Aspen Institute, 2014) and in Connected Learning: An agenda for research and design (Digital Media and Learning Research Hub, 2013).

With the proliferation of broadband, mobile devices with data capabilities, easy-to-use mobile applications, data storage, and applications that operate 'in the cloud' (in online digital repositories, servers and software), there has been considerable interest in learning in the 'open'. Open learning, also known as open education, can be defined as a set of practices, resources, and scholarship that are openly accessible, free to use and access, and to re-purpose. Open learning supports educators who wish to improve upon shared practices, resources, and scholarship. Conole (2013) describes open learning as comprising open source software, open educational resources, open approaches to teaching, open courses, open research, open systems, open scholarship, and open technology. Bates (2005) goes further to suggest that the essential characteristic of open learning is the removal of barriers to learning. As an emerging practice, open learning definitions are still currently being debated and discussed among researchers in educational learning design, practice, pedagogy, and theory.

The history of open learning has its roots in the Montessori movement with its emphasis on student choice and learning through experience; an approach where students engaged directly with the community in which they were situated (Westera, 1999). Montessori's principles of good teaching are reflected in current K-12 open learning environments where strategies have evolved from Montessori's face-to-face tactile and choice-based experiences to include online critical thinking, collaborative, and communicative experiences (AMI, 2007). Technology provides learners with experiences beyond the immediate physical context of the classroom albeit in a virtual medium. In an open learning experience, both formal and informal learning opportunities are available to any student at any time. Open learning enables students to choose their own experiences, with learning driven by the goals of the student themselves.

The open learning movement is based on a set of beliefs shared by a wide range of academics (Westera, 1999; Barianiuk, 2007; Nov, Arazy & Anderson, 2011) who argue that knowledge should be free and open to use and re-use; collaboration should be easier, not harder; individuals should receive credit for contributing to education and research; and finally concepts and ideas are linked in unusual and surprising ways and not the simple linear forms that today's textbooks present. Baraniuk (2007) asserts that open learning promises to fundamentally change the way authors, instructors, and students interact worldwide. However, in open learning experiences while the person developing the experience might have a purpose and learning outcome in mind, the learner engaging in those experiences may have a different motive. There is an economic argument that describes open learning as an approach that reduces costs given the ability to reuse and re-purpose others' work. Open learning can be a catalyst for institutional change as well as a critical review of pedagogy through the power of open learning networks and culture associated with open learning proponents.

Designing open learning experiences is quite different from traditional instructional design. By virtue of the experience being open, and possibly more informal, instructional designers have very little input as to the way the knowledge gained from the learning experience will be used, or to the extent the participant will engage or persist in the learning experience (Nov et al., 2011). Couros (2006) describes some of the barriers to adopting open learning that include a general lack of awareness of open in the K-12 sector, or technology decision making that focuses on technology rather than pedagogy. A fear of being "open" or the technology skills required for open practice may inhibit educator adoption of open learning practices. Finally, perceptions about use of technology, its interoperability, and generally the power and control loss associated with "giving" resources away or enabling students to determine their own learning direction can influence educator's attitudes about open learning practices.

Open learning practices in a K-12 learning environment are different from other environments. Unlike in an adult learning environment, open learning generally takes place in structured settings, is overseen by a teacher and has defined objectives for student achievement. While student choice and autonomy are important to an open learning environment, this autonomy is significantly controlled in the K-12 environment simply by the nature of the curricular and policy demands of the educational system. In Canada, examples of emerging open learning practice include educator professional development opportunities and networked student learning (Roberts, 2013). As a structured environment, open learning in K-12 takes on different and unpredictable outcomes due to controlling influences that do not exist in higher education and adult learning environments (Roberts, 2013).

While research in higher education and adult learning environments has embraced concepts related to open learning, current research in K-12 open learning is limited or non-existent. In fact, any research on online or distance learning in the K-12 sector is limited (Barbour & Reeves, 2009; Cavanaugh, Barbour & Clark, 2009). According to Cavanaugh et al. (2009) the current research in K-12 has focused on defining distance learning and its current strengths and weaknesses. However, many K-12 classrooms, both online and onsite (traditional school-based classrooms) are incorporating technology-supported open learning options and resources and are not part of this research.

Rice (2009) used a Delphi method to conduct extensive research in K-12 online learning and suggests that while there is clear evidence for priority research in online course design and online best practices, little has been done. According to Rice priority areas for research include defining best practices, evaluation of course design, delivery, access, and teacher training and accountability. Finally, the 2014 New Media Consortium Horizon Report for K-12 supports a call for further study to evaluate models of open learning in the K-12 environment (New Media Consortium, 2014). In K-12 there is a definite need for future research in open and online learning practices.

As open learning evolves in K-12 practice, blended learning practices are emerging and hold a great deal of promise. Through blended learning, classroom teachers are extending classroom learning into the online environment, creating open learning opportunities outside of, and integrated with, the classroom. Blended learning is defined as face-to-face or computer-mediated, real-time instruction augmented with asynchronous and/or online resources or activities (Harasim, 2011). While blended learning is used extensively in many educational contexts (Picciano, Seaman, Shea, & Swan, 2012; Staker et al., 2011), research in blended learning environments is lagging far behind its practical applications (Means, Toyama, Murphy, Bakia., & Jones, 2010; Drysdale, Graham, Halverson, & Spring, 2013). In addition, some research in blended learning environments is categorized as online learning research. Picciano and Seaman (2009) emphasize that researchers need to understand the difference between distinctly online learning environments and distinctly blended learning environments and should classify their research accordingly.

Means et al. (2010) conducted a meta-analysis of available research in blended learning environments and assert that blended learning environments demonstrate a higher level of effectiveness than fully online or fully face-to-face environments. In addition, they found that when online courses are either teacher directed or contain a great deal of peer-to-peer support, the effectiveness of the approach is greater than courses that use a purely independent study. Blended learning approaches that combine the best elements of online and face-face instruction are likely to emerge as the predominant teaching model of the future. Students that work in a collaborative K-12 blended learning environment also have the opportunity to create or expand their own personal learning, leading to enhanced formal and informal learning (Horn & Staker, 2011). Finally, blended learning can be a catalyst for change as it encourages the use of Web 2.0 technologies and enhances student collaboration (Watson, 2008).

The shift to open learning has led to many emerging practices related to open resources, open practices, and open scholarship. This chapter discusses some of these emerging trends in detail including Open Education Resources, digital literacy and Massive Open Online Courses. All three are having an impact in both online and classroom-based practices for teachers in K-12.

Open Education Resources

Open Education Resources (OER) are teaching, learning, and research resources that reside in the public domain or have been released under an intellectual property license permitting their free use or re-purposing by others. They are "learning materials licensed in such a way as to freely permit educators to share, access, and collaborate in order to customize and personalize content and instruction" (Bliss, Tonks & Patrick, 2013, p. 3). OER include full courses, modules, textbooks, streaming videos, tests, software, and any other tools, resources, materials or techniques used to support access to knowledge (Atkins, Brown, & Hammond, 2007).

The organization, sharing and creation of OER are an important aspect of open learning in K-12 environments. OER are generally created for educational purposes, and are shared under a Creative Commons Copyright license (https://creativecommons.org/licenses/) in repositories or as stand-alone resources for reuse and repurposing (Atkins et al., 2007). A key aspect of OER use is the set of rights afforded by 'open licenses', such as those provided through Creative Commons (CC) licenses (Green & Wiley, 2012). CC licenses broaden rights from copyright holders to others in society who would like to make use of existing works such as books, courseware, images, video, animations or other resources that can be freely reused in educational settings. Specifically four areas of practice are covered by CC licenses:

1. Reuse: the right to reuse content in its unaltered, verbatim form;
2. Revise: the right to adapt, adjust, modify, or alter the content itself;
3. Remix: the right to combine the original or revised content with other content to create something new; and
4. Redistribute: the right to make and share copies of the original content, revisions, or remixes with others (Wiley, 2010).

In the United States K-12 OER resources were historically created to meet particular regional or state standards and have limited potential for assisting educators outside of that state or region; however, the consistency of the Common Core Standards (http://www.corestandards.org/) that have now been adopted by many states make it far more likely that shared resources may be repurposed on at least a national level (Porter, McMaken, Hwang & Yang, 2011; Bliss et al., 2013). Educators who value the creation and use of OER in academic environments do so for several reasons including the importance of academic voice over commercial market forces, the importance of rapid dissemination of information for development and research purposes, and the enhanced reputation and publicity that might result from creation of OER (Hylén, 2009).

Some notable examples of K-12 OER projects include Curriki (www.curriki.org), CK-12 (www.cK-12.org), OER Commons (www.oercommons.org), and Khan Academy (www.khanacademy.org). The OER Research Hub (http://oerresearchhub.org/) is a group of researchers and institutions compiling research into the impact of OER in education. Their research site (http://oermap.org/) provides a comprehensive consolidation of OER research, policy, and links to OER resources. The site includes a map outlining the impact of OER in higher education and K-12 and includes compilations of OER policy by country/location, links to lists of OER projects, and other emerging practices.

A caveat in the use of OER, as noted by Baraniuk (2007), is in challenges regarding their reuse. Many open resources require software and certain publishing formats such as Adobe's Portable Document Format (PDF) or Microsoft's Word. Along with a whole host of other software, there may be restrictions in use that do not necessarily allow for easy methods for remixing content into other forms, or require proprietary tools in order to do so. To be truly "open" would require little or no restriction. The same often occurs with repositories of OER that require registration and/or are restricted to particular groups or organizations. While it is possible to create repositories built entirely on open source formats populated by open resources, given the restrictions in the ease of use, collaborative features, and entrenched user base, it is much more common for educators to use cloud-based applications and services, especially in K-12 districts and organizations.

Bliss et al. (2013) argue that the transformation of K-12 environments to open learning requires sharing and a collaborative environment within which to do so. As educators turn to participatory approaches to foster trust and understand user needs, practices take on a variety of forms. All, however, share the ability for participants to collectively negotiate the agenda and activities, ensuring the potential for voice and engagement. The development and sharing of OER is quickly contributing to the movement to open learning in K-12 education. Emerging policy initiatives of competency-based and personal learning, along with common curriculum standards, are driving the need to share learning materials simply and easily between and among educators within and beyond state or provincial boundaries. In most classroom environments, whether online, in a regular classroom or a blend thereof, teachers require more granular, searchable outcomes-based learning materials. The shifting landscape of K-12 education has begun to shape a more common canvas within which all teachers can share resources and practices.

It is important to distinguish OER from learning objects and open source software. While both OER and learning objects are designed for sharing, learning objects are often not publicly accessible. They are often stored in learning object repositories or LORs, and by nature most LORs are proprietary – not necessarily free for public use (Robertson, 2010). Essentially a LOR may house both OER licensed for public use and sharing along with learning objects licensed for use by a restricted audience. As a result many are housed in repositories that are not accessible publicly, losing the 'open' from the education resource. Open source refers to open coding within a technology product or process, and is often collaboratively built code, produced within a shared group. The learning system Moodle (http://moodle.org) is a good example of an open source product, and Moodle could be the vehicle for sharing and delivering content that may include OER as a component, or proprietary, closed content as well.

Good teachers adapt and share materials to meet the needs of their learners and the learning environment. The flexible licensing inherent in Creative Commons-licensed OER provides greater opportunity for teachers to do this. OER support differentiated instruction as they provide a rich and diverse amount of content that can be remixed, reused, and redistributed in the same or new formats. They also provide the opportunity for students to remix content, an important advantage in engaging students in their own learning and personalizing their education. This approach allows teachers to tailor curriculum to meet individual student needs without the traditional obstacle of textbooks and curriculum written for a more generic audience.

Use of OER principles for the development of educational curriculum materials has the potential to enhance the development and adoption of new curriculum while lowering overall costs, however, the use of open learning practices is relatively new in K-12 education. The importance of OER to educational institutions is in the ability of teachers to reuse, remix, repurpose, and re-share learning materials, reducing resource redundancy and sparing the duplication of expenditure on development of new resources to meet changing curriculum needs. OER can be adapted locally to meet the needs of individual learners, lessening the need to invest in designing original resources to meet multiple classroom needs. Tonks et al. (2013) assert that when teachers are expected to create, remix, and update their own curricular resources the role of teacher becomes more of a pedagogical professional, and less that of a manager (Gur & Wiley, 2007).

Adoption of OER also reduces risks and costs for educational institutions, as school districts no longer need to monitor 3rd party copyright restrictions, lowering risks of legal vulnerability. Teachers are free from being vigilant on use of materials, and can share freely without worry. Bliss & Patrick (2013) put this well: "By sharing publicly funded learning materials … we can move away from 're-creating the wheel', enabling sharing and collaboration with learning materials, resources, and professional development" (p. 2).

Open Digital Literacy

While there is a growing contingent of K-12 classrooms engaging in the use and creation of open learning and OER (Cavanaugh, Barbour, & Clark, 2009), the challenge in understanding this work is that it is difficult to differentiate between who is the user and who is the producer when it comes to open learning in the classroom (Hylén, 2006). An understanding of and skills in open digital literacy are critical to the engagement required in an open learning approach based on OER. Much of the work being conducted in open learning in K-12 mimics tenets of the theory of connectivism (Siemens, 2004) in which the network of learners and materials is complex, diverse, and self-organizing. Although progress is being made in the inclusion of open learning in K-12 classrooms from the "alarmingly disappointing" status indicated in a 2002 report (Solomon, 2002), there is much work to be done.

The challenge for educators in using open learning materials and content is that the transitory nature of the Internet creates a mixed blessing. On one hand, the Internet can be an empowering tool that allows individuals to create, share, connect, and learn with other like-minded individuals around the globe. On the other hand, open, digital teaching and learning provides challenges for educators who want to bring this into their classroom. Skills in open digital literacy increase the opportunity for this to occur. At the same time there are questions about the credibility, value, reliability, and permanence of access to online materials (Zhang, 2001; Salmon, 2004; Chen et al., 2009). As well, with many online sources there are challenges regarding sourcing, credibility, and many do not reveal an audit of changes or revisions to the information presented (Flanagin & Metzger, 2000; Alexander, 2006). As a result there is a certain reticence on the part of K-12 educators and administrators to use and share open learning resources (Cavanaugh, Gillian, Kromrey, Hess, & Blomeyer, 2004). For the most part, literature on the use of open learning in K-12 settings is still focusing on defining and then detailing the affordances of open learning and OER (Cavanaugh, Barbour, & Clark, 2009). There is an understanding that online and digital literacy are important to the future of students (Warschauer, 2007), and open learning may hold part of the solution (Atkins, Brown, & Hammond, 2007), but there is little guidance as to how to make this happen in traditional classroom contexts (Rice, 2006).

Despite the challenges and opportunities provided through open learning in an open digital literacy model, there still is the persistent belief that plagues open learning and scholarship about the value of open content. Educator views toward Wikipedia exemplify a common belief about open content that because anyone can edit it, the material inherently must not be reliable (Rozenweig, 2006). In K-12 education there is often a privileging of traditional, or offline texts (Alvermann, 2002) and a belief that textbooks, magazines, or newspapers are a more credible and valid source than online, digital sources (Abdulla, Garrison, Salwen, Driscoll, & Casey, 2002; Metzger, Flanagin, Eyal, Lemus, & McCann, 2003). This privileging is extended when the creator or publisher of the online digital material is not well known or accredited (Forte & Bruckman, 2006; Tapscott, 2009). Additionally, there is an assumption that because something is printed in a book, magazine, or newspaper it has been fact-checked, and has to be true. For the most part, and especially in the case of open, digital content, the review and value evaluations are less clear (Lynch, 2003). These challenges are exacerbated as students take on new responsibilities when reading and writing in the open. They take a much more active role in their learning (Mayer, 2003; Moreno & Mayer, 2000), acting in a leadership role as they craft and revise new learning processes and products (Cook-Sather, 2002; Unsworth, 2001). However, given these new opportunities, there are concerns regarding ownership of content, and recognition of intellectual property as students and educators write and share content openly online (Jenkins, 2009).

Massive Open Online Classes

Likely one of the most notable emergent practices in open learning has been Massive Open Online Courses (MOOCs) with the emergence of Coursera (https://www.coursera.org/), Udacity (https://www.udacity.com/) and edX (https://www.edx.org/). MOOCs have dominated the literature with a promise of reforming higher education by reducing tuition and 'democratizing' higher education. A MOOC is typically a course offered through an institution for credit that is opened up to anyone online to access. The level of engagement in MOOCs varies considerably. Data supporting positive learning outcomes is lacking, and completion rates for most MOOCs are very low (Yuan, Powell & Olivier, 2014). However, key to the MOOC initiative has been the shift to open learning with new approaches to online and open learning becoming part of practice.

MOOCs grew out of the work of Siemens and Downes on connectivism (Siemens, 2004). Siemens argues that MOOCs are connectivist in nature in that they are based on networking and learning drawn from knowledge that is already available through the people involved in the MOOC. This knowledge is generative; coherence within that knowledge base is learner formed and instructor guided, and interactions are distributed and multi-spaced. Each person helps to complete the learning for another. The interaction among the collective focuses and fosters autonomous and self-regulated learners.

A MOOC provides learners with the opportunity to connect with digital artifacts or people which represent 'nodes' of learning in open environments. The node connections provide a pattern to create new learning opportunities for the learner (Siemens, 2004). Connectivism in this instance, assumes two important skills that distinguish it from other learning theories: the learner's ability to seek out current information and the learner's ability to filter out secondary extraneous information (Kop and Hill, 2008). In a MOOC the learner creates a personal learning environment where the learner (and not a teacher) organizes the learning. Learning is self-directed and will emerge via the connections to different nodes within networks. It is dependent on the learner's ability to identify the properties of effective networks.

MOOCs have not emerged to any extent in K-12 largely due to the highly regulated curriculum and credit system in K-12 education. Experience with MOOCs has found that the chaotic nature and openness of a MOOC as they have evolved in adult education environments do not provide for the necessary framework, or safety measures, required for a K-12 learning setting (Roberts, 2013). While learning communities are created in a MOOC and provide a mechanism for shared knowledge construction for learners and networks in K-12 (Reil, 1998), learning is dependent upon the participation and interaction between the learners who share common interests. This leads to what Fischer (2011) describes as a culture of participation supported by a variety of digital tools, hardware, and software. Creating this in the highly structured K-12 learning environment is a significant challenge for teachers.

Research indicates that young learners are learning in a connectivist manner (Rheingold, 2012; Prensky, 2006; Ito et al., 2010), and Ito points out that learning is already taking place among youths in peer groups and interest groups using social media, gaming, and cartooning in online worlds. She further notes that complex learning is reflected in groups where students and adults work together as “peers” in specific interest groups. So while there has been little written about MOOCs in K-12 education, a K-12 MOOC could be used to supplement student learning beyond prescribed courses and curriculum and to provide student exposure to diverse and cultural or international perspectives (Ferdig, 2013; Roberts, 2013). However, a MOOC’s biggest impact in K-12 education is likely to be in connecting teachers together as a professional development learning experience, and supporting an open learning, online community of practice.

Implications for Policy and Practice

The emergence of open learning practices in K-12 education has many implications for policy and practice at the national, state, and provincial levels. From policies on acceptable use and digital literacy to the ownership and use of open education resources policy makers are challenged to keep up with the rapid and emerging world of technology-driven online, networked, and open learning. Based on the authors’ examination of current peer-reviewed and action research and task force papers (Adams Becker et al., 2014; Alberta Education, 2013; Aspen Institute, 2014; and Digital Media and Learning Research Hub, 2013 to name a few), three implications for open learning policy are evident:

1. The need to empower and trust local educators in the practice, research, and choice of using digital resources as part of their instructional practices, integrated into curriculum;
2. The need to review and/or create policies to ensure the safety of students and teachers online; and
3. The need for flexible and transparent policy that can be quickly adapted to address rapidly changing situations.

Policy Implication No. 1 - Educator Empowerment

The International Association for K-12 Online Learning (iNACOL http://www.inacol.org/) recently released state policy recommendations that include policy for open education resources (iNACOL, 2013). Successful adoption and use of OER and open learning practices are completely dependent on an open climate within which to share. The iNACOL report argues that an open learning climate is both policy and practice driven, and requires:

1. Policy created by state, regional, or local authorities that the use of public funds to create OER and other open practices whereby such resources would hold an open license for sharing, collaboration, and access for all educators and students;
2. Repositories and sites where instructional materials and OER can be listed, indexed, and made available for sharing and repurposing; and
3. Funding and support to develop, maintain the infrastructure required to share OER.

These policy recommendations from iNACOL underscore the promise OER holds to change the K-12 education landscape. The 2012 Paris OER Declaration (UNESCO, 2012) was the first step for the development of policies supporting OER. The Declaration was aimed at encouraging governments to contribute to the awareness and the use of OER and to develop strategies and policies to integrate OER in education. OER are integral to emerging education policy trends toward common standards. In the US, the Common Core Standards (http://www.corestandards.org/) provide teachers with the impetus, reason and common language needed to share resources across states. In Western Canada inter-provincial agreements were recently signed regarding the development and use of OER and open textbooks (Hylén, 2006), making OER sharing more attractive across the country.

Finally, a policy shift to emphasizing science, technology, and mathematics subject areas (STEM http://www.state.gov/stem) has provided incentive for creators of OER to publish, share, and have teachers repurpose resources. STEM materials afford enhanced opportunities for reuse and localization because of the number of graphical and animated instructional modules that are becoming available in an OER format. Mountain Heights Academy, formerly the Open High School of Utah, (MHA, 2014), is one example in which teachers and students create open curricular materials that are freely shared with the world using a Creative Commons license (Tonks, Weston, Wiley & Barbour, 2013).

Policy Implication No. 2 - Review of Current Open Policies

Several challenges present themselves as one considers the K-12 potential in reading and/or writing of open, digital content areas. The first is the creation of a school Acceptable Use Policy (AUP) that permits the use and sharing of open, digital materials by students or teachers. In addition, some online texts and tools require that students be 13 years of age to use the service. Because of the potential challenges associated with monitoring the use of these open, online spaces, students in K-12 are generally forbidden any online publishing opportunities (Stone, 2008; Wicks, 2010).

With the emergence of MOOCs, game-based learning, OER, and other networked learning opportunities, researchers are actively considering how to connect cross-generational peers and interest groups in educational opportunities (Ito et al., 2010; Downes, 2012; McCauley, Stewart, Siemens & Cormier, 2010). There are significant policy implications in the support required for the use of social media and networking in the classroom or learning environment (Ito et al., 2010; Rheingold, 2012; Siemens, 2012; Dawley, 2009). However, educational policies have not kept abreast of the demand for social media use in the classroom, and existing policy often stymies attempts to innovate using open online learning by restricting access or use. The difficulty of keeping the balance between student safety while providing access to social media websites for educational purposes is well-documented (Isaacs, Kaminski, Aragon, & Anderson, 2014), and an area that each school and district must be spending efforts at to improve.

At present, most school policies typically do not condone or allow for the inclusion of open digital content in classroom instruction (Hagood, Alvermann, & Heron-Hruby, 2010). School districts may also be reticent, or explicitly forbid, the publication and open presence of educators in online spaces and social media sites (Hobbs, 2006). This mindset by school districts is changing, however, there are still a disturbing number of school districts that do not favour educators employed by the district producing, publishing, or being overtly active on online social networks (Harasim, 1995; Becker, 2000).

Additionally, there are unanswered questions about the ownership of intellectual property that is created within school districts (Levy, 2003; Wheeler, Yeomans, & Whieeier, 2008). In some districts, teacher-created intellectual property is considered to be school or district property, while in others it is considered the creator's property. Bliss et al. (2013) argue that the transformation of K-12 environments to open learning requires sharing and a collaborative environment. As educators turn to participatory approaches to foster participant trust and understand user needs, practices take on various forms, but all share the potential for participants to collectively negotiate the agenda and activities. Within this context, ownership of student created artifacts complicates the issue even further as this property could be the student's property, the property of a group who created the project, the property of the teacher who initiated the project, or the property of a school or district.

Policy Implication No. 3 - Flexible and Collaborative Policies
The development and sharing of OER is quickly contributing to the movement to open learning in K-12 education. Emerging policy initiatives of competency-based and personal learning, along with common curriculum standards, are driving the need to share learning materials simply and easily between and among educators within and beyond state and provincial boundaries (for example, see the flexible policy framework "Learning and Technology Framework" of Alberta Education, 2013). In most classroom environments, whether online, in a regular classroom or a blend thereof, teachers require more granular, searchable outcomes-based learning materials. The shifting landscape of K-12 education has begun to shape a more common canvas within which all teachers can share resources and practices.

Implications for practice
With changes in policy that promote educator and district responsibilities in practice and professional development, three major implications have emerged from the literature (Adams Becker et al., 2014; Alberta Education, 2013; Aspen Institute, 2014; Digital Media and Learning Research Hub, 2013):

1. Educators and/or school district review and integration of standards for open learning;
2. Educators and/or school district promotion of co-learning, collaboration, sharing, and connecting theory and practice on open learning; and
3. Educators, school district, parent and community efforts to protect themselves and students in online learning environments.

Practice Implication No. 1- Reviewing and Creating Authentic Standards
To provide guidance for K-12 educators on authentic and effective uses of technology in the classroom several groups have started to develop a series of standards and skills necessary for students and educators. The International Society for Technology in Education (ISTE) standards for students and teachers were one of the first widely recognized to detail required technology skills (ISTE, 2007). During the same period the American Association of School Librarians (AASL) organized and published the *Standards for the 21st-Century Learner* (American Association of School Librarians, 2007), and the Partnership for 21st Century Skills (P21) published their framework describing required skill sets for a 21st Century learner (Partnership

for 21st Century Skills, 2006). While describing skill sets for technology use and integration, the three frameworks provide little or no guidance for educators on the use or inclusion of open learning in the classroom. The only mention of the word "open" is in the AASL and P21 skills where they indicate that learners should build and maintain an "open" mindset that is accepting of new ideas.

One additional framework of skills that is under development is the Mozilla Web Literacy Map (https://wiki.mozilla.org/Webmaker/WebLiteracyMap). This map provides a schematic of the skills and competencies necessary to more effectively read, write, and participate on the Internet. Additionally, the Web Literacy Map is the first to promote and frame "open practices" in online education in an effort to promote transparency and access. Many of the skills that are included in theoretical perspectives for online learning from digital literacies (Bawden, 2001; Lankshear & Knobel, 2008), new literacies (Leu, Kinzer, Coiro, & Cammack, 2004; Lankshear & Knobel, 2006), multi-literacies (Cope & Kalantzis, 2000; Luke, 2000), or multimodal design (Kress & Van Leeuwen, 2001; Bezemer & Kress, 2008) are included in the Web Literacy Map. Additional distinctions included in the Web Literacy Map that affect open learning include a focus on infrastructure, coding, privacy, and identity.

Instructional models need to be developed that support educators and students as they view the use of the Internet and other communication technologies as a literacy. There are multiple theoretical perspectives and models that investigate the use of the Internet to support lifelong reflective learning, while empowering students through inquiry in open, online learning environments. One instructional model that has been developed to address these interconnections between multi-literacies, multimodal design, and the web literacies is the Online Research and Media Skills (ORMS) model (McVerry, 2013; O'Byrne & McVerry, in press). The ORMS model focuses on three cornerstones: online reading comprehension, online content construction, and online collaborative inquiry. The materials for this curriculum are openly available online at https://sites.google.com/site/ormsmodel/.

Practice Implication No. 2-Connecting Models, Theory and Practice

The proliferation of technology in the classroom has provided educators with the opportunity to blend and diversify teaching through use of a variety of pedagogies to create open learning. However, traditional learning theories such as behaviourism and cognitivism are limited in describing open learning practices. Traditional education theories have described learning as a teacher-focused, content, and assessment driven task with clear outputs defined (Bell, 2010; Anderson & Dron, 2011). Social constructivism (Vygotsky, 1978; Dougimas, 1998) and more recently connectivism (Siemens, 2004; Bell, 2010; Anderson & Dron, 2011) offer pedagogical approaches that support student-centered learning, a critical component for open learning. With the growing access to content and information afforded through ubiquitous access to the Internet via technology, teachers are shifting practices toward engaging students in a larger, open network of learners dependent upon each other in a constantly changing ecosystem of learning (Morrison, 2013).

In this connected, open world, the very definition of learning is being refined through emerging theories such as connectivism that provide a rich palette from which to understand how learning is occurring in these open and connected learning environments. Downes (2012) describes eight key elements of open learning and connectivism:

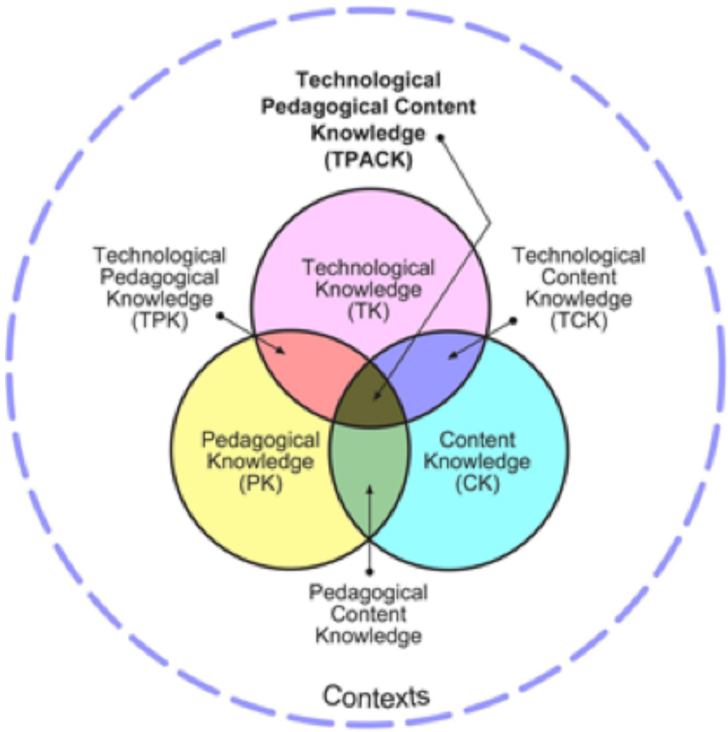
1. Learning and knowledge rests in diversity of opinions;
2. Learning is a process of connecting specialized nodes or information sources;
3. Learning may reside in non-human appliances;
4. Capacity to know more is more critical than what is currently known;
5. Nurturing and maintaining connections is needed to facilitate continual learning;
6. Ability to see connections between fields, ideas, and concepts is a core skill;
7. Currency (accurate, up-to-date knowledge) is the intent of all connectivist learning activities; and
8. Decision-making is itself a learning process. Choosing what to learn and the meaning of incoming information is seen through the lens of a shifting reality.

While there is a right answer now, it may be wrong tomorrow due to alterations in the information climate affecting the decision (Siemens, 2004, p. 6).

While these theories provide an opportunity to think about the possibilities of open learning, the story of how K-12 educators can develop an integrated, technology-based open learning design that meets the needs of learners is critical. As most of the research and writing has come from experiences in post-secondary and adult education settings, and as K-12 pedagogy is different, connectivism and other similar theories may not fully describe open learning in K-12.

A promising option for integrating theory with practice in K-12 open learning is the Technological Pedagogical Content Knowledge framework (TPACK - http://www.tpack.org). The TPACK framework offers a means for considering integration of technology into learning situations by examining the potential interactions between technology, pedagogy, and content knowledge (Koehler & Mishra, 2009). Focusing on each aspect of the system as interdependent, rather than separate from each other in the educational context, leads to an integrated and personalized approach to learning that draws from the best of traditional and emerging pedagogy and open learning environments.

Figure 1: TPACK Technological Pedagogical Content Knowledge (Koehler & Mishra, 2009)



The TPACK model suggests that interaction between content knowledge (subject matter) and pedagogical knowledge (teaching/learning process) creates what is known as pedagogical content knowledge or the interpretation of subject matter represented in multiple ways through adaptation and tailoring. This approach is similar to connectivism that sees nodes and networks creating knowledge through interaction (Downes, 2012; Siemens, 2006). With the addition of technology knowledge (productive application) technological content knowledge is created, an understanding of how technology and content influence/constrain each other. Finally, technological pedagogical knowledge is the understanding of how teaching/learning are influenced by technologies.

Technology, pedagogy, and content knowledge provide the basis for an examination of effective teaching with technology but require teachers to have understanding of how concepts are represented by technology, apply pedagogical techniques using technologies to teach content, to have knowledge of student prior learning and how they learn, knowledge of how technology can address student comprehension of difficult concepts, and knowledge of how technology can build new knowledge or strengthen existing. The TPACK model is gaining interest in describing emergent practices in K-12 open learning.

Another promising model for inclusion of technology and open learning into the K-12 classroom is the Online Research and Media Skills (ORMS) model described earlier. The ORMS model (McVerry, 2013; O'Byrne & McVerry, in press) focuses on literacy practices in online spaces. The purpose of the ORMS model is to prepare students for a digital and global economy while also reinforcing reading, writing, speaking, listening, and viewing of content area knowledge. There are three cornerstones in the ORMS model which support lifelong reflective learning that empowers students through online inquiry, composition, and comprehension with the use of learning environments that utilize authentic, productive, and ethical use of applications required in today's global economy:

1. Online Collaborative Inquiry-A group of local or global learners who arrive at a common outcome via multiple pathways of knowledge;
2. Online Reading Comprehension- The skills, strategies, practices, and dispositions students need to locate, evaluate, and synthesize information during problem based inquiry tasks; and
3. Online Content Construction- A process by which students construct and redesign knowledge by actively encoding and decoding meaning through the use of ever-shifting multimodal tools.

The three cornerstones (online reading comprehension, online content construction, and online collaborative inquiry) reflect the three strands (exploring, building, and connecting) in the Mozilla Web Literacy Map. The inclusion of the Web Literacy Map as a means to frame teaching and learning using technology is important because of the focus on open learning in the standards.

Practice Implication No. 3- Online Protection to Promote Open Collaboration

Districts, educators, students, parents, and the community need to examine the importance of digital ownership in context of data collection and how data is being used. By preventing the creation of new digital content, educators may be preventing opportunities for deeper and more meaningful learning opportunities (Roberts, 2013). Alternatively, by encouraging the creation of digital content and interactions in open learning environments, students may be "opening" themselves to having their data being used by others without their permission. Current federal and provincial/state laws and court proceedings have, and will continue to influence copyright, data collection, data sharing, and privacy regulations. Open learning is dependent upon having the legal permission to share personal data, content, and digital creations in open digital environments.

As students create open resources, teachers should encourage conversation about the ownership of these digital resources, and provide students with information concerning licensing of their creations. Districts and teachers should be quite transparent about the intellectual property generated in educational settings and who owns this property. In the case of group-created products, teachers should model discussion of the potential licenses that could be obtained, and the benefits and risks of each type of license. Ideally, the school district should outline policy that guides teachers in informing students of their rights and obligations as open content is created and potentially modified.

Implications for Research

While there is a lack of peer-reviewed research in K-12 online and blended learning, open learning is defined differently based on the context, situation, medium, and learner. Although some of the research from online learning in higher education can be considered, K-12 learners have a variety of unique characteristics that are not shared with adult learners. As open learning creates a personalized approach, it is difficult to create a comparative analysis between research in higher education and K-12. Accordingly, there is an urgent need for future research that is more inclusive of case studies in the K-12 space, action and ethnographic research, digital artifact or collaborations, and the establishment of open online learning communities – not necessarily traditional peer reviewed journal articles.

Based on the work of Adams Becker et al. (2014), Alberta Education (2013), the Aspen Institute (2014), and the Digital Media and Learning Research Hub (2013), the following broad areas for future research in K-12 open learning include:

1. Processes in the adoption and use of Open Educational Resources;
2. Flexible learning design and the creation of open learning environments;
3. The role of the teacher in the open learning environment; and
4. Digital literacies for open learning.

Widespread use of OER is hampered by problems and concerns with quality and accessibility of these resources. While many educators create OER and may store these resources in various locations digitally, there are few repositories that are sufficiently accessible and provide robust and relevant search capabilities. In addition, there are few mechanisms in place to insure that the resources are well aligned with relevant standards, or that they will be transferrable from one context to another. Research to determine how to locate, identify, store, and share OER would be beneficial. Because of the common core standards and inter-provincial agreements, the potential for common taxonomies exist. Researchers and educators are encouraged to develop these technologies, test them, and share them with the greater educational community.

The traditional online course, characterized by a closed course or learning management system with proprietary resources, has been challenged by the changing paradigms of instruction that include communities of practice models such as the Flat Classroom Project, and inquiry based projects on a global scale. While research is being conducted in higher education and adult settings, very little if any research has focused on the impact of these models on a K-12 environment. Researchers and educators are encouraged to examine existing and emerging models of open K-12 learning to determine their impact on student competencies and development, and on the learning community as a whole. Alternative structures of assessment, including digital badges, might hold promise within a new paradigm such as this. However, at the current time little research has been conducted that demonstrates this promise beyond meager speculation.

The role of the teacher within an open learning environment is different from that of a teacher within the traditional classroom. However, the connection between the pedagogy that drives an open environment in a traditional setting and the pedagogy that drives open learning in a digital and information rich environment could be further explored to the benefit of the K-12 community. Principles of connectivism and TPACK could be explored further to assist in determining to what extent open learning has evolved, and the impact of this evolution on teacher identity and teacher role.

Finally, a different skill set is necessary as students engage in open creation of content and learning in open environments. Developing characteristics of awareness of differing audiences, the need to appropriately attribute work which has been remixed and remade, and the intellectual rights that we have as we create and publish our own work are very important to ensuring successful implementation of open online practice. Research into the way that these skills are developed in K-12 students is sparse at this point. Researchers are encouraged to work with K-12 teachers to develop models for discussion and potential evaluations of awareness as students gain these skills.

Conclusion

Open learning is becoming a critical focus for K-12 technology-supported programs, both online at a distance and extended from the classroom. This chapter reviewed emerging practices that are influencing open learning in K-12 including Open Educational Resources, Digital Literacy and Massive Open Online Courses. The implications of open learning in relation to policy, practice and research in K-12 online and blended learning environments are considerable, and there is a real need for a new focus on research in open learning practices in K-12 education. While there are definitely opportunities for technology-supported blended learning, MOOC-like and open courses or projects and the expansion of digital literacy in the K-12 learning environment, the question remains: what should open learning look like? While research in open learning has been sparse in the K-12 sector, post-secondary research suggests that it is time to consider the integration of social media into appropriate formal educational environments to build on, and connect with, what learners know and learn outside of the formal environment.

Open learning and courses in K-12 need to offer an opportunity to bridge the gap between what is being learned at home and school. They need to promote student leadership and engagement in their own learning and environment, for youth to learn and express themself (Ito et al., 2010). An open learning environment and course should offer youth an opportunity to personalize their learning, to make it meaningful, authentic, and engaging. Open learning creates the opportunity to offer all networks a chance to connect and learn together regardless of age, experience, culture, or background. These networked publics are the future of K-12 education.

References

Abdulla, R. A., Garrison, B., Salwen, M., Driscoll, P., & Casey, D. (2002, August). The credibility of newspapers, television news, and online news. In *Education in Journalism Annual Convention, Florida USA.*

Adams Becker, S., Estrada, V., Freeman, A., & Johnson, L. (2014). NMC Horizon Report: 2014 K-12 Edition. *Austin, Texas: The New Media Consortium.*

Alberta Education. (2013). *Learning and Technology Policy Framework.* Retrieved July 11, 2014 from http://education.alberta.ca/admin/technology/policyframework.aspx

Alexander, B. (2006). Web 2.0: A new wave of innovation for teaching and learning?. *Educause review, 41*(2), 32.

Alvermann, D. E. (2002). Effective literacy instruction for adolescents. *Journal of literacy* Research, *34*(2), 189-208.

AMI: Association Montessori Internationale (1970). *Maria Montessori: A centenary anthology, 1870 - 1970.* Amsterdam.

American Association of School Librarians. (2007). AASL standards for the 21st century learner. Retrieved 29, December, 2008 from http://www.ala.org/ala/mgrps/divs/aasl/guidelinesandstandards/learningstandards/standards.cfm

Anderson, T., & Dron, J. (2010). Three generations of distance education pedagogy. *The International Review Of Research In Open And Distance Learning, 12*(3), 80-97. Retrieved from http://www.irrodl.org/index.php/irrodl/article/view/890/1663.

Aspen Institute Task Force on Learning and the Internet. Learner at the Center of a Networked World. Washington, D.C: The Aspen Institute, June 2014.

Atkins, D. E., Brown, J. S., & Hammond, A. L. (2007). *A review of the open educational resources (OER) movement: Achievements, challenges, and new opportunities* (pp. 1-84). Creative Commons.

Baraniuk R. (2007). Challenges and opportunities for the open education movement: A connexions case study. In Toru Iiyoshi & M. S. Vijay Kumar (Eds.), *Opening up education: The collective advancement of education through open technology, open content, and open knowledge.* (pp. 229-246). Cambridge, Massachusetts: MIT Press.

Barbour, M. K., & Reeves, T. C. (2009). The reality of virtual schools: A review of the literature. *Computers and Education, 52*(2), 402-416.

Bates, A.W. (2005). *Technology, e-learning and distance education.* (2nd ed.). New York: Routledge.

Bawden, D. (2001). Information and digital literacies: a review of concepts. *Journal of documentation, 57*(2), 218-259.

Becker, H. J. (2000). How exemplary computer-using teachers differ from other teachers: Implications for realizing the potential of computers in schools. Contemporary Issues in *Technology and Teacher Education, 1*(2), 274-293.

Bell, F. (2010). Connectivism: Its place in theory-informed research and innovation in technology-enabled learning. *The International Review Of Research In Open And Distance Learning, 12*(3), 98-118. Retrieved from http://www.irrodl.org/index.php/irrodl/article/view/902/1664

Bezemer, J., & Kress, G. (2008). Writing in multimodal texts a social semiotic account of designs for learning. *Written communication, 25*(2), 166-195.

Bliss, T., Tonks, D., & Patrick, S. (2013). Open educational resources and collaborative content development: A practical guide for state and school leaders. *International Association for K-12 Online Learning (iNACOL).*

Bruce, B. C. (2003). *Literacy in the Information Age: Inquiries into Meaning Making with New Technologies.* Order Department, International Reading Association, 800 Barksdale Road, PO Box 8139, Newark, DE 19714-8139.

Conole, G. (2013). *Designing for learning in an open world*. (Vol.4). Springer.

Cavanaugh, C., Barbour, M., & Clark, T. (2009). Research and practice in K-12 Online Learning: A Review of Open Access Literature. *The International Review Of Research In Open And Distance Learning, 10*(1).

Chen, C., Sun, K., Wu, G., Tang, Q., Qin, J., Chiu, K.,Fu, X., & Liu, J. (2009). The impact of internet resources on scholarly communication: A citation analysis. *Scientometrics, 81*(2), 459-474.

Cope, B., & Kalantzis, M. (Eds.). (2000). *Multiliteracies: Literacy learning and the design of social futures.* Psychology Press.

Dawley, Lisa. (2009). *Social network knowledge construction: Emerging virtual world pedagogy.* Retrieved June 13, 2012 from http://edtech.boisestate.edu/ldawley/SNKC_pdf.pdf

Dougimas, M. (1998). *A journey into constructivism.* Retrieved from: http://dougiamas.com/writing/constructivism.html#trivial.

Downes, S. (2012) *Connectivism and Connective Knowledge: Essays on meaning and learning networks,* National Research Council Canada. Retrieved June 13, 2012 from http://www.downes.ca/files/Connective_Knowledge-19May2012.pdf

Drysdale, J. S., Graham, C. R., Spring, K. J., & Halverson, L. R. (2013). An analysis of research trends in dissertations and theses studying blended learning. *The Internet and Higher Education, 17*, 90-100.

Ferdig, R. E. (2013). What massive open online courses have to offer K–12 teachers and students. Lansing, MI: *Michigan Virtual Learning Research Institute*. Retrieved May 26, 2014 from: http://media.mivu.org/institute/pdf/mooc_report.pdf

Fischer, G. (2011) Understanding, fostering, and supporting cultures of participation. *Interactions. Vol XVIII (3).*

Flanagin, A. J., & Metzger, M. J. (2000). Perceptions of internet information credibility. *Journalism & Mass Communication Quarterly, 77*(3), 515-540.

Forte, A., & Bruckman, A. (2006, June). From Wikipedia to the classroom: exploring online publication and learning. In *Proceedings of the 7th international conference on Learning sciences* (pp. 182-188). International Society of the Learning Sciences.

Green, C. & D. Wiley D. (2012). Openness as Catalyst for an Educational Reformation ... Retrieved May 26, 2014, from http://www.educause.edu/ero/article/openness-catalyst-educational-reformation.

Gur, B. S., & Wiley, D. A. (2008). Instructional technology and objectification. *Canadian Journal of Learning and Technology/La revue canadienne de l'apprentissage et de la technologie, 33*(3).

Hagood, M. C., Alvermann, D. E., & Heron-Hruby, A. (2010). *Bring it to class: Unpacking pop culture in literacy learning.* Teachers College Press.

Harasim, L. M. (Ed.). (1995). *Learning networks: A field guide to teaching and learning online.* MIT press.

Harasim, L. (2011). *Learning theory and online technologies.* Routledge.

Hobbs, R. (2006). Non-optimal uses of video in the classroom. *Learning, Media and Technology, 31*(1), 35-50.

Horn, M. B., & Staker, H. (2011). The rise of K-12 blended learning. *Innosight Institute.* Retrieved April 21, 2014 from http://www.leadcommission.org/sites/default/files/The%20Rise%20of%20K-12%20Blended%20Learning_0.pdf.

Hylén, J. (2006). Open educational resources: Opportunities and challenges.*Proceedings of Open Education*, 49-63.

Hylén, J. (2009). Why individuals and institutions share and use OER. *Open educational resources: Conversations in cyberspace.*

Isaacs, N., Kaminski, K., Aragon, A., & Anderson, S. K. (2014). Social networking: Boundaries and limitations part 2: Policy. *TechTrends, 58*(3), 10-15.

iNACOL. (2013). *OER state policy in K-12 education: Benefits, strategies, and recommendations for open access, open sharing*. Retrieved from http://www.inacol.org/cms/wp-content/uploads/2013/06/inacol_OER_Policy_Guide_v5_web.pdf.

International Society for Technology in Education (2007). The national educational technology standards and performance indicators for students. Eugene, OR: ISTE.

Ito, M., Baumer, S., Bittanti, M., Boyd, D., Cody, R., Herr-Stephenson, B., Horst, H.A., Lange, P.G., Mahendran, D., Martinez, K.Z., Pasco, C.J., Perkel, D., Robinson, L., Sims, C. & Tripp, L. (2010). *Hanging Out, Messing Around, Geeking Out: Living and Learning with New Media.* Cambridge: MIT Press.

Jenkins, H. (2009). *Confronting the challenges of participatory culture: Media education for the 21st century.* Mit Press.

Kop, R., & Hill, A. (2008). Connectivism: Learning theory of the future or vestige of the past?. *International Review of Research in Open & Distance Learning, 9*(3). Retrieved May 24, 2014 from: www.irrodl.org/index.php/irrodl/article/download/523/1137.

Kress, G., & Van Leeuwen, T. V. (2001). Multimodal discourse: The modes and media of contemporary communication.

Lankshear, C., Snyder, I., & Green, B. (2000). Teachers and technoliteracy: Managing literacy, technology and learning in schools.

Lankshear, C., & Knobel, M. (2006). *New literacies: Changing knowledge in the classroom.* McGraw-Hill International.

Learning and Technology Policy Framework. (2013). School Technology Branch, Alberta Education. Retrieved July 11, 2014 from http://education.alberta.ca/admin/technology/policyframework.aspx

Leu, D. J., Kinzer, C. K., Coiro, J. L., & Cammack, D. W. (2004). Toward a theory of new literacies emerging from the Internet and other information and communication technologies. *Theoretical models and processes of reading,5*(1), 1570-1613.

Levy, S. (2003). Six factors to consider when planning online distance learning programs in higher education. *Online Journal of Distance Learning Administration, 6*(1).

Livingstone, S. (2004). Media literacy and the challenge of new information and communication technologies. *The Communication Review, 7*(1), 3-14.

Luke, C. (2000). Cyber-schooling and technological change: Multiliteracies for new times. *Multiliteracies: Literacy learning and the design of social futures,* 69-91.

Lynch, C. A. (2003). Institutional repositories: Essential infrastructure for scholarship in the digital age. *portal: Libraries and the Academy, 3*(2), 327-336.

McCauley, A., Stewart, B. Siemens, G. and D. Cormier. (2010) *The MOOC Model for Digital Practice.* Retrieved May 24, 2014 from: http://www.elearnspace.org/Articles/MOOC_Final.pdf

Means, B., Toyama, Y., Murphy, R., Bakia, M., & Jones, K. (2010). Evaluation of evidence-based practices in online learning: A meta-analysis and review of online learning studies.

Metzger, M. J., Flanagin, A. J., Eyal, K., Lemus, D. R., & McCann, R. M. (2003). Credibility for the 21st century: Integrating perspectives on source, message, and media credibility in the contemporary media environment. *Communication Yearbook, 27*, 293-336.

Mishra, P., & Koehler, M. (2006). Technological pedagogical content knowledge: A framework for teacher knowledge. *The Teachers College Record,108* (6), 1017-1054.

Moreno, R., & Mayer, R. E. (2000). Engaging students in active learning: The case for personalised multimedia messages. *Journal of Educational Psychology and Technology, 92,* 724-733.

Morrison, D. (2013). A tale of two MOOCs: Divided by pedagogy. Retrieved May 26, 2014 from http://onlinelearninginsights.wordpress.com/2013/03/04/a-tale-of-two-moocs-

coursera-divided-by-pedagogy/.
Mountain Heights Academy (MCA), (2014). Retrieved April 24, 2014 from http://www.mountainheightsacademy.org/aboutus/.
New Media Consortium. (2014). *The NMC horizon report 2014 K-12.* Retrieved July 12, 2014 from http://cdn.nmc.org/media/2014-nmc-horizon-report-k12-EN.pdf.
Nov, O., Arazy, O., & Anderson, D. (2011, July). Technology-Mediated Citizen Science Participation: A Motivational Model. In *ICWSM.*
Ohler, J. (2014). About this community. Message posted to Digital Citizenship MOOC 20014. Retrieved April 25, 2014 from https://plus.google.com/communities/117633234010941243215.
Oishi, L. (2007). Working together: Google apps goes to school. *Technology & Learning 27.9: 46.*
Partnership for 21st Century Skills. (2006). A state leader's action guide to 21st century skills: A new vision for education. Tucson, AZ: Partnership for 21st Century Skills.
Petersen, J. (2013). An Introduction and Overview to Google Apps in K-12 Education: A Web-based Instructional Module. Retrieved May 26, 2014 from http://scholarspace.manoa.hawaii.edu/bitstream/handle/10125/27150/13106sTCCpaper_2013_jpetersen%20copy.pdf?sequence=1.
Picciano, A.G., & Seaman, J. (2009). K-12 online learning: A 2008 follow-up of the survey of U.S. school district administrators. Sloan-C (p. 37). Mahwah, NJ.
Picciano, A. G., Seaman, J., Shea, P., & Swan, K. (2012). Examining the extent and nature of online learning in American K-12 education: The research initiatives of the Alfred P. Sloan Foundation. *The Internet and Higher Education, 15(2)*, 127-135.
Porter, A., McMaken, J., Hwang, J., & Yang, R. (2011). Common core standards the new US intended curriculum. *Educational Researcher, 40*(3), 103-116.
Prensky, M. (2005). Listen to the natives. *Educational leadership, 63*(4). Retrieved May 26, 2014 from: http://centre4.core-ed.net/viewfile.php/users/38/1965011121/ICT_PD_Online/ListentotheNatives.pdf.
Reinking, D., McKenna, M. C., Labbo, L. D., & Kieffer, R. D. (Eds.). (1998).*Handbook of literacy and technology: Transformations in a post-typographic world.* Routledge.
Rheingold, H. (2012) *Net Smart: How to thrive online.* Cambridge: Massachusetts, MIT Press.
Rice, K. L. (2006). A comprehensive look at distance education in the K–12 context. *Journal of Research on Technology in Education, 38*(4), 425-448.
Rice, K. (2009). Priorities in K-12 distance education: A delphi study examining multiple perspectives on policy, practice, and research. *Educational Technology & Society, 12* (3),

163–177.
Riel, M. (1998). Education in the 21st century: Just-in-time learning or learning communities. Emirates Center for Strategic Studies and Research Retrieved from: http://faculty.pepperdine.edu/mriel/office/papers/jit-learning/.
Roberts, V. (2013.) MOOCifying K-12: Relationships, collaboration, risk-taking. *Hybrid Pedagogy.* Retrieved May 26, 2014 from http://www.hybridpedagogy.com/author/verena-roberts/.
Roberts, V. (2013) *Open Learning and MOOCs in Canadian K-12 Online and Blended Environments.* In Michael Barbour (Ed.), State of the Nation Study: K-12 Online Learning in Canada. Victoria, BC: Open School BC.
Robertson, R. J. (2010). What do academic libraries have to do with Open Educational Resources? Theme: Long term sustainability of open education projects first steps to start up. Retrieved from http://openaccess.uoc.edu/webapps/o2/handle/10609/4847.
Rosenzweig, R. (2006). Can history be open source? Wikipedia and the future of the past. *The Journal of American History, 93*(1), 117-146.
Salmon, G. (2004). *E-moderating: The key to teaching and learning online.* Psychology Press.
Siemens, G. (2004). Connectivism: A learning theory for the digital age. *International Journal of Instructional Technology and Distance Learning, 2*(1), 3-10.
Siemens, G. (2006). *Connectivism: Learning theory of pastime of the self-amused?* Retrieved June 13, 2010, from http://www.elearnspace.org/Articles/Connectivism_response.doc
Siemens, G. (2012) What is the theory that underpins *our* MOOCs? Retrieved June 13, 2012 from http://www.elearnspace.org/blog/2012/06/03/what-is-the-theory-that-underpins-our-moocs/.
Solomon, G. (2002). Digital equity: it's not just about access anymore-sure, most schools now have computers and internet access, but are all students receiving the same high-quality learning experience? We examine the issues.*Technology and Learning, 22*(9), 18-27.
Staker, H., Chan, E., Clayton, M., Hernandez, A., Horn, M.B., & Mackey, K. (2011). The rise of K–12 blended learning: Profiles of emerging models. *Innosight Institute Report.* Retrieved May 7, 2014 from http://files.eric.ed.gov/fulltext/ED535181.pdf.
Stone, A. (2008). The holistic model for blended learning: A new model for K-12 district-level cyber schools. *International Journal of Information and Communication Technology Education (IJICTE), 4*(1), 56-71.
Stone, G. (2011) The e-resources management handbook. *Against the grain, 23* (1). 36-38.

Sultan, N. (2010). Cloud computing for education: A new dawn?. *International Journal of Information Management 30*(2), 109-116.

Tapscott, D. (2009). *Grown up digital* (Vol. 361). New York: McGraw-Hill.

Tonks, D., Weston, S., Wiley, D., & Barbour, M. (2013). Opening a new kind of high school: The story of the open high school of Utah. *International Review Of Research In Open & Distance Learning, 14*(1), 255-271.

UNESCO (2012). 2012 Paris OER Declaration. World OER Congress, Paris, June 2012. Retrieved from http://www.unesco.org/new/fileadmin/MULTIMEDIA/HQ/CI/CI/pdf/Events/Paris%20OER%20Declaration_01.pdf.

Vygotsky, L. (1978). Interaction between learning and development. *Readings on the development of children*, 34-41.

Wang, B. & HongYu X. (2011). The application of cloud computing in education informatization. Computer Science and Service System (CSSS), 2011 *International Conference.* 2673-2676.

Warschauer, M. (2007). The paradoxical future of digital learning. *Learning Inquiry, 1*(1), 41-49.

Watson, J. (2008). Blending learning: The convergence of online and face-to-face education. *Promising Practices in Online Learning,* North American Council for Online Learning. Retrieved May 26, 2014 from http://rogersfoundation.org/system/resources/0000/0015/NACOL_promising_practices_in_blended_learning.pdf.

Westera, W. (1999). Paradoxes in open, networked learning environments: Toward a paradigm shift. *Educational Technology-Saddlebrook NJ, 39,* 17-23.

Wheeler, S., Yeomans, P., & Wheeler, D. (2008). The good, the bad and the wiki: Evaluating student-generated content for collaborative learning. *British journal of educational technology, 39*(6), 987-995.

Wicks, M. (2010). A national primer on K-12 online learning. Version 2. *International association for K-12 online learning.* Retrieved May 26, 2014 from http://files.eric.ed.gov/fulltext/ED514892.pdf.

Wiley, D. (2010). Openness as catalyst for an educational reformation. Educause Review (July/August, 2010). Retrieved May 26, 2014, from https://net.educause.edu/ir/library/pdf/ERM1040.pdf.

Wiley, D. (2009). *Defining "Open"* . Retrieved July 5, 2014 from http://opencontent.org/blog/archives/1123

Yuan, L., Powell, S., & Olivier, B. (2014). *Beyond MOOCs: Sustainable online learning in institutions.* Retrieved May 26, 2014 from http://publications.cetis.ac.uk/wp-content/uploads/2014/01/Beyond-MOOCs-Sustainable-Online-Learning-in-Institutions.

pdf.
Zhang, Y. (2001). Scholarly use of internet-based electronic resources. *Journal of the American society for information science and technology, 52*(8), 628

Chapter 20

Personal Learning Environments in K-12

Wendy Drexler,
International Society for Technology in Education, wdrexler@gmail.com

Abstract

Personalization is a trending topic in educational technology. The definition is so broad as to become a catch phrase to describe many new tools and transformation initiatives. While the concept of personalization is gaining traction, the actual application of student-constructed personal learning environments (PLEs) is currently limited in the K-12 literature and practice. This chapter explores existing research on PLEs and networked learning for adults and children. Research-based examples in K-12 are presented along with the processes required to support student-constructed personal learning environments. Implications for teaching practice, learning, and education policy are shared along with a call for additional research specific to K-12 students.

Introduction

Young learners face a rapidly changing landscape in which analysis and synthesis of information and distributed human interactions are critical to effectively solve problems (Wagner, 2008). Personal learning environments (PLEs) provide students with increased control over the learning process and a level of autonomy not typically realized in the highly structured, traditional classroom setting. As such, students who construct PLEs gain practice in a number of processes required for effective networked learning and problem solving. They learn to properly vet resources, synthesize considerable amounts of information, and reach out respectfully to experts and potential learning collaborators (Drexler, 2010). Personal learning has implications for student empowerment, teacher roles, administrative leadership, and educational policy. The Horizon Report (2010) recognizes the efficiencies of personalization describing the implications for informal learning as profound. The scalability of personal learning in K-12 public education is dependent upon instructional design that scaffolds students' ability to take greater control of the learning process and administrative policies that give students greater access to Internet resources. The subsequent Horizon Report (2011) confirms that the technologies required to build PLEs currently exist. How they are used in the classroom will depend greatly on shifts in attitude toward technology, teaching, and learning. This chapter will define personal learning environments, present an overview of PLEs in the research, and discuss the implications of student constructed personal learning environments in K-12 policy and practice.

Personalization is a popular topic among educators as well as educational technology designers and developers. Though it may seem subtle, there is a difference between personalized and personal. The United States Department of Education defines personalization as "instruction that is paced to learning needs, tailored to learning preferences, and tailored to the specific interests of different learners. In an environment that is fully personalized, the learning objectives and content as well as the method and pace may all vary" (USDOE, 2010, p. 1). The terms paced and tailored presume that while the student has some measure of choice, the instruction and learning objectives are still under the guidance and control of the teacher or curriculum designer. The latter portion of the USDOE definition gets closer to the concept of a personal learning environment in which objectives, content, method, and pace are under the control of the student. When educators refer to personalized learning environments, they are likely to have a different concept in mind from that of a personal learning environment as defined in this chapter. It helps to think of personalization as a continuum of teacher and student control on which personal learning environments represent the greatest measure of student control (Drexler, 2010).

A personal learning environment allows the learner more control to customize the learning experience and connect the learner to others (Downes, 2007). It refers to the methods students use to organize content, "the tools they choose, the communities they start and join, the resources they assemble, and the things they write" (Wilson, 2008, p.18).

Research Synthesis

Zhou (2013) synthesized recent literature on Personal Learning Environments differentiating the personal, the learning, and the environment perspectives. From a personal perspective, the research supports learner control and ownership. "However, it is rarely discussed how to transfer the responsibility of facilitating learning from educational institutions to individual learners" (Zhou, 2013, p. 1162). From a learning perspective, the process of constructing an effective PLE requires mastery of certain skills and self-regulation. The practice of these skills may take place through the process of constructing the PLE with the support and control of a teacher or institution (Zhou, 2013). The environment is comprised of the platform and tools, the community, and resources the learner chooses to include in the PLE (Zhou, 2013).

PLEs manifest in an infinite number of ways because the student selects the tools and communities that will best meet his or her learning objectives. In one example, a second grade teacher builds her own PLE to organize curricular resources for a curriculum-mapping project. Ultimately, she organizes units through web mixes and shares this PLE with her students (Ash, 2013). In another example, seventh grade science students study poisonous and venomous creatures using multiple online tools including Google Scholar, science-specific search engines, videos, blogs, articles, and books. They use Skype to connect with experts around the globe. Digital resources are collected and organized using an aggregating tool called Symbaloo. Their research is synthesized and evaluated via a Glogster multimedia digital poster that includes text, video, graphics, and audio (Drexler, 2010). In a high-school scenario, a librarian helps students create personal learning environments and information dashboards using Google Sites, Wordpress, Symbaloo, wikis, NoodleBib, and Scoop.it (Hamilton, 2012). The collection of the tools students use and the human connections they make define their unique personal learning environment. New tools and technologies are constantly evolving and expanding. Wilson (2008) identified a number of patterns characteristic in personal learning tools. He found that PLE tools might serve as a navigation layer, discourse manager, connection hub, time and effort manager, media creator or mixer, identity integrator, or a multi-mode multi--platform. Any combination of these patterns may be employed to build the personal learning environment.

Today's PLEs leverage new technologies and networked online learning, but the concept predates the Internet as we currently know it. Ivan Illich wrote *Deschooling Society* in 1970, before the Internet was accessible to most people, before the World Wide Web, and before the personal computer. He identified learning webs made up of all avenues of learning including television, reading, peers, and relationships (Illich, 1970). "We can provide the learning with new links to the world instead of continuing to funnel all educational programs through the teacher" (Illich, 1970, p. 73). Illich recognized the importance of social connections, collaboration, and learner empowerment. He saw that a sense of community beyond the classroom could provide a foundation for deeper learning.

Community is a key factor in networked learning (Goodyear, 2004), but not the only means of making connections. Networked learning is sometimes confused with computer supported collaborative learning (CSCL), computer mediated communication (CMC), and communities of practice (COP), all of which focus on social interactions (Johnson, 2008). But, the central notion of networked learning is in “promoting connections” (Johnson, 2008, p.1). What is done with those connections is at least as important. Johnson indicates a sense of savvy in the accomplished networked learner. “Once a connection is made, requisite skills might include how many connections are tenable, or how to marshal an element of affective intelligence so as to appreciate how even brief messages can chill or foster the network” (Johnson, 2008, p. 4). That sense of savvy extends to resources as well as people (Johnson, 2008).

A foundation in digital literacy is necessary to become an effective networked learner. Digital literacy extends beyond a basic comfort with new technologies. Alkali and Amachi-Hamburger (2004) identify five major digital skills: photo-visual (the ability to make sense of graphical representations), reproduction (create new artifacts from existing content), branching (knowledge construction from hypertext), information (evaluating content), and socio-emotional (interacting effectively with others online). This list may encompass some or most of the skills required to navigate the Internet effectively today. But, the landscape continues to change. A broader definition proposed by Leu et al. (2004) offers greater flexibility.

> The new literacies of the Internet and other ICTs include the skills, strategies, and dispositions necessary to successfully use and adapt to the rapidly changing information and communication technologies and contexts that continuously emerge in our world and influence all areas of our personal and professional lives. These new literacies allow us to use the Internet and other ICTs to identify important questions, locate information, critically evaluate the usefulness of that information, synthesize information to answer those questions, and then communicate the answers to others. (pg. 43)

Digital literacy is neither consistently defined nor taught (Moore, 2002). Students who prefer online learning often have prior knowledge and experience using Web-based tools (Hannafin & Hannafin, 2008). However, many students, while familiar with technologies in the social context, are not necessarily prepared to use those tools for deep learning. Consequently, the teacher who ventures into networked learning must take on the task of actively teaching digital literacy skills. These skills change depending upon the content, context, and tools used in the learning process.

Networked learning is student-centered. Control for the learning process shifts to the student. He or she assumes responsibility for learning goals and the means with which they are attained (Hannafin & Hannafin, 2008). Web applications and emerging technologies offer new opportunities for students to access, organize, and control learning. Incorporating these tools aids in dissemination of knowledge that is part of the global learning community or collective intelligence (McLoughlin & Lee, 2008). The traditional teacher-centered approach assumes a static knowledge base. With the creative contribution of users in networked learning, knowledge is constantly changing and being presented from different points of view. Decision-making is increasingly important as students determine what content or knowledge is worthy of adding to the PLE and the extended networked learning community (Zenios & Goodyear, 2008).

Open educational resources (OER) further add to the plethora of content through which learners sift to piece together a successful learning journey. In many cases, educators have designed open educational resources, some of which include full courses. OER, along with newly available web technologies, continue to create avenues to further explore and research networked learning from a pedagogical perspective.

The convergence of increased ease of access to information and the exponential growth of open source educational resources provides a new repository of valuable content from which students can learn (Downes, 2007). Open educational resources are "digitized materials offered freely and openly for educators, students, and self learners to use and re-use for teaching, learning, and research" (Hylen, 2006, p. 1). They include scholarly articles, lesson plans, websites, and fully designed courses posted on the Internet for all to access. The exponential growth of online information poses a challenge to the learner who must locate sources and determine credibility. A major value of open educational resources is the accessibility of content created by professors, teachers, and researchers at reputable educational institutions. In effect, someone else has already collected the resources, put them into a viable format or course, and provided a slightly higher level of confidence that the source is reliable. The Institute for the Study of Knowledge Management in Education (ISKME) created OER Commons in February 2007 "to provide support for and build a knowledge base around the use and reuse of open educational resources" (OER Commons, 2007). OER Commons includes primary, secondary, and post secondary resources, open textbooks, tutorials, lesson plans, and entire courses.

Open educational resources provide free and increasingly reliable access to content. Emerging

Web applications allow learners to organize content in new ways, create original works, build upon the works of others, and collaborate with experts or communities of learners who share a common goal (Richardson, 2008). Really simple syndication (RSS) offers a means for users to subscribe to changing content such as blogs, wikis, news feeds, podcasts, and video. Synchronous online communication such as video conferencing, microblogging (e.g. Twitter), and instant messaging provide new avenues for reaching experts in any field of study. Digital libraries and searchable repositories of open educational resources (OER) give students access to information on virtually any topic. Functionality mash-ups (Severance et al., 2008) are combinations of web tools that bring together multiple applications as well as content from multiple sources with a user-friendly interface. Such an interface becomes the personal learning environment that builds structure around the student-constructed synthesis of online content including social connections to other students or subject matter experts.

A number of personal page options such as iGoogle, Netvibes, PageFlakes, and Symbaloo incorporate Application Programming Interface (API) widgets to pull content from external sites and organize it based on user preference. Web applications also provide the means for users to synthesize what they have learned and create new content to share with others. For example, Glogster, a digital poster program, allows students to combine text, graphics, video, audio, and images on any topic imaginable. With so many tools available, those who can effectively apply the tools that manage the content have an advantage. Many teachers who are experimenting with the use of web-based applications in the classroom share their experience via blogs, Twitter, Facebook, and other social networking sites.

Couros (2008) developed a model of the networked teacher that represents an educator's professional personal learning environment (PLE). Presumably, a teacher will be better equipped to facilitate networked learning if he or she has experienced the construction of such a model as a learner. The significant connections in Couros' view of the network include colleagues, popular media, print and digital resources, the local community, blogs, wikis, video conferencing, chat/IRC, social networking services, online communities, social bookmarking, digital photo sharing, and content development communities (Couros, 2008).

The Networked Teacher is a model by which educators begin to build professional connections to support teaching practice. Couros constructed this model based on feedback from a number of teachers who were actively participating in networked learning for their professional development. He used their input to tweak and revise the model (Couros, 2008). It serves as an example of the numerous connections or nodes that comprise a professional network. Beyond

Couros' research, little has been done to explore the impact of such a model from a student perspective, especially in K-12 education.

The goal of personal learning is to empower the student to independently construct rich, effective networks in support of his or her learning objectives. Effective independent inquiry does not happen automatically (Mayer, 2004). Drexler (2010) conducted a design-based research case study to determine the processes that students go through when constructing personal learning environments. As a result of this research, a networked student model was developed with a focus on the learning process rather than the specific tools used to build a PLE. Technology tools are helpful as examples, but are only important in how they support the following processes.

- Practicing digital literacy
- Practicing digital responsibility
- Organizing content
- Dealing with technology
- Collaborating and socializing
- Synthesizing and creating
- Taking responsibility and control for learning

Scaffolding these processes requires development of a supporting skillset over a period of time rather than through a single project (Drexler, 2010). Students require the support of a teacher as they develop these skills. Students participating in this study had no prior experience with networked learning and a limited grasp of digital literacy. Most were familiar with social networking sites such as Facebook, but few considered applying technology as a means to learn. They were able to conduct a simple Google search, but did not know about alternative search engines, how to dissect a URL, or how to evaluate the reliability of websites. They initially limited their search to the first page results without digging deeper or taking time to consider the credibility of the source. Most students began with an image search. They were clearly interested in images over text. Once they found the text they wanted and captured it, they leveraged that content to search for more images or video. The teacher had to take additional time to actively teach the concept of digital literacy and provide opportunities for the students to practice.

Digital responsibility is a subset of digital citizenship (Ribble, 2004). It refers to appropriate use of all types of media, behaving responsibly when interacting with others online, and following school acceptable use policies (Ribble, 2004). The teacher was mindful of the need to actively teach these skills throughout the design and delivery phase of this project. The students had little prior instruction, if any, in appropriate online behavior. While there was a school acceptable use policy in place, few students were aware of its contents. The teacher was very open with the students and continually reminded them of the responsibility that comes with freedom of access to Internet sites. He freely relayed examples of inappropriate use of technology along with his expectations. Reading of comments on YouTube was off limits. Downloading of music was limited to those tunes the students already had purchased. They could listen to iPods, but not download music from school. Students were reminded to cite sources properly and give credit to authors.

Organization was a critical process in the students' construction of personal learning environments (Johnson, 2008). Students had to set up user accounts, add content widgets on Symbaloo personal pages, and rearrange the widgets to meet their needs. In order to synthesize the content accumulated during the research process, it was important to have organized it in such a way as to maximize ease of retrieval. Organization of the Symbaloo pages differed from one student to another. Some had only a few blocks on the personal page representing only those resources to be used in school. Some had as many blocks as could fit on the page with everything from the required school widgets to CNN News. Each student had complete control over the way the content was organized as long as they kept school-related blocks together. Some students arranged blocks by color. Others organized blocks by function. The teacher respected each student's organizational style and preference, empowering the learner to make decisions about the learning process. In some cases, he offered suggestions for structural layout. In others, the Web application in use provided the organizational structure.

Socializing and collaborating took a number of forms including whole-class discussion, conversing with individual students or online experts, helping another student, and questioning or conversing with the teacher. Students had more difficulty resuming on-task behavior when whole-class socializing was taking place. However, most examples of this were directly related to instruction. The individual responses students received from experts around the world were the most memorable and powerful from the students' perspectives.

The artifacts students created to represent the synthesis of their research included a scientific report and a Glogster digital poster. The students used the Internet to identify subject matter experts, scientists who specialized in the animal researched. They emailed the scientist and provided a link to the digital poster asking for feedback on their work. Those students who received feedback experienced the peer-review process first hand.

The processes that support student construction of personal learning environments are complex. The development of the supporting skills is time consuming and requires considerable teacher facilitation and support. As such, students do not begin building PLEs with full control, rather they gain autonomy as the processes are practiced and mastered.

Rahimi, van den Berg, and Veen (2013) propose a roadmap for building Web 2.0-based personal learning environments in educational settings. They argue "the student's control model and the teaching process should interact with each other in order to define appropriate technology enhanced learning activities to be accomplished by students to build their PLEs" (Rahimi et al, 2013, p. 3). The teacher and student co-develop a learning environment that recognizes the student as socializer, as decision maker, and as knowledge producer. They suggest project-based learning as a means to build these skills. Prerequisite conditions include defining a learning project, defining the appropriate assessment and evaluation rubric, meeting technological requirements, defining an appropriate work grouping mechanism, providing initial support, and training students in the basic functionalities of the selected web tools (Rahimi et al, 2013).

One of the ultimate goals of the personal learning environment is for students to self regulate the organization of numerous resources into meaningful learning (Turker and Zingel, 2008). Zimmerman (2008) identified the phases students go through when working toward self regulated learning as forethought, performance, and self-reflection. The processes supporting these phases include goal setting, attention focusing, and self-evaluation (Zimmerman, 2008). Students who are just getting started with personal learning environments do not typically attain full self-regulation (Drexler, 2010). They are, in effect, networked learners in training. The teacher may facilitate goal setting, performance, and self-reflection by integrating these processes within the instructional design. Long-term goals are established at the start of the project. Short-term goals are shared each day. Students perform based on assignments and guidance from the teacher. Self-reflection may take place through student blogs or journals. As a result, the process of taking control and responsibility for learning is scaffolded by practicing digital literacy and responsibility, organizing content, collaborating and socializing, and synthesizing and creating (Drexler, 2010).

Constructivism serves as the theoretical framework for student construction of personal learning environments. Students are expected to access, navigate, disseminate, and synthesize large quantities of information for the purpose of constructing knowledge. They build an environment with technology through which they can learn. They do not learn from the technology, but through the process of applying it with the goal of constructing a custom personal learning environment (Jonassen, 2003). Constructivism implies that knowledge is constructed by the learner and encourages "greater participation by students in their appropriation of scholarly knowledge" (Larochelle et al., 1998).

The foundation of constructivism that is attributed to Jean Jacques Piaget has evolved into at least six different forms: personal (Kelly and Piaget), radical (Glasersfeld), social (Vygotsky), social constructionism (Gergen), critical (Taylor), and contextual (Coburn) (Geelen, 1997). It is in the combination of these theoretical points of view and the "dialectical tension between differing emphasis" that the theory is best applied to practice (Geelen 1997). Generally speaking, constructivism asserts that learners construct knowledge based on their experiences and social interactions (Jonassen et al., 2003).

Jonassen views technology as a collection of tools to support knowledge construction, an information vehicle for exploring knowledge to support learning, a context to support learning by doing, a social medium to support learning by conversing, and an intellectual partner to support learning by reflecting (Jonassen et al., 2003). The key principles are knowledge construction, doing, conversing (or sharing), and reflecting. Each of these components is present in a networked learning model that supports PLEs (Drexler, 2010). Students may use RSS and social bookmarking to organize information and build upon prior knowledge with the goal of completing a task or meeting a learning objective. Social media, or Web-based applications designed for the purpose of interacting with others online, promote conversations. Blogs are one example of a vehicle through which students can reflect on the learning process. All of these pieces in combination support a constructive learning experience. The student's personal learning environment pulls them together.

The ill-defined process reflected in constructive learning (and networked learning) is not always comfortable for the student, especially one who has customarily "engaged in learning activities because they are required, rather than through intrinsic interest" (Jonassen et al., 2003, p. 238). Teacher roles are impacted to the extent that they relinquish some intellectual and management authority while also working to gain familiarity with the technology (Jonassen et al., 2003).

Ultimately, meaningful learning occurs with knowledge construction, not reproduction; conversation, not reception; articulation, not repetition; collaboration, not competition; and reflection, not prescription (Jonassen et al., 2003). Jonassen's perspective of meaningful learning guides the design of constructivist learning environments. The design of the teacher-facilitated, student-created personal learning environment adheres to constructivist principles with the goal of developing a networked student who takes increased responsibility for his or her learning while navigating an increasingly complex content base (Drexler, 2010). Creating a learning environment with a culture that supports this student autonomy could be challenging within the cultural myths of a traditional classroom. Taylor et al. (1997) identified these myths as (1) the objectivist view that scientific knowledge embodies universal truths that can be known or discovered and (2) the perceived need to control the classroom environment and view "curriculum as a product that needs to be delivered" (Taylor et al., 1997, p. 295).

Such a teacher-focused perspective fails to take into account the "major cultural restraints that can counteract the development of constructivist learning environments" (Taylor et al., 1997, p. 293). Taylor et al. (1997) suggest taking a critical view of constructivism that addresses the cultural perceptions of the learning environment. Open discourse between teacher and student provide a learning environment that is empowering and negotiable.

Research on personal learning environments remains somewhat limited, especially in K-12. Existing research primarily targets the negotiation of control between teacher and student, the processes students apply when constructing personal learning environments, and the implications on self-regulation. As teachers experiment with blended learning and encourage students to apply a broad range of web-based applications, the learning process is likely to become more personalized. As such, new PLE models will appear in the literature providing opportunities to reflect on the processes that constitute the foundation for personal learning.

Implications for Policy and Practice

Student construction of personal learning environments has implications for teacher roles, school policy, assessment, and blended learning. PLEs require a significant shift in control from the teacher to the student (Drexler, 2010). As such, the day-to-day behavior and activities of the teacher change from traditionally teacher focused learning to student centered learning. School policies, especially those designed to control student behavior, must be revisited. A considerable level of trust is required to revise policy to reflect greater student choice and decision-making in the learning process. Both formative and summative assessments may be affected. Teachers and policy makers should reflect on what the current tests are measuring and whether those outcomes truly represent what and how students are learning. Traditional learning environments are likely to become more blended. Teachers already employing blended learning techniques likely find the need to adjust the blend.

Teacher practice is significantly altered as a result of implementing student construction of personal learning environments. In spite of the challenges, the seventh grade science teacher who used a PLE approach with his students reflected that he could not imagine returning to the way he previously taught (Drexler, 2010). This was especially interesting, as this teacher was already known for his constructivist teaching style. At the same time, he had numerous conversations with other teachers at the school, most of whom would not consider a networked learning approach. Each expressed concern about the reliability of technology and time constraints that resulted from dealing with the technical difficulties. Teachers also worried about student behavior, access to inappropriate materials, and general lack of control (Drexler, 2010).

The scalability of networked learning is dependent upon changes in school policies, hiring practices, and pre-service teacher education. Some teacher concerns are the result of a system in which strict policies, high stakes testing, and a desire for control constrain teacher autonomy. Others are the result of roles that are ingrained in teachers through their personal school experiences and further reinforced in most pre-service education programs.

The roles of the teacher also change drastically in a student-centered learning environment. There is little if any lecture, considerable technology trouble-shooting, and a lot of one-on-one or small group facilitation. Student success depends on his or her motivation but also greatly on the strategic guidance of the teacher. The teacher's ability to gauge a student's understanding and progress are key to achieving the delicate balance between student autonomy and teacher intervention (Drexler, 2010). Adopting a networked learning approach requires considerable teacher professional development and a philosophy different from that of most current educators. The implications of the latter on the potential of networked learning are far reaching. They extend to school policy, hiring practice, and pre-service teacher education.

Current school policies often hinder the success of a PLE design. Many schools have responsible or acceptable use policies (AUP) that restrict student access to devices, tools, and social sites with learning potential. Often, many websites are blocked. Leadership support is not enough. Network administrative support is critical to monitor student access to websites and support teachers who ask that certain sites be unblocked.

Applying personal learning environments on a school or district-wide basis requires sweeping changes in policy, the assumption of greater risk, and support of teacher professional development. Parents and community members should be part of the conversation leading to these changes. How does the school or district balance access with safety? What is their real liability? How are students made aware of expectations? What kind of training is effective for teachers? How much technology integration is expected as part of the job requirement?

Assessment is an issue. It is not clear how networked learners will perform on standardized tests for accountability. Teachers are well conditioned to build their curriculum around these tests. Even those who do not teach to the test are mindful of the need for their students to show progress. Some of these political implications indicate that networked learning and the construction of personal learning environments may have greater chance for implementation in non-traditional schools.

A blended approach, one that combines the best of face-to-face with online instruction, may be a more effective outlet for a networked learning design. Time spent face-to-face with students can be used for collaboration with other students and individual guidance from the teacher. The student is then free to focus time outside of class on Internet research, communication with experts and peers around the globe, and building the personal learning environment. A guided approach in a blended environment facilitates independent learning (Cavanaugh, 2009). Furthermore, students learn how and when to ask for guidance (Cavanaugh, 2009) creating a foundation on which 21st century students can build life-long learning skills.

One of the most important design implications is the need for deliberate scaffolding of the processes needed to construct a personal learning environment. Similar to guided inquiry (Mayer, 2004), the student construction of PLEs is best facilitated with strategic guidance from the teacher. A blended learning delivery may provide a better outlet for a networked learning design. Furthermore, most students who use their own computers in a blended or online learning environment have less restricted access to Internet resources at home than at school. While this may bring up issues of Internet safety and privacy, it also offers increased direct access to many educational applications that could be inadvertently blocked by the school network.

There is also potential for implementation of networked learning in a fully online virtual school. One benefit of online learning is the access it provides to a wider range of courses (Cavanaugh, 2009). Implementing networked learning for the student construction of personal learning environments extends study to any topic. Teacher facilitation and guidance is still a requisite part of the process but could be conducted easily in the online environment through synchronous and asynchronous means. Again, virtual schools rely on network access from a remote location. If the student is learning from home, there are fewer concerns about restrictive filtering. Parents could monitor online behavior as necessary and even support the student's efforts along with the teacher.

Implications for Research

More work is needed across multiple subject areas and grade levels. Further exploration of the processes that support construction of PLEs will inform how students adopt greater self-regulation and management of networked learning. Such studies could determine how design is affected by age of student or how design might change for a math or literature inquiry versus science. Longitudinal studies are needed to fully determine whether students eventually take greater responsibility for the learning process over time. Will the student become self-directed or continue to look to the teacher for guidance? At what point, if any, will a student take over full control of the learning process? Given the entire Internet for potential resources, will students seek out every learning node possible, or will they continue to revert to the easiest search method, stopping at the first answer they encounter? Without teacher intervention, will students continue to focus on the resources with which they are most comfortable? How hard will they try to form new connections?

Design thinking (Brown, 2009), a concept originally conceived for business product-design shows promise in classrooms (Goldman et al., 2009) and may begin to address some of the issues of self regulation. Design thinking is human-centered, action-oriented, and mindful of process (Goldman et al., 2009). The personality traits of a design thinker include empathy, integrative thinking, optimism, experimentalism, and collaboration (Brown, 2009). The general idea is to think about design from an end-user and big picture perspective. Consider what the user needs and begin building with ongoing prototyping to test ideas and make adjustments. Brown (2009) refers to this as building to learn. In effect, students who design personal learning environments are building to learn, and these learning structures are easily shared online. Perhaps if students view the personal learning environment as a creative process from which others can learn, they will attend to the quality of work, be mindful of process, and explore the supporting content in greater depth. Further research is needed to determine whether applying a design thinking process has an impact on self-direction or the depth at which students apply the research process to their personal learning environments.

One of the most elusive research questions within the field of education and educational technology is how to measure whether learning has taken place. The results are further challenged by the means with which educators measure student success. Are standardized test scores a valid or accurate measure of the quality of personal learning, or are we in need of alternative assessments that focus on the 21st century skills required to navigate in this environment? Further research is required to address this question to determine the best means of assessment. Perhaps there is more to measure than simply content knowledge. An assessment of a student's ability to effectively execute each of the processes identified in this study may serve as a better assessment goal. Developing a set of competencies within each process and measuring the student's ability to perform is the first step toward acknowledging personal learning as a valuable 21st century skill. The goals of learning can be different when trying to manage complex skills. The student first works toward a process goal "perfecting the form or procedure that the skill involves without regard to the final outcome, then shifting attention to the product goal once the procedure is more automatized" (Ormrod, 2008, p. 526).

From a teaching perspective, networked learning has implications for teacher roles and professional development. Networked learning blends the concept of educator expertise with learner construction (Siemens, 2007). Siemens (2007) views the role of teacher as curator, an expert learner who creates spaces in which knowledge can be created, explored, and connected.

> While curators understand their field very well, they don't adhere to traditional in-class teacher-centric power structures. A curator balances the freedom of individual learners with the thoughtful interpretation of the subject being explored.
>
> (Siemens, 2007, p. 17)

Is there a certain skill set associated with teachers who facilitate networked learning, or does it have more to do with disposition and teaching style? Teacher beliefs about the value of technology as a teaching tool may determine effective integration more than traditional forms of professional development (Mueller et al., 2008). Administrators should consider whether it is even possible, practical, or prudent to require teachers to change their teaching paradigms to adopt a networked learning approach. Such a radical departure from traditional curriculum and pedagogy will require teacher buy-in. Even in an organization in which the culture supports innovative programming, teachers will need ongoing mentoring and support. A cognitive apprenticeship model in which less experienced teachers practice with the guidance of those who have already implemented networked learning is likely a more effective approach to professional development. Similar consideration is warranted for pre-service teaching programs. Providing opportunities for pre-service teachers to experiment with network learning from both a teacher and learner perspective may influence the likelihood they will apply these techniques in their future classrooms.

Research suggests pre-service teachers who experience educational technology courses designed around 21st century skillsets rather than technical skills see greater value in the use of technology for learning and are less anxious about using it in the classroom (Lambert & Gong, 2010). Pre-service and in-service teacher change requires a mindset in which technology is seen as critical for effective student learning (Ertmer & Ottenbreit-Leftwich, 2010). Teacher education and professional development must also address knowledge of how to use technology to affect learning, confidence, or self-efficacy for successfully implementing technical knowledge, pedagogical belief, and a culture in which innovation is supported (Ertmer & Ottenbreit-Leftwich, 2010).

The explosion of alternative delivery methods such as online and blended learning models offers new outlets for the networked student. If, when, and how students and teachers choose to take advantage of these opportunities will define the future of networked learning and personal learning environments within the structure of school. However, the nature of personal learning is such that students with Internet access can choose to participate without that structure. Their success may depend on how well they have been prepared in the processes that support learning in an ever-changing increasingly networked world.

Conclusion

Many K-12 schools are slow to facilitate digital literacy and digital responsibility. Some also fail to acknowledge the consequences this could have for students in a future where networked learning is crucial for success in work and life. The Internet with its learning potential and possible pitfalls is a reality of everyday communication and work life. We do our children a disservice when we do not prepare them to responsibly navigate and harness this resource for learning. Greater access to mobile devices and wireless networks will eventually render the point of site-based filtering moot, as students will reach any content they desire directly from their smart phones. Greater restrictions are not the answer. Direct instruction, communication of expectations, and community support are critical. Yet these efforts are not possible without significant changes in pre-service teacher education, professional development, administrative policies, and community awareness.

The limited research on personal learning environments in K-12 indicates the need for deliberate scaffolding of student construction of PLEs to support learning objectives and provide a foundation for safe, responsible life-long learning beyond the classroom. The implications for delivery, student learning, teacher professional development, and policy must be considered and addressed before personal learning environments can be effectively scaled beyond the few experiments currently taking place among a limited number of classroom teachers.

References

Ash, K. "Personal Learning Environments' Focus on the Individual: Personal Learning Environments emerging as K12 trend to watch." Education Week 22 May 2013: S32. Opposing Viewpoints in Context. Web. 26 April 2014.

Alkali, Y. E., & Amichai-Hamburger, Y. (2004). Experiments in Digital Literacy. *CyberPsychology & Behavior, 7*(4), 421-429.

Brown, T. (2009). *Change by Design: How Design Thinking Transforms Organizations and Inspires Innovation* (First Edition.). Harper Business.

Cavanaugh, C. (2009). *Getting Students More Learning Time Online: Distance Education in Support Expanded Learning Time in K-12 Schools.* The Center for American Progress.

Couros, A. (2008, February 25). Open Thinking » What Does the Network Mean to You? Retrieved April 29, 2014 from http://educationaltechnology.ca/couros/799

Downes, S. (2007, February 2). Half an Hour: What Connectivism Is. Half an Hour. Retrieved April 28, 2014, from http://halfanhour.blogspot.com/2007/02/what-connectivism-is.html.

Downes, S. (2007, June 11). Open Educational Resources And The Personal Learning Environment. Taipei, Taiwan. Retrieved April 28, 2014, from http://www.slideshare.net/Downes/open-educational-resources-and-the-personal-learning-environment.

Downes, S. (2007). Models for Sustainable Open Educational Resources. Interdisciplinary Journal of Knowledge and Learning Objects, 3, 29-44. Retrieved April 28, 2014, from http://www.downes.ca/cgi-bin/page.cgi?post=33401

Drexler, W. (2010). The networked student model for construction of personal learning environments: Balancing teacher control and student autonomy.*Australasian Journal of Educational Technology, 26*(3), 369-385.

Drexler, W. (2010). *The networked student: A design-based research case study of student constructed personal learning environments in a middle school science course* (Doctoral dissertation, University of Florida).

Ertmer, P., & Ottenbreit-Leftwich, A. (2010). Teacher technology change: How knowledge, confidence, beliefs, and culture intersect. *Journal of Research on Technology in Education, 42*(3), 255–284.

Geelan, D. R. (1997). Epistemological Anarchy and the Many Forms of Constructivism. Science & Education, 6(1), 15-28.

Goldman, S., Carroll, M., & Royalty, A. (2009). Destination, imagination \& the fires within: design thinking in a middle school classroom. In *Proceeding of the seventh ACM conference on Creativity and cognition* (pp. 371-372). Berkeley, California, USA: ACM.

Goodyear, P., Banks, S., Hodgson, V., & McConnell, D. (2004). Advances in Research on Networked Learning. Kluwer Academic Publishers.

Hamilton, B. (2012). *Embedded librarianship: tools and practices.* Chicago, Ill.: ALA TechSource.

Hannafin, M., & Hannafin, K. (2008). Cognition And Student-Centered, Web-Based Learning: Issues And Implications For Research & Theory. Presented at the International Conference on Cognition and Exploratory Learning in Digital Age, Freiburg, Germany.

Horizon Report: The K12 Edition » Four to Five Years: The Personal Web. (2009). . Horizon Project. Retrieved April 25, 2009, from http://wp.nmc.org/horizon-k12-2009/chapters/personal-web/.

Horizon Report (2010) Horizon Project. Retrieved March 29, 2010, from http://wp.nmc.org/horizon2010/.

Hylen, J. (2006). Open Educational Resources: Opportunities and Challenges. Paris, France: OECD's Center for Educational Research and Innovation.

Illich, I. (1970). Deschooling Society. Marion Boyars Publishers Ltd

Johnson, M., & Liber, O. (2008). The Personal Learning Environment and the Human Condition: From theory to teaching practice. *Interactive Learning Environments, 16*(1), 3-15.

Johnson, M. (2008). Expanding the concept of Networked Learning. In Proceedings of the 6th International Conference on Networked Learning. Halkidiki, Greece.

Jonassen, D. H., Howland, J., Moore, J., & Marra, R. M. (2003). Learning to Solve Problems with Technology: A Constructivist Perspective (2nd ed.). Prentice Hall.

Lambert, J., & Gong, Y. (2010). 21st Century Paradigms for Pre-Service Teacher Technology Preparation. *Computers in the Schools, 27*(1), 54.

Larochelle, M., Bednarz, N., Garrison, J. W., & Garrison, J. (1998). Constructivism and education, Cambridge University Press.

Leu, J., Kinzer, C. K., Coiro, J. L., & Cammack, D. W. (2004). Toward a Theory of New Literacies Emerging From the Internet and Other Information and Communication Tech-

nologies. *Reading Online*, 43-79.
Mayer, R. E. (2004). Should There Be a Three-Strikes Rule Against Pure Discovery Learning? The Case for Guided Methods of Instruction. *American Psychologist, 59*(1), 14-19.
McLoughlin, C., & Lee, M. (2008). Mapping the digital terrain: New media and social software as catalysts for pedagogical change. In Proceedings ascilite Melbourne 2008. Melbourne, Australia.
Moore, P. (2002), An Analysis of Information Literacy Education Worldwide. White Paper prepared for UNESCO, the U.S. National Commission on Libraries and Information Science, and the National Forum on Information Literacy, for use at the Information Literacy Meeting of Experts, Prague, The Czech Republic.
Mueller, J., Wood, E., Willoughby, T., Ross, C., & Specht, J. (2008). Identifying discriminating variables between teachers who fully integrate computers and teachers with limited integration. *Computers & Education, 51*(4), 1523-1537.
OER Commons (2014). What is OER Commons? Retrieved April 28, 2014 from http://www.oercommons.org/about#about-oer-commons
Ormrod, J. E. (2008). *Human Learning* (5th ed.). Prentice Hall.
Rahimi, E., van den Berg, J., & Veen, W. (2013). A Roadmap for Building Web2. 0-based Personal Learning Environments in Educational Settings. In *Proceedings of the fourth international conference on Personal Learning Environments (The PLE Conference 2013).*
Ribble, M., Bailey, D., & Ross, T. (2004). Digital Citizenship. *Learning & Leading with Technology, 32*(1), 6-12.
Richardson, W. (2008). Blogs, Wikis, Podcasts, and Other Powerful Web Tools for Classrooms (2nd ed.). Corwin Press.
Siemens, G. (2007, February 12). Online Connectivism Conference. Online Connectivism Conference. Retrieved April 29, 2014, from http://www.slideshare.net/gsiemens/connectivismonline.
Severance, C., Hardin, J., & Whyte, A. (2008). The coming functionality mash-up in Personal Learning Environments. Interactive Learning Environments, 16(1), 47-62.
Taylor, P. C., Fraser, B. J., & Fisher, D. L. (1997). Monitoring constructivist classroom learning environments. *International Journal of Educational Research, 27*(4), 293-302.
Turker, M. A., & Zingel, S. (2008). Formative Interfaces for Scaffolding Self-Regulated Learning in PLEs. *eLearning Papers, 9.*
U.S. Department of Education (2010), Individualized, Personalized, and Differentiated Instruction Retrieved April 27, 2014 from https://www.ed.gov/technology/draft-netp-2010/individualized-personalized-differentiated-instruction
Wagner, T. (2008). The Global Achievement Gap: Why Even Our Best Schools Don't Teach

the New Survival Skills Our Children Need--And What We Can Do About It. Basic Books.

Wilson, S. (2008). Patterns of Personal Learning Environments. Interactive Learning Environments, 16(1), 17-34.

Zenios, M., & Goodyear, P. (2008). Where is the Learning in Networked Knowledge Construction? In Proceedings of the 6th International Conference on Networked Learning. Halkidiki, Greece.

Zhou, H. (2013). Understanding Personal Learning Environment: A Literature Review on Elements of the Concept. In R. McBride & M. Searson (Eds.), Proceedings of Society for Information Technology & Teacher Education International Conference 2013 (pp. 1161-1164). Chesapeake, VA: AACE.

Zimmerman, B. (2008). Investigating Self-Regulation and Motivation: Historical Background, Methodological Developments, and Future Prospects. *American Educational Research Journal*, 45(1), 166-183.

Editor Bios

Richard E. Ferdig is the Summit Professor of Learning Technologies and Professor of Instructional Technology at Kent State University. He works within the Research Center for Educational Technology and also the School of Lifespan Development and Educational Sciences. He earned his Ph.D. in Educational Psychology from Michigan State University. He has served as researcher and instructor at Michigan State University, the University of Florida, the Wyzsza Szkola Pedagogiczna (Krakow, Poland), and the Università degli studi di Modena e Reggio Emilia (Italy). At Kent State University, his research, teaching, and service focus on combining cutting-edge technologies with current pedagogic theory to create innovative learning environments. His research interests include online education, educational games and simulations, the role of faith in technology, and what he labels a deeper psychology of technology. In addition to publishing and presenting nationally and internationally, Ferdig has also been funded to study the impact of emerging technologies such as K-12 Virtual Schools. Rick was the founding Editor-in-Chief of the *International Journal of Gaming and Computer Mediated Simulations*, is the current Associate Editor-in-Chief of the *Journal of Technology and Teacher Education*, and also serves as a Consulting Editor for the Development Editorial Board of *Educational Technology Research and Development* and on the Review Panel of the *British Journal of Educational Technology.*

Kathryn Kennedy is a Senior Researcher for MVU's Michigan Virtual Learning Research Institute where she conducts and manages multiple research projects pertaining to K-12 online and blended learning. Kennedy formerly served as the Director of Research for the International Association for K-12 Online Learning (iNACOL). Her practical experiences and research interests include educator professional development for technology integration and instructional design in traditional, blended, and online learning environments. Together with her co-author, Dr. Leanna Archambault, she co-chairs the Virtual Schooling SIG for the Society for Information Technology and Teaching Education (SITE). Archambault and Kennedy won the 2012 Online Learning Innovator Award for Outstanding Research for iNACOL. Additionally, Archambault and Kennedy are the founding Editors-in-Chief of the *Journal of Online Learning Research*, a peer-reviewed, international, open source journal published by the Association for the Advancement of Computing in Education (AACE). Kennedy also co-edits for the K-12 section of eLearn Magazine, which is published by the Association for Computing Machinery (ACM). She received a Ph.D. in curriculum and instruction with a concentration in educational technology from the University of Florida. Learn more about her work at http://www.kathrynmkennedy.com

Author Bios

Md Amiruzzaman is a doctoral student in mathematics education at Kent State University. His primary research interest lies in students' understanding of mathematics. He is presently concentrating on teaching experiment to explore students understanding.

Leanna Archambault, Ph.D., is an Associate Professor at Arizona State University. Dr. Archambault's research areas include teacher preparation for online and blended classrooms, the nature of technological pedagogical content knowledge, and the use of innovative technologies to improve learning outcomes. Most recently, she has collaborated on the Hartwell Sustainability Education Project to create, teach, and study a newly developed blended course, Sustainability Science for Teachers. Together with her co-author, Dr. Kathryn Kennedy, she co-chairs the Virtual Schooling SIG for the Society for Information Technology and Teaching Education (SITE). They won the 2012 Online Learning Innovator Award for Outstanding Research.

Michael K. Barbour is the Director of Doctoral Studies for the Isabelle Farrington College of Education at Sacred Heart University. He has been involved with K-12 online learning in a variety of countries for well over a decade as a researcher, teacher, course designer, and administrator. Michael's research focuses on the effective design, delivery and support of K-12 online learning, particularly for students located in rural jurisdictions.

Jered Borup is an assistant professor in the Division of Learning Technologies at George Mason University. He earned his Ph.D. in Instructional Psychology and Technology from Brigham Young University in 2013. Jered has taught online and blended courses since 2008 and was a history teacher at a junior high school for six years. In his current position, he is working to build the Integration of Online Learning in Schools Master's and Certificate program (http://learntech.gmu.edu/). His current research interests include developing online learning communities and identifying support systems that adolescent learners require to be successful in online environments. A full list of his publications can be found at https://sites.google.com/site/jeredborup/.

Brenda Boyer is the high school librarian and Chair of the Information & Technology Resources Dept. for the Kutztown (PA) School District. She teaches information literacy, research and library science topics in brick and mortar and online settings. Brenda has presented at conferences such as AASL, ISTE and iNACOL on topics such as embedded librarianship, flipped instruction, and social media curation. She is currently a part-time instructor at Rutgers University and is completing her doctorate in Instructional Design for Online Learning at Capella University. She can be contacted at boyer.brenda@gmail.com, or followed @bsboyer on Twitter.

Craig Buschner has been teaching at CSU, Chico since 1989 and has spent 40 years in the profession. His areas of expertise include elementary physical education, research on teaching and learning, online physical education, curriculum theory and design, and teacher education. Originally from Washington, DC, Craig was assistant and associate professor at the University of Southern Mississippi and completed visiting professorships at the University of Texas-Austin and the University of Denver. His professional service includes numerous presentations at state, district, national and international conferences and the publication of book chapters and articles to include *Journal of Teaching Physical Education, Quest, Journal of Classroom Interaction, Contemporary Education,* and the *Journal of Physical Education, Recreation and Dance (JOPERD)*, among others. He has served on the editorial boards of *JOPERD, The Physical Educator and the Journal of Teaching in Physical Education*. He authored the book, *Teaching Children Movement Concepts and Skills: Becoming a Master Teacher* (1994) Human Kinetics. Buschner is a former national instructor for the "American Master Teacher Program". Additionally, Buschner was instrumental in the writing of the NASPE (National Association for Sport & Physical Education) *Guidelines for Advanced Programs*. Craig served from 2003-2009 on the NASPE (now SHAPE) Board of Directors and served as the President, and national spokesperson from 2007-2008. Craig spoke to numerous organizations and groups in the United States about the need for quality physical education for all.

Cathy Cavanaugh is Director of Teaching and Learning in Worldwide Education at Microsoft Corporation, working with education leaders and organizations around the world to accelerate learning and teaching by transforming education with cloud and mobile technology.
Cathy's previous roles include academic leadership in higher education in the Middle East during a national mobile learning program, and work as a professor of educational technology in US universities. She was a Fulbright Senior Scholar advancing e-learning in Nepal. She has developed successful and innovative online degree and professional development programs, and blended learning programs for K-12 students. She also directed professional development centers in the US, and was a classroom teacher in the US and Caribbean. Cathy's research and her 150 published books, chapters, articles, and papers focus on technology-empowered teaching and learning in virtual schools, online and blended learning, teacher development, mobile learning, and integration of devices into schools. Her work has been recognized for its impact

with international awards. Cathy is a frequent speaker at education events on these topics. She has consulted on educational technology with national and state governments, universities, schools, and organizations. She serves as associate editor of the Journal on Online Learning Research, and is a member of editorial board of Association for Computing Machinery eLearn Magazine. Her education includes a Ph.D. in Curriculum and Instruction, a Master of Education, and a Bachelor of Education.

Nancy Fichtman Dana is Professor of Education in the School of Teaching and Learning in the College of Education at the University of Florida. Her research focuses on teacher and administrator professional development with a particular focus on practitioner inquiry. She has published 9 books and over 50 articles and book chapters on the topic, and most recently, has studied the ways K-12 virtual school teachers use the practitioner inquiry process to better understand teaching in the virtual school environment. Dr. Dana has received many honors including the Association of Teacher Educator's Distinguished Research in Teacher Education Award and the National Staff Development Council (NSDC) Book of the Year Award.

David N. Daum, Ph.D., is an Assistant Professor at the University of Southern Indiana. Dr. Daum's research areas include K-12 blended and online physical education curricula, how that curricula is implemented and the impact of that curricula. In addition he is interested in how technology is defined and utilized in face-to-face classrooms and in the preparation of future teachers. He is particularly fascinated with blended and online physical education because of its rapid growth with no apparent guidance. For future research projects he would like to examine K-12 blended and online physical education courses impact on student learning and physical activity levels.

Kara Dawson is a Professor of Educational Technology in the School of Teaching and Learning at the University of Florida. Her scholarship focuses on the ways educational technologies influence teaching and learning within the contexts of K-12 education and online post-secondary environments. She has published over 100 articles in journals such as the *Journal of Educational Computing Research, Internet in Higher Education, Journal of Research on Technology in Education, British Journal of Educational Technology, American Journal of Distance Education,* and the *Journal of Distance Education*. She has also secured over 3 million dollars in external funding and has been recognized for her research and mentoring accomplishments by the University of Florida. She has also served as the Chair of one of AERA's largest special interest groups, SIG TACTL (Technology as an Agent of Change in Teaching and Learning) and serves on review boards for numerous journals including *Educational Technology Research and Devel-*

opment and *Journal of Research on Technology in Education.*

Terry Diamanduros is an Associate Professor of School Psychology in the College of Education at Georgia Southern University where she teaches both face-to-face and online courses. She received her doctorate degree in School Psychology from New York University. She is an active member of the Georgia Association of School Psychologists (GASP) and the National Association of School Psychologists (NASP). Dr. Diamanduros served on the Executive Board of the Georgia Association of School Psychologists from 2010-2012 and also served in NASP leadership as a NASP delegate representing the state of Georgia from 2011-2014. She is presently a manuscript reviewer for several journals including the *Journal of Online Learning Research*. Some of her research interests include the role and training needs of school psychologists in online K-12 schools, social communication among students in online courses, the role of technology on adolescent development, cyberbullying and its impact on youth, the role of school psychologists in cyberbullying prevention, and the impact of trauma on children and adolescents.

Wendy Drexler, ISTE's Chief Innovation Officer, has over 20 years of K20 experience in multiple roles. She has been a champion for effective integration of technology in K-12, higher education, and corporate settings. Wendy has taught elementary, middle, and high school, as well as undergraduates and graduate students. In her former position as Director of Online Development at Brown University, she led the design and production of Brown's first online courses. She managed the research portion of the Enhancing Education Through Technology (EETT) federal Title II grant across 23 school districts in Florida. Prior to earning a Ph.D and Ed.S in educational technology, Wendy managed eLearning design teams at IBM and AT&T. Her research interests include student construction of personal learning environments, balancing teacher control with student autonomy, and advancing the processes that support networked learning.

Jeff S. Drysdale graduated from Brigham Young University with a Ph.D. in Instructional Psychology and Technology. He has assisted with blended learning courses at BYU and has taught high school students for nine years. His research interests focus on the interpersonal relations within K-12 online and blended learning environments that contribute to student success.

Bryan Dykman is a program associate at the Center for Online Learning and Students with Disabilities. His work includes writing, editing, designing, and managing Center publications and reporting findings from the Center's work to funding agencies.

Lee Graham is an Associate Professor of Educational Technology at the University of Alaska, Southeast. She teaches the courses in the Educational Technology Master's Program and has served as the Program Coordinator for the STEM Program. Dr. Graham was a finalist for the Bammy Award for College Professor of the year in 2014, and was awarded Teacher of the Year by Liverpool University for her work in their online Ed.D. Program in 2011. Her work with online course design yielded her the award of Platinum Award for Best Practices in Online Programming in 2007. Dr. Graham's research and creative activity centers on emerging online pedagogy and innovative practice. She is a member of the Editorial Review Board for the Association for the Advancement of Computing in Education's (AACE) *Journal of Online Learning Research.* You may foller her on Twitter at @ak_leeg and on Google+ at https://plus.google.com/u/0/+LeeGrahamAK/posts.

Diana Greer, PhD, is a former assistant research professor in the Center for Research on Learning and the Project Director of the Center on Online Learning and Students with Disabilities at the University of Kansas. She was also a professor by courtesy in the Special Education department where she taught courses on teaching strategies for working with students with high incidence disabilities. Her research interests were in cognitive load theory, the alignment and access of online learning resources with state and national standards, and the development and evaluation of online resources for teachers, students, and parents. She has authored or co-authored numerous journal articles and book chapters reporting on the perceptions and perspectives of various stakeholders in online learning and how educators and policy makers can and should approach the promises and challenges of online learning for students with disabilities. Currently, Dr. Greer is a coordinator for special education services for a school district in Kansas.

Lisa Hasler Waters received her Ph.D. in Educational Technology from the University of Hawaii. She is currently a 1:1 Technology Integrator at Flint Hill School - an Apple Distinguished K-12 independent school in Northern Virginia. In this role, she guides teachers along the continuum of technology integration helping them transform their teaching practices with meaningful use of technology. She also works with students helping them to wisely navigate and use technology for learning. Previously, she was a research associate for the Institute for Alternative Futures, where she focused her research on educational futures. She has over 10 years experience as a research and instructional design consultant specializing in K-12 online and blended learning. Additionally, she has over 5 years experience as a K-8 teacher. Her research agenda focuses on educational futures, K-12 online/blended learning, technology and pedagogy, and parental involvement in online learning.

Rebecca Kelly is the high school librarian in the Quakertown Community School District in Pennsylvania. She has served as the district Technology Integration Coach and was an integral member of the team who developed and implemented their award winning online program, blended program, 1:1 and BYOD initiatives. In addition to her work in Quakertown, she serves as the International Association for K-12 Online Learning (iNACOL) Northeast Regional Committee Co-Chairperson and a technology committee member for the Pennsylvania Association for Supervision and Curriculum Development (PASCD). She serves on the executive board of PASCD Delaware Valley Region, on their professional development committee, and was awarded the title of ASCD Emerging Leader for 2013. She has presented at various conferences at the county, state and national level in the areas of promising practices in online learning, blended learning, library program integration, social media for professional development, Web 2.0 Tools and library-teacher-administration collaboration for student academic success. She holds an undergraduate degree in Education from Bloomsburg University, with school library science certification from Kutztown University. Her graduate work was at the University of Pittsburgh where she earned a Master in Library and Information Science, and certification in Educational Leadership from Pennsylvania State University.

Karl W. Kosko is an assistant professor in mathematics education at Kent State University. His program of research centers on mathematical communication with a focus on student engagement in and teacher facilitation of whole class discussion, and students' mathematical writing. This line of research also includes study of the individual and social resources, such as technology, which teachers and students operationalize in their engagement in mathematical communication.

Randy LaBonte has been a senior level executive for over 30 years in the education sector, works and teaches online. His doctoral research led him to take on the role of lead consultant and researcher for seven years at the BC Ministry of Education and was on a team that researched distance education for the Alberta government. He was central in development of policy, agreements, and e-learning standards as well as led the design and implementation of the Quality Review process for BC online K-12 schools. He presently teaches online courses for Vancouver Island University and recently took on the role of Acting Chief Executive Officer for the Canadian eLearning Network (http://canelearn.net) while continuing his other contract work.

Susan Lowes is Director of Research and Evaluation at the Institute for Learning Technologies at Teachers College, Columbia University. She has conducted research at both the university and K-12 levels, with a focus on the impact of technology on teaching and learning, and directed evaluations of multi-year projects funded by the U.S. Dept. of Education, the National Science Foundation, state and local departments of education, and private foundations. She is particularly interested in online learning and has evaluated online professional development initiatives for teachers and administrators, as well as online courses and programs for students. Her recent focus has been on teaching students how to learn online, using the concept of locus of control, and on the use of LMS data to discover patterns of student and teacher interaction. Dr. Lowes is also Adjunct Professor in the Program in Computers, Communication, Technology, and Education at Teachers College, teaching a course on online schools and online schooling and a course on methodologies for researching technology and education. She received her Ph.D. in Anthropology from Columbia University for work on the island of Antigua in the West Indies and still does some research there when she has some spare time.

Dorit Maor has over two decades of research and teaching in educational technology and mobile learning and has supervised many doctoral students to completion. Her teaching and research expertise is in the area of eLearning, in particular the integration of innovative pedagogies with new technologies and the changing roles of the teacher and the learner with the use of social learning. Dorit turned her online teaching experience into research on how to optimize teachers' online pedagogies and how to create a community of learners to achieve cognitive gain. Her special interest eLearning developed from the use of multimedia in the science classroom to the implementation of mobile learning with K-12 students. Her rigorous qualitative research approach resulted in publications in refereed journals, book chapters and conference presentations. For more information about Dr. Maor, view her full profile at http://profiles.murdoch.edu.au/myprofile/dorit-maor/

Aidan McCarthy, as Director of the Global Digital Learning Strategy team for Microsoft Worldwide Education, works with Ministries of Education, education leaders, policy makers and partners globally to help them realize the teaching and learning potential of Anywhere Anytime Learning. In this role, McCarthy oversees a worldwide team of black belt experts to enable Microsoft's vision for education in a Mobile First, Cloud First world. Aidan has a Master of Learning Technologies degree and is completing Doctoral research on developing educators in Children's Hospitals to expand their digital pedagogies in mobile learning technologies for their practice. Aidan has worked in education for over 25 years, teaching, leading schools and directing 1:1 learning programmes. During 2001 - 2007 Aidan worked with Microsoft focused on eLearning in the US and transitioned to Europe, Middle East, and Africa as the Learning Solutions Manager before returning to the US as the WW Managing Director. Aidan returned to Australia as CIO for two of Australia's top international schools in his home state of Western Australia driving their 1:1 learning programs. In 2010 Aidan joined the Apple WW Education team and led the WW Strategic Initiatives Group. Aidan returned in 2014 to his current role at Microsoft. Aidan is a recognised public speaker and well known for his work in helping universities, Ministries of Education, schools and education leaders to effectively plan, implement, integrate and evaluate learning with Information and mobile learning technologies. His strategic planning has assisted in the development of education policy directions for governments and Ministries of Education throughout the world.

Lauren Sobolewski McMahon is a Ph.D. candidate at Kent State University in Curriculum and Instruction with a focus in Middle Childhood Mathematics Education. Her primary research is centered on the Common Core Student Standards for mathematical practices. She is presently focusing on middle school teachers' personal engagement with these standards.

Scott McLeod, J.D., Ph.D., is widely recognized as one of the nation's leading experts on K-12 school technology leadership issues. After 14 years as an Educational Leadership professor, Dr. McLeod currently serves as the Director of Innovation for Prairie Lakes Area Education Agency in Iowa. He also is the Founding Director of the UCEA Center for the Advanced Study of Technology Leadership in Education (CASTLE), the nation's only academic center dedicated to the technology needs of school administrators, and was a co-creator of the wildly popular video series, *Did You Know? (Shift Happens)*. He has received numerous national awards for his technology leadership work, including recognitions from the cable industry, Phi Delta Kappa, the National School Boards Association, and the Center for Digital Education. In 2011 he was a Visiting Canterbury Fellow at the University of Canterbury in New Zealand. In 2013 he received the Technology Leadership Award for the state of Iowa. Dr. McLeod blogs regularly about technology leadership issues at *Dangerously Irrelevant* and is a frequent keynote speaker and workshop facilitator at regional, state, national, and international conferences. He also is the co-editor of the book, *What School Leaders Need to Know About Digital Technologies and Social Media.*

Michael Menchaca is an associate professor in the Department of Learning Sciences and Technology at the University of Hawaii at Manoa. He specializes in online learning and has helped create and establish successful online programs at multiple institutions for more than ten years. He publishes research on online learning, social justice with technology, and integrating technology into teaching and learning. Dr. Menchaca has published in some of the field's most significant journals and has also written chapters and co-edited books for the *International*

Society for Technology in Education, which sets standards for technology integration in K-12 environments. He has consulted for numerous schools, districts, and county and state offices. He has served as principal investigator for several state and federal grants. Dr. Menchaca was also an IT specialist for many years, specializing in network management.

Amy Murin is the former Senior Researcher for the Colorado-based Evergreen Education Group, and was one of the lead researchers and writers for *Keeping Pace with K-12 Digital Learning*, the group's annual report. Through Evergreen she wrote state reports for California, Colo¬rado, Missouri, and others, and worked with leading organizations in the field to better understand some of the challenges facing the expansion of high-quality digital learning options for K-12 students, including teacher licensing, the role of charters in virtual schooling, online learning funding, and quality and accountability. Amy has an extensive background in elemen¬tary education, nonprofit management, research, and writing. She received an undergraduate degree in Elementary Education and Social Sciences from Vanderbilt University, and a master of Nonprofit Management from Regis University.

W. Ian O'Byrne is an Assistant Professor of Educational Technologies at the University of New Haven. Ian is the coordinator of the Instructional Technology and Digital Media Literacy program at the University of New Haven. He is currently a member of AERA, IRA, and LRA, NCTE. He currently serves on the Policy and Legislative Committee as well as the Area 10 Co-Chair and e-editor for LRA. He also serves on the Literacy, eLearning, Communication, and Culture Committee for IRA. He is the current Department Editor for Multiliteracies: Production and Consumption for the *Journal of Adult and Adolescent Literacy*. His research examines the literacy practices of individuals as they read, write, and communicate in online spaces. You can follow him online on Twitter (@wiobyrne), Google+ (https://plus.google.com/u/0/+IanOByrne/posts), and at his blog (wiobyrne.com).

Colin Osterhout recently completed his M.Ed. from the University of Alaska Southeast. In the past he has worked as a systems administrator and technology specialist for school districts across the state of Alaska. He currently splits his time between working to improve access to outdoor education in Southeast Alaskan schools and parenting.

Kristine E. Pytash is an assistant professor in Teaching, Learning and Curriculum Studies at Kent State University's College of Education, Health, and Human Services, where she co-directs the secondary Integrated Language Arts teacher preparation program. She was a former high school English teacher. Her research focuses on the literacy practices of youth in alternative schools and juvenile detention facilities, disciplinary writing, and preparing teachers to teach writing. Her recent work has appeared in the *Journal of Adolescent & Adult Literacy, English Journal, Voices from the Middle*, and *Middle School Journal.*

Jeanne B. Repetto is an Associate Professor in the School of Special Education, School Psychology and Early Childhood, College of Education at the University of Florida. Dr. Repetto teaches courses in transition, teaching strategies, and oversees the University of Florida's EdHCT: Education Health Care Transition Graduate Certificate. Her research interests lie in the areas of secondary/transition education relating to community, employment, and personal/social choices; Education/Health Care Transition; online at risk learners and student outcomes. Dr. Repetto's work in Transition Education includes having served as the PI of the Florida Transition Center for 19 years, receiving funding for over 10 million dollars in grants. She has written 2 books, 8 chapters and 30 referred journal articles. She is a past president of the International Division on Career Development and Transition (DCDT). She is a recipient of the National Donn Brolin Award for state leadership in transition and the Florida Transition Champion Lifetime Achievement Award. She is a founding member and currently serves as co-chair of ICHET: The Interdisciplinary Collaborative on Healthcare and Education Transition.

Kerry Rice is a 2012-2013 Senior Fulbright Scholar and Professor in the Department of Educational Technology at Boise State University. She is author of *Making the Move to K-12 Online Teaching: Research-Based Strategies and Practices* (Pearson, 2012). As an advocate for reform in public education, her passion and scholarship center on policy, practice and research in the field of K-12 online education. She led the development of the Idaho K-12 Online Teaching Standards for the Idaho K-12 Online Teaching Endorsement, and was a founding member and served as Vice President of the Board of Directors for INSPIRE Connections Academy virtual charter school. Her research focuses on best practices in K-12 online education with articles appearing in the *Journal of Research on Technology in Education (JRTE), the Journal of Educational Technology and Societ*y (JETS), and the *British Journal of Educational Technology* (BJET), among other publications. She has presented at numerous national and international conferences including those of the *International Association for K–12 Online Learning Virtual School Symposium* (iNACOL, VSS), *the Association for Supervision and Curriculum Development* (ASCD), the *Society for Information Technology and Teacher Education.*

Mary Rice is interested in teacher/teacher educator identities and literacies as they apply to diverse learners and diverse learning contexts. Her book *Adolescent Boys' Literate Identity* was named 2012 Publication of the Year by the Narrative SIG of the American Educational

Research Association. Her current book project, *Advances in Research on Teaching: Exploring Pedagogies for Diverse K12 Online Learners*, is slated for publication in 2016.

Jayson Richardson is a Director of the Center for the Advanced Study of Technology Leadership in Education (CASTLE) (www.schooltechleadership.org) and an Associate Professor at the University of Kentucky in the USA. He researches leadership, technology, and international development. Jayson teaches in the only program in the US (and possibly the world) dedicated to the leadership side of school technology integration. Contact him at jayson.richardson@uky.edu; Twitter: @Jaysonr

Verena Roberts, BEd, MALT, MET, is a passionate open educator from Calgary, Alberta, Canada. Her teaching career has included public and private k12 schools in Canada and Singapore. She has been lucky enough to teach, develop and consult about curriculum and technology integration from pre-k to Higher Education. Verena has facilitated or developed a wide range of open networked learning projects with a focus on open access to learning and open educational resources. Some of her projects include cMOOCS for educators like #Digifoot12, #OCLMOOC rethinking games based learning in the #Gamified Project and creating sustainable trusting online communities in the Healthy Healers Project in Alaska. She is currently an online teacher with Palliser Beyond Borders in Alberta, the Acting Chief Innovation Officer with CANeLearn (Canadian Association for Online and Blended Learning) and an eLearning/Open Learning Consultant and Instructional Designer . Verena has presented at a wide variety of conferences and is the iNACOL 2013 Award Recipient for k12 Innovation in Blended and Online Learning for developing TheOC@ADLC (The Open Classroom at Alberta Distance Learning Centre).

Carrie J. Spitler is a Transition Specialist for Spring Branch Independent School District in Houston, Texas. Dr. Spitler earned her PhD in Special Education from the University of Florida in December of 2013. During her doctoral program, she worked as a research assistant for NCIPP (The National Center to Inform Policy and Practice in Special Education Professional Development), and subsequently as a graduate assistant for Project PRAIS (Preparing Researchers in Assistive Technology Application in Inclusive General Education Contexts for Students with Significant Disabilities). Her research interests include secondary/post-secondary transition, online education for students with disabilities and/or students identified as at risk, and effective education services for students with significant intellectual and developmental disabilities. Dr. Spitler has published articles in special education and distance education peer-reviewed journals, as well as presented research at a wide variety of scholarly and practitioner-based conferences. In her current position, she works directly with educators, students, families, and representatives of community agencies in order to plan, coordinate, deliver, and evaluate transition education and services at the school and/or district level. She can be contacted at carrie.spitler@gmail.com

Dawn Tysinger earned a Ph.D. in Psychology with a Concentration in School Psychology and a Subspecialization in Counseling Interventions from The University of Memphis in Memphis, Tennessee. Dr. Tysinger has also earned the Nationally Certified School Psychologist credential from the National Association of School Psychologists (NASP). Dr. Tysinger is an Associate Professor in the nationally-recognized and National Association of School Psychologists – Approved School Psychology Program at Georgia Southern University. Before coming to GSU, she practiced in the public schools in both Louisiana and Kansas and served as an adjunct faculty member for Emporia State University in Emporia, Kansas. Dr. Tysinger has contributed to her field through active participation in NASP, publications in school psychology journals, and presentations at the local, state, regional, and national levels. She currently serves on the NASP/NCATE program review board for school psychology programs and as a member of the editorial boards of *Journal of School Psychology, Psychology in the Schools, Trainers' Forum: Journal of the Trainers of School Psychologists*, and *Journal of Online Learning Research.*

Jeff Tysinger is an Associate Professor and Program Director in the nationally accredited School Psychology Program at Georgia Southern University. He has trained school psychology candidates at GSU since 2007. From 2003 to 2007, he was a member of the faculty in the school psychology program at Emporia State University. He has worked as a school psychologist in Anchorage, Alaska and Louisiana in Lafourche Parish. Dr. Tysinger obtained his Ph.D. in school psychology with an emphasis in counseling and interventions from the University of Memphis in 2002 and holds the Nationally Certified School Psychologist credential. His research focuses on ethics, supervision, consultation, crisis work in schools, and the roles of school psychologists in K-12 online learning environments. He serves on the editorial review boards of *Journal of School Psychology* and *Journal of Online Learning Research.* Dr. Tysinger is also a review for the NASP Program Approval Board and the NASP NCSP Review Board.

John Watson is CEO of the Evergreen Education Group, which he founded in 2000. Evergreen is a leading consulting and advisory firm focused on K-12 education, with an emphasis on educational technology, policy research, and market intelligence. John has developed and managed Evergreen's projects with school districts, charter schools, state agencies, private schools, state virtual schools, non-profit organizations, and content and technology companies.

John is the lead researcher and writer for Evergreen's annual national education policy report *Keeping Pace with K-12 Digital Learning*. He has also written state education reports for California, Michigan, Missouri, and Maryland. John's work has been cited in the New York Times, Wall Street Journal, USA Today, Education Week, and many other media outlets. He has been invited to advise state legislators, boards of education, and commissions in Maine, Idaho, Iowa, Missouri, and elsewhere. He is a frequent speaker at conferences including the iNACOL Blended and Online Learning Symposium, the Association for Supervision and Curriculum Development, and the National School Boards Association. He has planned and delivered training days for educators in California, Colorado, Michigan, Minnesota, Idaho, Tennessee, and elsewhere. Prior to founding Evergreen, John was director of business development for eCollege. He has also taught science in an outdoor school in Colorado, tutored students in Hawaii, and led students on experiential adventures in Maine, Vermont, and Belize. In addition to education, he has worked in fisheries biology and a variety of natural resource and conversation positions. John holds a BA from Middlebury College and an MS and MBA from the University of Michigan.

Index

ability, abilities 34, 71, 73-74, 86, 87, 93, 119, 124, 136, 140, 157, 168, 183, 186-189, 192, 210, 217, 254, 269-271, 269-273, 292-294, 316, 325, 331-332, 334-335, 327, 339, 378, 382, 395, 396, 406, 417, 419, 423-424, 426, 432, 448, 450, 458, 461
academic, academics 2, 20, 39, 61, 65, 72, 79, 84, 85, 99-100, 102-103, 110, 112, 116, 118-122, 131-132,139, 151, 155, 158, 174-175, 186-187, 193, 197, 201, 213, 215, 263, 279-280, 289, 304, 306-307, 311-312, 316-317, 319, 321-322, 327, 337, 339, 345, 348-350, 352-353, 355, 359-360, 370, 373-375, 378, 380-381, 383-384, 386-387, 394, 396, 399, 401-402, 415- 416, 419, 422, 443, 464, 471, 475, 477
academic standards 61
Academy 5, 20, 56, 212, 218, 238, 368-369, 422, 428, 441-442, 479
access 3, 5, 9, 11, 27, 29, 32, 37, 39-40, 47, 53-54, 56-59, 62-66, 72-74, 78, 86, 99, 118-120, 122-123, 133, 136-137, 151-152, 154, 156, 158, 164-165, 167, 170, 174, 182, 184, 189, 213-215, 236, 270, 283, 304, 308, 314, 328, 342, 350, 358, 360, 365, 373, 377-379, 381, 383-384, 392, 394, 398-399, 404-405, 408, 418, 420-421, 425-426, 428-429, 431-432, 439-440, 443, 448, 451-452, 454-455, 458-460, 462, 474, 478, 480
accessible 53, 62, 123, 155, 189, 353, 372, 392, 402, 406, 416, 418, 423, 436, 449
accountability 51, 53-63, 65, 68, 72-73, 75, 77, 114, 208, 293, 354, 420, 459, 478
accounting 28, 35, 285, 294
accredited 238, 255, 425, 481
Acting 425, 475, 480
active 39-40, 115, 185-186, 204, 206-207, 212, 218, 247, 252, 273-274, 277, 279, 307-308, 310, 318, 372, 425, 429, 441, 473, 481
activity, activities 2-3, 10, 19, 26, 36, 39, 56, 59, 90-91, 97-98, 99-100, 113-114, 118, 120, 122-123, 168, 181-182, 186, 193, 202, 204, 203-204, 206-210, 212, 214-215, 217-219, 227, 235, 253, 262, 274, 305, 307, 312, 326, 327, 329, 332-334, 343, 346, 351, 353, 361, 370, 372-373, 387, 395, 399, 406, 420, 423, 429, 432, 455-457, 472, 474
adaptable 151, 349
adaptation 263, 347, 355, 406, 433
adapted 219, 351, 389, 424, 427
adapting 46, 248, 314, 399
adaptive 61, 66, 70, 168, 352, 395, 397
Adolescent 127-128, 181, 194-195, 197, 200, 321, 323, 339-340, 470, 473, 478-479
adopted 70-71, 227, 249, 267, 357, 389, 403, 406, 422

adopting 286, 362, 366, 390, 400, 419, 458
adoption 52, 55, 60, 73, 148, 394, 398, 407, 419, 424, 428, 435
adulthood 127
adults 107, 129, 131-132, 370, 405, 427, 447
advantage 11, 61, 114, 152, 154, 213, 276, 288, 314, 320, 351, 370, 424, 452, 462
advantages 57, 88-89, 153, 181, 202, 339, 371
advocacy 85, 165, 209, 263, 286, 374
advocate, advocates 26, 32, 34, 74, 112, 150, 212, 297, 330, 376-377, 404, 479
advocated 53, 66, 122, 140, 165, 234, 251, 294
affordable 66, 72, 404
Africa 476
agencies 3, 19, 57, 60, 67, 122, 356, 358, 360, 473, 481
agreements 72, 428, 436, 475
Alabama 5, 14, 20, 68, 86, 342
Alaska 415, 474, 478, 480-481
Alberta 33-34, 44, 384, 418, 427, 430, 435, 437, 441, 475, 480
Algebra 18, 86-87, 95, 99, 101, 103, 158, 163-164, 166-168, 173-176, 333, 344
aligned 61, 87, 168, 237, 252, 365, 379, 396, 436
alignment 142, 474
America, American 25-27, 31-33, 35, 37-39, 43-44, 46-47, 53-54, 54-55, 57-60, 66, 67, 75, 79, 101-102, 104, 127, 130, 132-133, 157-158, 173-175, 198, 202, 203, 206, 211, 212, 218, 239, 243, 258, 260-261, 263-265, 280-281, 298-301, 320, 341-344, 357, 360, 362-363, 367, 379, 383-384, 407-408, 413, 430, 438, 442-445, 463, 465-466, 471-472, 479
Amsterdam 176, 438
analyses 89, 95, 99, 101, 361
analysis 45, 53, 62, 83-85, 88-89, 91, 93-100, 102, 112, 115, 124, 131, 140, 142, 156-157, 173, 175, 193, 199, 210, 219, 251, 261, 278, 280, 288, 300, 331, 334, 339, 350-353, 363, 396, 399, 405, 409, 411, 435, 439, 447, 465
analytic 62, 97
analytical 61, 97
analytics 46, 60-62, 72-73, 80, 83, 98, 353
analyze 55, 97-99, 125, 171, 253, 351, 396
analyzed 84, 89, 92, 97, 99, 313-314, 329, 332, 351
analyzing 83, 92, 97, 115, 248, 288
animations 422

anytime 57, 59, 385, 387, 392, 396-397, 406, 476
anywhere 30, 57, 59, 136, 385, 387, 392, 397-398, 406, 476
applets 166-167, 172
approaches 36, 56, 63, 83-85, 100, 140, 171, 179, 182, 192, 228, 237, 246, 261, 277, 337, 350, 378, 393, 395, 402-403, 405, 418, 421, 423, 426, 429, 432
Arizona 7, 61, 219, 225, 228, 322, 470
Arkansas 5, 15, 68, 133
artifacts 152, 426, 430, 450, 454
assess 67, 88, 185, 206-207, 210-211, 216, 227-228, 288-289, 292, 326, 381
assessed 167, 355
assessing 57, 206, 241, 290, 293, 341, 363, 381, 387
assessment 20, 55-56, 59-61, 70, 77, 87, 110, 124, 134, 175-176, 206, 214, 218, 226, 229, 234, 237, 251, 296, 333, 347-349, 351-352, 373, 379-381, 386, 388, 395-397, 400, 404-406, 431, 436, 455, 457, 459, 461
assignment 87, 269, 350, 352
assistance 54, 108, 132, 296, 317, 327, 335, 356, 366, 372, 376, 378, 381, 383
assistant 86, 470-472, 474-475, 478, 480
athletes 308
at-risk 11, 91, 95, 101, 105, 107-110, 112, 114-115, 118-127, 129-130, 134, 215, 252, 258, 278, 293, 308, 334-337, 340, 348, 363
attendance 18, 58, 60, 62, 68-69, 75, 110, 173, 327, 398
attention 19, 34, 69, 98, 155, 161, 165, 171, 192, 211, 234, 249, 254, 268, 270-271, 276, 287, 291, 296-297, 307, 325, 359, 395, 400, 403, 455, 461
attitude, attitudes 87, 89, 102, 174, 176, 193, 209, 218-219, 244, 258, 299, 394, 374, 397, 408, 419, 448
attrition 87, 325-326, 338-339, 344
audience, audiences 27, 183-184, 185, 187, 190, 197, 198, 423-424, 436
Auditor 9, 21, 85, 103
augmented 390, 395, 407, 420
Australia 27, 30, 32, 34, 36-37, 43, 46, 48, 157, 241, 399, 407, 409, 465, 477
authentic 183, 188, 190, 216, 227-228, 237-238, 274, 288, 371, 375, 379, 382, 395-397, 404-405, 407, 430, 434, 437
autism 136, 153, 158
automated 168, 171, 377, 379-380
autonomy 64, 396, 419-420, 447, 455, 457-458, 463, 473
awareness 66, 122, 183, 202, 235, 252, 270, 419, 428, 436, 462

badges 436
barriers 40, 46, 52, 57, 70, 194, 247, 293, 358, 416, 418-419
baseline 73, 297, 350
behavior, behaviors 62, 95, 99-100, 115, 118-119, 121-122, 175, 199, 204, 209, 251, 269, 290, 304, 307-308, 313-314, 314, 316, 320, 332-333, 350-351, 351 371, 386, 454, 457-458, 460, 463
behavioral 114, 118-119, 127-128, 131, 133, 158, 177, 274, 278, 348-349, 352, 360, 411
belief, beliefs 32, 54-55, 60, 68, 94, 211, 217, 228, 248, 260, 276, 413, 419, 425, 461, 462, 464
benefit, benefits 86, 88, 91, 95, 122, 126-127, 129, 169, 171, 202, 204, 209, 211, 248, 259, 267-269, 275, 287, 276, 289, 291, 330, 334, 337, 357, 373, 391, 398, 399, 403, 405, 435, 436, 440, 459
bilingual 199, 261
biology 99, 103, 263, 482
Blackboard 27, 99
blended 1-4, 10-16, 19-21, 23, 25-27, 29-34, 36-40, 42-43, 45, 47, 49, 51-53, 56-64, 66-69, 71, 73, 75-76, 80, 85-86, 99, 105-106, 109-110, 112, 114-115, 120, 122-126, 135-136, 140-141, 151, 153-154, 161-164, 166-173, 179-183, 187, 189-194, 196, 199, 201-204, 206-218, 223-228, 234, 237-241, 250, 254-256, 258, 261, 263, 265, 268, 274-278, 283-297, 303-305, 307, 309, 311-312, 316, 318, 320-321, 323, 326, 328, 339, 341-342, 345, 347, 350-351, 353-354, 358-360, 365-367, 369-370, 372-373, 375-377, 383, 387, 389-390, 392, 408-409, 415-416, 418, 420-421, 435, 437, 439-440, 443-444, 457, 459, 462, 469-475, 480, 482
blended learning 1-4, 10-16, 19-21, 23, 25-26, 29-34, 36-40, 42-43, 45, 49, 51-53, 56-60, 62-64, 68, 71, 73, 75-76, 80, 105, 109, 112, 114-115, 122-126, 135, 140-141, 153-154, 161, 163-164, 167-170, 172-173, 179-182, 187, 191-194, 196, 199, 204, 210, 223-225, 234, 240, 250, 255-256, 258, 261, 263, 265, 283-287, 290-291, 293-297, 303-305, 307, 309, 316, 320-321, 323, 326, 339, 341-342, 345, 347, 353-354, 358-360, 365-366, 373, 375, 389, 408-409, 415-416, 420-421, 435, 437, 439-440, 443, 457, 459, 462, 469, 471, 473-475, 480
blogging 181, 183, 198
budgeting 58, 297
bullying 215, 284, 308, 362
calculator 164-165
California 11-12, 14, 19, 21-22, 25, 44, 201, 321-322, 344, 464, 478, 482
campus 288, 306, 308, 344

Canada 27, 30, 32-34, 36-37, 41-43, 95, 384, 412, 420, 428, 439, 443, 480
capella 362-363, 471
career 2, 61, 66, 70, 117, 127-129, 131-133, 157, 211, 215, 236-237, 255, 267-268, 320, 370, 376, 392, 400, 479-480
Carnegie 194, 218
Carolina 5, 15, 20, 68, 71, 91-92, 95, 98, 102, 164, 174, 177, 408
Catholic 293, 299
challenges 2, 6, 8, 40-41, 49, 56, 65, 72, 90-91, 97, 109, 132, 134, 181, 184, 189-190, 192, 194, 198, 203-204, 208, 211, 226, 241, 246, 248, 259, 264, 267-270, 286, 289, 292, 297-298, 300, 309, 314, 316, 333, 338, 341, 345, 348, 352-353, 355, 358, 377, 380, 387, 405, 411, 417, 422, 425, 428-429, 438, 440, 458, 464, 474, 478
change 9, 16, 34, 43-44, 47, 52-53, 56, 59, 68-69, 72, 74-75, 78, 80, 88, 103, 185, 187, 193, 215-216, 238, 246, 248-249, 253, 260, 263, 278, 284, 294, 296, 301, 349-350, 358, 401, 403, 417, 419, 421, 428, 441, 450, 457-458, 460-463, 465, 472
charter 2-3, 8-10, 13-15, 18-19, 33-34, 44, 55-56, 59, 63-65, 77-78, 94, 96, 101, 104, 112-113, 117-121, 130, 132-133, 136, 150, 156, 158, 170, 173, 250, 290, 299, 304, 306-311, 313, 316, 318, 320-323, 329, 331-332, 343, 360, 362, 479, 481
cheating 218
children 27, 35, 52, 54, 57, 79, 114, 121, 128-129, 131-132, 138, 140, 154, 156-159, 161, 186-187, 194-196, 208, 210, 212-213, 217-219, 284, 303-304, 306-308, 310-315, 317-318, 320-321, 323, 352, 356, 362-363, 392, 398, 404-405, 410, 412, 444, 447, 462, 466, 471, 473, 476
choice 6-8, 33, 45, 47, 55, 62-63, 65, 72-73, 78, 86, 153, 156, 209, 215, 292, 307-308, 310, 318, 418-419, 427, 448, 457
Christian 30, 242, 411
citizenry 53, 373
classroom, classrooms 2-3,10, 12, 13, 29, 45, 48-49, 52, 55, 57-58, 69, 71, 74-75, 83, 85-89, 86, 92, 91-93, 95, 100, 101-103, 102, 112, 118, 122-123, 126-127, 131, 157, 158, 164, 167,168-169, 172, 173, 174, 175-177, 181-182, 182-184, 186-189, 191, 192, 193-196, 198-200, 215, 226-227, 229, 234, 240-241, 246, 248, 255, 259-261, 269, 271-272, 279, 285, 286, 288, 297, 307, 309, 318, 320, 327, 329-330, 332, 335, 336-337, 343-344, 352, 370, 379, 383, 387, 394-395, 385-386, 397, 399, 404, 407, 408, 409, 410, 411, 412-413, 415-416, 419-420, 423-425, 429-431, 434, 436-437, 439-441, 447-449, 452, 457, 460, 462- 465, 470, 471, 472, 476, 480
coaches 96, 151-153, 262, 304, 306, 313-314, 321, 326, 328
coaching 144, 265, 272, 275, 280-281, 290

coding 97, 135, 140, 423, 431
cognition 196, 210, 226-227, 234, 237, 241, 279, 412, 464
cognitive 93, 97, 106, 119, 127, 130, 136, 183, 185, 206-207, 210, 213-214, 216, 227-228, 237, 241, 274, 290, 327, 329, 334, 363, 392, 394-395, 399-400, 461, 474, 476
collaborative learning 127, 192, 200, 382, 394, 402, 406, 413, 444, 450
college, colleges 15, 21, 35, 41, 45, 47, 61, 66, 70, 83, 93, 129, 132-133, 152, 169, 196-197, 200, 207, 215, 236, 239, 247, 258-259, 262-264, 292 298, 301, 307, 316, 320-321, 344, 360, 366, 368, 376, 380, 383-384, 387, 391-392, 400, 406-407, 410, 412, 440-441, 470, 472-476, 478-479, 482
Colorado 6, 9-11, 19-21, 23, 67, 69, 75-78, 85, 102-103, 322, 334, 341, 478, 482
Columbia 19, 27-28, 31-33, 42, 49, 83, 247, 475-476
community 48, 66, 95, 97, 105, 109, 113, 115, 118, 120-121, 123, 127, 133, 184, 211, 249-250, 252-254, 261-262, 265, 272, 274-275, 288, 298-299, 321, 328, 332, 337-341, 344, 356, 358, 365, 367, 371, 374, 381, 392, 398, 403, 405, 417-418, 427, 430, 434, 436, 442, 449-452, 459, 462, 475-476, 479, 481
comparison 73, 87, 102, 104, 125, 159, 167-168, 172, 375, 410, 413
competency 77, 80-81, 204, 206, 210, 216, 349
complete 14, 35, 40, 69, 74, 87-88, 93, 108-109, 112, 139, 141, 165, 181, 203, 207-208, 238, 240, 310, 337-338, 371, 375, 382, 426, 454
completion 18, 69, 88, 98, 110, 113, 115, 120, 122, 132-133, 168, 215, 288, 293, 335, 342-343, 350, 352, 382, 398, 426, 476
complex 3, 8, 97, 183, 185, 187, 190, 268, 270, 273-274, 317, 320, 325, 356, 386, 394-395, 424, 427, 455, 457, 461
complexity 3, 59, 169, 181, 184, 186, 189, 199, 226, 314
compliance 55, 60, 113, 131, 133
computer, computers 11, 19, 22, 28, 47, 51, 61, 102-103, 103, 127, 151, 156, 162, 164-165, 171, 174, 174-177, 176, 180-181, 184, 189, 194-196, 196, 296, 278, 339-340, 342, 359, 385, 388, 392, 399, 408, 408-410, 413, 412-413, 438, 444, 449-450, 443, 459, 464-465, 469, 476
Computing 41, 75, 101, 243, 298, 371, 396-397, 407, 411-412, 444, 469, 472, 474
concerns 9, 52, 59, 62, 69, 116, 137, 155, 188, 206, 208, 259, 274, 292, 295, 317, 322, 350, 353, 359, 390, 425, 436, 458, 460
Congress 54, 57-58, 444
connected 4, 13, 34, 37, 40-41, 63, 71, 80, 113, 117, 120, 190, 225, 305, 370, 382, 411, 417-418, 432, 461
connected learning 34, 370, 382, 418, 432

Connecticut 6, 20
Connectivism 424, 426, 432-433, 436, 438-440, 443, 463, 465
constructivism 288, 431, 439, 455-457, 464
constructivist 174, 280, 367, 385, 457-458, 464-465
content analysis 83-84, 89, 91, 96-98, 102, 142, 300, 351, 363
context , contexts 25-26, 30-34, 31, 37, 38-39, 39-40, 52, 75-76, 78, 105, 118, 119, 120, 124, 141, 163, 167, 169-170, 170, 172, 172-173, 175, 182-184, 185,186-187, 188-189, 191-192, 192, 199, 204, 227, 228, 234, 245-247, 248, 249 -251, 254, 262, 267, 269, 268-271, 272, 273, 275, 277-278, 281, 290, 291, 294, 305, 322, 326, 344-345, 354, 359, 405, 407, 417, 418, 419, 420, 425 429, 433-436, 442, 450, 456, 463, 472, 479-480
copyright 381, 421, 424, 435
counseling 347, 349, 352-353, 356, 360-361, 363, 481
counselor, counselors 252, 284, 328, 348, 353, 360 363
coursera 426
credential 291, 357-358, 481
credit 1-2, 8, 11, 18, 61, 110, 134, 136, 164, 212, 218, 238, 293, 334, 344, 348, 419, 426, 454
crisis intervention 348, 358, 360-362
culture 52, 58, 72, 74-75, 157, 172, 185, 199, 212, 241, 264, 279, 290, 355, 403, 411, 413, 419, 427, 437, 440, 457, 461-462, 464, 478
curation 366, 372, 377-378, 381-382, 387-388, 471
curricula 114, 200, 206, 216, 226, 404, 472
curricular 36, 60, 136, 154, 202, 206, 216, 294, 382, 420, 424, 428, 449
curriculum 13-14, 29, 54, 56, 61, 65, 86, 91, 105, 115, 117-120, 123-124, 129, 134-136, 141-144, 151-153, 156-158, 162, 165, 174-177, 199, 206, 213, 216, 218-219, 227, 237, 255-256, 263-264, 272, 283, 294, 297, 333, 340, 354-355, 368, 371, 375-376, 387, 402, 404, 423-424, 426-427, 430-431, 442, 448, 457, 459, 461, 469, 471-472, 475, 477-480, 482
curriculum design 213, 368
customize 33, 123, 339, 370, 421, 448
cyber schools 39, 110, 121, 124-125, 157, 304, 320, 443
database, databases 112, 138-140, 181, 367, 377, 378, 380, 381, 385, 387, 396
decision, decisions 51, 52, 54, 55, 70, 99, 101, 109, 129, 167, 169, 255, 283, 291, 301, 333, 332-333, 352, 354, 361, 373, 419, 432, 454 455
degree, degrees 53, 65, 90, 100, 108, 186, 210, 240, 255, 289, 292, 297, 334, 337, 344, 348, 366, 369, 471, 473, 475-476, 478

Delaware 475
delivery 1, 25-27, 31-33, 36, 38-39, 44, 46, 49, 57, 59, 73-74, 86, 98, 124, 207, 209, 211, 214-216, 240, 287-289, 296, 304, 347, 350, 353-354, 356-358, 420, 454, 459, 462-463, 470
delivery models 26-27, 31-32, 216
design 25, 39, 77, 84, 86-88, 97-98, 100, 112, 115, 117, 120, 123-124, 141, 144, 151, 155, 161, 167, 185, 195, 197, 211, 213-214, 216, 226-229, 234-236, 242-243, 251, 255-256, 259, 265, 272-273, 278-279, 298, 333, 348-351, 355, 361, 365-369, 371, 378-379, 381, 383, 385-386, 390, 393-394, 404-406, 409, 418-420, 431-432, 435, 439, 441, 448, 454-455, 457-460, 463-464, 469-471, 473-475
designers 98, 117, 123, 185, 251-252, 326, 381-382, 405, 409, 419, 448
developers 154, 337, 381, 405, 448
devices 74, 218, 357, 366, 369, 371, 391-392, 394-398, 405-406, 408, 411-412, 418, 458, 462, 471
digital literacy 389, 415-416, 418, 421, 424-425, 427, 437, 450, 453, 455, 462-463
digital responsibility 453, 462
diploma 1, 8, 76, 78, 107-109, 120, 126
directors 148, 157, 292-293, 295, 297, 471, 479
disability 54, 109, 113, 119-120, 123, 127, 136-137, 153, 155, 158
discourse 97-98, 102, 177, 197-199, 261, 417, 441, 449, 457
disruptive 12-13, 21, 44, 52, 67-68, 72, 75, 225, 304, 321
distance 1-2, 21-22, 25-28, 30-38, 40-44, 46-49, 51, 53, 56-57, 78, 86, 101-104, 112, 115, 117, 121-122, 124-127, 130, 132-133, 138, 156-159, 173-174, 176-177, 179, 181-182, 193-194, 197-199, 202, 207, 220, 240, 243, 260, 263-265, 280, 287, 289, 298-299, 301, 316, 318-320, 322, 328, 330, 332, 340-345, 356, 358, 361, 363, 384, 386-387, 407, 411, 415-416, 420, 437-444, 463, 472, 475, 480
Distance Learning 28, 42-43, 47-49, 51, 53, 57, 101, 103, 130, 177, 179, 198, 220, 301, 343-345, 384, 411, 420, 438-441, 443-444, 480
district, districts 2-3, 5-12, 6-13, 15, 18-20, 19-20, 22, 31, 52, 55, 59, 61, 64-65, 67, 69-70, 72, 74, 107, 109, 114,134, 150, 153, 163, 165, 202, 203, 209, 211, 216, 237, 240, 247, 250, 252, 292-293, 300, 365, 404, 429-430, 435, 442, 459, 470-471, 474-475, 480-481, 240-241, 252, 255, 291-293, 296, 300, 336, 423-424, 429, 434-435, 473, 478, 481
diverse 19, 40, 113, 118, 125-126, 130, 132, 158, 244, 258, 307, 319, 360, 409, 416, 423-424, 427, 479-480
diversity 64, 164, 197, 249, 261, 355, 406, 432
doctoral 44, 133, 140, 155, 176-177, 204, 206, 219-221, 260, 265, 287, 289, 297-300,

313, 348, 362-363, 463, 470, 475-476, 480
dropout 64, 102, 104, 108-109, 111, 126-131, 133-134, 338, 341, 344, 348
Dropout Prevention 109, 111, 126, 128, 130-131
Dyslexia 396, 408
e-books 366, 410
eCollege 482
economic 51, 56, 66, 108, 127, 211, 296, 398-399, 410, 412, 419
economy 54, 188, 399, 410, 413, 434
ecosystem 402, 416, 432
Educational Administration 289, 296-301
educational leadership 195, 262, 286-291, 295-297, 299-301, 385, 442, 475, 477
Educational Technology 12, 41, 57-59, 71, 76, 78-80, 102, 128-129, 132, 157, 175, 213, 228, 238, 242-243, 259-260, 264, 299, 322, 340, 343, 363, 407, 409-411, 413, 440, 442, 444, 447-448, 460, 462-463, 469, 471-474, 476, 479, 481
educator, educators 2, 15, 22, 61, 66, 71, 93, 101, 114, 117-119, 121-123, 121-126, 128, 129, 142, 151, 165, 173, 181, 183, 186-193, 203-204, 209-210,214, 212-216, 218, 221, 226, 228, 234, 236, 239, 241, 245, 246, 249, 252, 251-252, 259-260, 262-263, 265, 267, 275, 279-280, 281, 284-285, 291, 294, 341-342, 358, 361, 371, 374, 390, 392, 403, 405, 408, 416-418, 419-420, 421-425, 427-432, 428, 430, 434, 436, 448, 451-452,452, 458, 461, 469, 471-472, 474, 476, 479-480, 480-482
effective 26, 31, 36-37, 42-43, 58, 62, 70, 74, 94, 112, 115-116, 119, 123, 126, 128, 138, 150, 170, 172-173, 182-184, 191-193, 195, 208, 226-228, 234, 237-241, 246-249, 254-255, 261, 263, 267-273, 275-280, 284-288, 293-294, 296-297, 313, 316, 318-319, 334-336, 339-340, 344, 349, 353, 355-356, 361-362, 374, 378, 383, 388, 392, 395-396, 402-403, 405, 426, 430, 434, 438, 447, 449-450, 453, 459, 461-462, 470, 473, 480
efficiency 56, 59, 61, 67, 100, 290, 396
eLearning, e-learning 4, 21-22, 56, 26, 28, 30-31, 34-37, 39, 42, 47-48, 57, 58, 79, 101, 103, 127, 129-131, 151-152, 158, 169, 177, 197, 243, 291, 321, 323, 363, 410-411, 413, 438, 465, 471, 473, 475-476, 478, 480
elementary 11, 22, 27, 30, 32, 35-36, 54-55, 57, 60-61, 78-79, 91, 103, 112, 151, 166, 173-176, 184, 186, 190, 192, 194, 198-199, 210, 213, 218, 262-263, 296-297, 304, 321, 329, 341, 344, 397-398, 405, 409, 413, 471, 473, 478
embedded 74, 169, 199, 259, 284, 365-366, 368-373, 375, 377-378, 381, 383, 387, 396, 398, 464, 470
embedded librarian 366, 378, 387
emerging 53, 57, 64, 71-72, 112, 126, 156, 197, 202, 225, 243, 262, 284, 296, 299,

304, 308, 316, 319, 322, 325, 335, 340, 345, 365-366, 379-380, 383, 391, 404, 406, 412, 415-418, 420-423, 427-428, 430, 432-433, 436-437, 439, 441, 443, 451, 463-464, 469, 474-475
emotional 114, 133, 136, 158, 272-273, 336, 349-350, 358-359
empirical 39, 101, 112, 136, 138-141, 148, 150, 153-155, 159, 191, 202-204, 289, 295, 318, 335, 347, 349, 352-354, 361, 391, 394, 396-398
employment 117, 120-121, 129-130, 132, 215, 252, 291, 293, 398, 479
empower 145, 185, 188, 427, 453
encourage 67, 114, 121, 181, 185, 211, 227-228, 255, 271, 273, 295, 316-317, 327, 330-331, 435, 457
endorsements 71, 77, 122, 238
engage 107, 109, 117, 121, 156, 166, 169, 171, 179, 184, 186, 190-191, 223, 226, 228, 235, 313-314, 317, 326-327, 330-334, 348, 354, 376-377, 380, 390, 395, 403, 405, 419, 436
engagement 88, 96, 99, 115-117, 119-120, 127-128, 132, 136, 144, 180, 182, 184-185, 206, 220, 258, 260, 283, 312, 327, 332, 334, 339-340, 353, 362, 370, 392, 394-395, 397-398, 423-424, 426, 437, 475, 477
English 40, 45-46, 92, 136, 181, 188-189, 192-195, 199-200, 247, 279, 330, 333, 478-479
enrolled 3-4, 7-9, 12, 20, 26, 28, 30-31, 35, 69-70, 120, 146, 163-164, 167, 206-207, 214-215, 252, 283, 304, 306, 309-311, 313, 318, 328, 330, 335, 367
enrollment 9, 12, 15, 34-36, 61, 63, 65, 67, 69, 93, 99, 103, 307, 348, 357
equity 53-54, 56, 58, 62-63, 133, 271, 360, 443
E-rate 57, 63
ethnographic studies 83, 94-95
Europe 35, 476
European 29-30, 35, 37, 101, 127, 130, 279, 410
evaluate 67, 71, 124, 171, 188, 201, 214, 228, 239, 255, 261, 317, 348, 361, 379, 420, 434, 450, 453, 477, 481
evaluated 152, 273, 375, 449, 476
evaluating 71, 116, 134, 141, 198, 203, 244, 261, 272, 300, 345, 380, 444, 450
evaluation 22, 37, 46, 48, 61, 76, 79, 84, 86, 95, 97, 99, 102-104, 112, 117, 119-120, 128, 131, 135, 141, 143-144, 156, 165, 176, 198, 229, 237, 255, 263, 273, 277, 290, 293-295, 297, 301, 320, 322, 332, 341-342, 350-351, 355, 359, 379-381, 384, 395, 407, 410, 420, 441, 455, 474-475
evaluator, evaluators 84-85, 183-184, 190
evidence 15-16, 34, 60, 67, 77, 115, 117, 121, 138, 141, 155, 161, 164, 169, 202, 204,

207, 212, 214, 217, 223, 261, 276, 309, 311, 317-318, 323, 365, 368-369, 372-373, 385, 387, 398, 416, 420
evidenced 122
experience 4, 13-14, 26-29, 31, 33, 38, 44-45, 62, 73, 84-86, 89-90, 92-94, 101, 108, 113, 119, 122, 126, 132, 154, 208-209, 227-228, 235-238, 241, 243, 251, 253-254, 259, 268, 270, 272-273, 277, 279-280, 291, 295, 305, 329-330, 333, 343, 355-356, 360, 372-374, 377, 381, 391-392, 404, 406-407, 411, 418-419, 426-427, 437, 443, 448, 450, 452-453, 456, 462, 473-474, 476
experiment 27, 74, 457, 461, 470
Exploring 70, 106, 113, 157, 183, 195-199, 226, 259, 264, 284, 313, 317, 320-321, 339, 365-366, 407, 413, 434, 439, 456, 480
Facebook 452-453
facilitate 175, 183-184, 189, 191-192, 216, 246, 271, 291, 328, 330-331, 349, 403, 407, 432, 452, 455, 461-462
factors 10, 21, 64, 73, 86-87, 93, 98-99, 103, 108-109, 113, 115, 118, 127-128, 130-131, 151, 155, 158, 166-167, 170, 175, 208, 254, 263, 287, 289, 303, 308-310, 312, 319, 333, 359, 399, 404, 411, 418, 441
faculty 21, 43, 100, 209-211, 249, 255, 258, 288-289, 295, 340, 348-349, 355, 359, 371, 375-376, 378, 382, 403, 407, 443, 481
families 6, 118, 136, 154, 156, 307, 315, 330, 347-348, 354-356, 362, 398, 404, 481
family 62, 80, 109, 118, 121, 128, 209, 219, 307, 321-322, 394, 411
federal 21, 26, 28, 51-57, 61-63, 66-68, 70-72, 74, 76, 80-81, 84, 114, 157, 214, 435, 473, 478
feedback 77, 97, 144, 152-153, 167-169, 171, 181-184, 190, 198, 210-211, 217, 227, 229, 239, 247, 252, 270-271, 273, 276, 280, 314, 326, 329, 356, 395-397, 452, 454
feeling 92, 209, 326, 330, 353
feelings 209, 269, 337
field experiences 76, 92-93, 130, 197, 226-228, 235-236, 240-243, 260, 291, 296, 299, 343, 355, 362
Financing 294, 297
Finland 37
fitness 201-204, 206-207, 213, 216-220
flexible 42-43, 47, 49, 56, 61, 67, 70, 73, 107, 109, 198, 287, 299, 308, 314, 326, 392, 395, 406, 416-417, 423, 427, 430, 435
flipped 318, 320, 367, 369-370, 373, 385-386, 388, 471
flipped instruction 369, 373, 471

Florida 2-3, 5-7, 14-15, 18-20, 22, 26, 28, 45, 56, 61, 68-69, 107, 128, 133, 208, 219-221, 234-235, 245, 260, 264-265, 267, 279, 288, 300, 320, 335, 368, 407, 437, 463, 469, 472-473, 479-480
focused 11, 20, 31, 35, 54, 57, 62, 65-67, 90, 92, 94-95, 137-140, 142-143, 145, 147, 149, 153-154, 163, 182, 191, 206, 210, 234, 247-249, 251-252, 256, 276, 286-289, 291, 294, 311, 319, 335, 394, 400, 420, 436, 457, 474, 476, 481
foreign 40, 54, 66, 75, 92, 103, 181, 413
formal 4, 13, 116-117, 142, 150, 155, 186, 226, 275, 279, 294, 305, 329-330, 348, 351, 356, 369-370, 374, 419, 421, 437
format, formats 13, 104, 146, 168, 187, 191, 252, 272, 284, 289, 351, 353, 358, 365, 369, 370, 376, 422, 422-423, 428, 451
formative 214, 395-397, 457, 465
foundation 9, 22, 53-54, 67, 104, 129, 133, 212, 218-219, 234, 280, 295, 299, 319, 338, 367, 398, 403, 416-417, 442, 450, 456-457, 459, 463, 476
framework, frameworks 7, 9, 46, 56, 57, 68, 71, 80-81, 97-98, 106, 115-116, 125, 128, 142, 162, 177, 196, 224, 226-227, 237, 248, 284, 306-307, 313, 318, 338, 339-340, 348, 374, 387, 390, 397, 402, 407, 410- 412, 418, 426, 430-432, 437, 441, 455
full-time 2-3, 8-9, 11-12, 19-20, 25, 27, 29-30, 32, 34-36, 38-39, 65, 90, 92, 94, 99, 103, 120, 215, 250, 269, 314-316, 319-320, 328
functions 139, 199, 297, 335, 347-348, 352-354, 360
funded 2, 5-7, 11, 18, 20, 29, 35, 62-63, 65, 78, 301, 304, 424, 469, 476
funding 1, 3, 5-9, 11, 18-20, 26, 28-29, 33, 53, 56, 58-59, 61, 63-73, 80, 84-85, 417, 428, 472-473, 478-479
future 8, 21, 45-46, 49, 56, 100, 106-110, 112, 116-117, 122, 124-126, 150, 154-155, 162, 164-165, 170-174, 179-180, 191, 196, 198-199, 201-202, 210-211, 213-214, 216-218, 220, 224-228, 234, 236-237, 239, 241-242, 270, 277, 283-284, 295, 318, 325, 334, 341-342, 349, 358-359, 361, 370, 381, 384, 388, 390, 398, 404-407, 410, 413, 415-417, 420-421, 425, 435, 437, 440, 443-444, 462, 466, 472
gaming 390, 407, 427, 469
gender 99, 113, 136, 166, 175, 215, 270, 310
generation 61, 67, 154, 203, 216, 218-219, 226, 259, 370, 411
geographic 14, 30, 34-35, 40, 64, 73, 88, 181, 356, 358
geography 162, 196
geometric 169
geometry 165, 169, 172, 174
Georgia 5, 7, 15, 69, 71, 238, 344, 347, 473, 481

Germany 464
global 45, 52-53, 60, 62, 65-66, 74-75, 78, 187-188, 190, 194, 196-199, 300, 342, 374, 381, 384, 386, 398, 404, 409, 413, 417, 434, 436, 451, 465, 476
Google 139, 188, 304, 378, 431, 442, 449, 453, 470, 474, 478
governance 34, 56, 59, 63, 70, 101, 296
government 21, 26, 28-29, 31, 33-34, 37-41, 47, 54-57, 66-67, 71-72, 74, 108, 127, 140, 155, 363, 394, 400, 475
graders 102, 108, 168, 199, 409
grades 2, 12, 31, 35, 87, 99, 108, 145, 156, 164, 166, 212, 217, 310, 312-313, 319, 322, 327, 379
grading 329, 388
graduate 14, 100, 107, 126, 347-348, 354-356, 363, 368, 376, 385, 473, 475, 479-480
graduated 9, 108, 473
graduates 51, 66, 107, 133
graduating 236, 239
graduation 54, 68, 70, 77, 108-110, 124, 126, 128, 164, 213, 293, 316, 376
Greece 464, 466
groups 83-84, 86-89, 94, 109-110, 114, 123, 125, 127, 167-168, 211, 217, 249, 259, 331, 334, 348, 395-396, 398, 422, 427, 429-430, 471-472
growth 5-6, 8, 10-11, 19-21, 25, 34, 36, 38, 40, 51-53, 55, 58, 61, 63, 65-66, 72, 100, 106, 109, 122, 127, 164, 203, 209, 225, 239, 249-250, 269, 272, 274, 325, 357, 366, 369, 374, 383, 389, 398-400, 412, 451, 472
guidance 59, 75, 129, 148, 150, 170, 193, 226, 246, 252, 280, 285-286, 290, 293, 297, 375-377, 379, 392, 405, 425, 430-431, 448, 455, 458-461, 472
guidelines 71, 84, 114, 129, 196, 201, 203, 211-212, 220, 244, 252, 264, 293, 296, 316, 357-358, 360, 390, 471
habits 109, 121, 218, 378, 394, 410
Hawaii 5-6, 96, 303, 321, 442, 474, 477, 482
health 107-108, 127, 136, 157-159, 203-204, 209, 215, 219, 221, 245, 292, 308, 348-349, 352, 355, 359, 361-363, 478-479
healthcare 363, 479
helpful 59, 73, 92, 119, 123-124, 154, 168, 171, 226, 254-255, 278, 286, 291, 294, 331-332, 338, 350, 372, 453
helping 20, 94, 158, 270, 314, 327, 330, 339, 371, 404, 454, 474, 477
high school 1-3, 5, 7, 11-12, 14-15, 25-26, 28-29, 36, 44, 47, 51-53, 56, 66, 85, 91, 94, 97, 101, 103, 107-109, 114, 126, 128, 130, 132-133, 156-158, 166, 176, 181, 194, 207-

208, 210, 213, 218-220, 259, 263, 292-293, 299, 316, 321, 329-330, 332-333, 335-336, 340-341, 343-345, 361, 368-369, 376, 380, 386-387, 397, 405, 413, 428, 444, 470, 473, 475, 478
Hispanic 108-109, 307
history 1, 21, 25-26, 28, 32, 48, 51, 53, 55, 74, 76, 136, 152, 158, 162, 204, 248, 408, 418, 443, 470
hybrid 13, 36, 43, 85, 179-183, 185-193, 197, 200, 265, 287-288, 297, 443
hybrid learning 36, 43, 179-183, 185-190, 192-193
Idaho 5, 20, 56, 71, 238, 242, 479, 482
identities 136, 165, 194, 200, 262, 289, 479
identity 132, 248, 281, 289, 300, 431, 436, 449, 479
Illinois 2, 5, 65, 67, 219, 335
impact 5, 20, 51, 53, 56, 58, 60-62, 64, 66-68, 86-87, 99, 105, 107-108, 113, 115, 120, 124, 157-158, 176, 186-187, 206, 212, 215, 227, 239, 255, 260, 262, 270, 285, 294, 299, 310-311, 318, 323, 325, 329, 331, 334-335, 338, 340, 349, 351, 354, 359, 362, 389-390, 395, 398, 404, 407-408, 410, 421-422, 427, 436, 439, 453, 460, 469, 471-473, 476
iNACOL 3, 16, 22, 26, 36-37, 39, 41-43, 45, 71, 76-77, 80, 85, 93, 112, 114, 125, 127, 133, 196, 212, 214, 228, 234, 239, 242, 252, 255-256, 258, 260, 262, 265, 275, 278-280, 296, 325, 340, 343, 345-346, 366, 374, 385, 408, 428, 439-440, 469-470, 475, 479-480, 482
incentive, incentives 71, 89, 269, 272, 277, 336, 428
inclusion 36, 115, 117, 189, 239, 322, 371-372, 398-399, 412, 424, 429, 431, 434
inclusive 118, 120, 141, 408-409, 435, 480
income 55, 63, 108, 131, 307, 395
Indiana 9, 20, 201, 293, 298, 300, 472
indicators 71, 96, 129, 216, 242, 296, 410, 440
individual 3-5, 18, 26, 28-29, 33-34, 72, 85, 95-96, 107, 109, 113, 118-119, 121, 123, 125-126, 155, 168, 170-171, 182, 189, 204, 247, 272, 276, 286, 326, 329, 332, 342, 348, 352, 359, 361, 367-369, 374-375, 378-381, 397, 403, 417, 424, 449, 454, 459, 461, 463, 475
industry 52, 67, 73, 413, 477
influence, influences 51, 53, 60, 63, 67, 70, 72-74, 115, 128, 150-151, 155, 167, 171, 175, 183-184,191, 198, 218, 225-226, 242, 248-249, 269, 278, 291, 299, 309-310, 320, 340, 343, 354, 393-394, 419, 420, 433, 435, 450, 462, 472
information fluency 284, 365-371, 373, 379, 381-383, 387
information literacy 366, 369, 372, 379-380, 383, 386-388, 465, 470

innovation 12-14, 44-45, 51-53, 56, 59, 61, 67-68, 70, 73-75, 80, 249, 300, 321, 345, 403, 410, 412, 438, 462-464, 473, 477, 480
innovative 33, 55-56, 58-59, 62-63, 65-68, 70, 72-74, 92, 123, 161, 189, 224, 279, 297, 299, 349, 387, 403, 412, 417, 461, 469-471, 474, 476
inquiry 97, 150, 156, 166, 183, 188, 190, 200, 211, 247-250, 258-261, 263-264, 271, 279, 339, 342, 367, 373, 376, 378-379, 381-382, 385-386, 403, 413, 431, 434, 436, 444, 453, 459-460, 472
inservice 223, 225, 239-240, 248
in-service 213, 240, 246, 462
instructor 182, 209, 326, 330-331, 333, 372, 426, 469, 471
integrated 4, 13, 15, 58, 62, 167, 171, 305, 367, 372, 396, 399, 420, 427, 432-433, 478
interactions 92, 96-97, 101, 120-122, 124, 134, 169, 190, 199, 288, 310-312, 318, 320, 326-331, 333, 339, 344, 356, 426, 432, 435, 439, 447, 450, 456
Internet 4, 36, 56-58, 62-63, 74, 79-80, 104, 133, 136, 152, 159, 164-165, 174-175, 180, 186-187, 190, 194, 197, 212, 242-243, 291, 296, 341-342, 344, 357, 387, 389, 391, 425, 431-432, 438-439, 441-443, 448-451, 454, 459-460, 462, 464, 472
interviews 83, 89, 93-97, 100, 216, 235, 288-289, 292, 295, 329, 331-332, 334, 351
investment 19, 38, 61, 350
Iowa 6, 20, 65, 234-235, 241, 341, 477, 482
isolated 183, 308, 326, 330, 417
isolation 246, 269, 337
Israel 289, 299, 405, 409
issues 1, 14, 21, 36, 42, 44-47, 51, 56, 59, 62, 65, 69-70, 75, 77-78, 80, 87, 100, 120, 123, 127, 150, 155, 157, 169, 193-194, 201, 209, 218-219, 249, 252, 258, 260, 278-279, 286, 289, 293, 296-297, 301, 316, 320, 322, 327, 340-341, 345, 348, 352-353, 357-360, 368, 371, 409, 413, 417, 438, 443, 459-460, 464, 477
iterative 193, 259, 396, 403
journal 41-44, 46-49, 75-78, 84, 101-104, 127-134, 139-140, 156-159, 173-177, 181, 193-200, 202, 218-221, 236, 241-244, 258-265, 275, 278-280, 298-301, 320-323, 340-344, 346, 361-363, 383-384, 386-387, 395, 407-413, 435, 438, 440-445, 463-466, 469, 471-474, 478-479, 481-482
Journalism 39, 437, 439
journals 40, 42-43, 47, 49, 84, 100, 135, 138-140, 154-156, 181, 193, 244, 288, 304, 385, 387, 395, 455, 472-473, 476-477, 480-481
justice 185, 249, 262-263, 271, 477
K-12 online education 76, 102, 225, 251, 255, 479

K-12 online learning 1-2, 16, 22, 26, 28-30, 32-38, 41-45, 47, 56, 68, 76, 80, 85, 93, 97, 102-103, 107, 114, 122, 130, 150, 157, 162, 177, 197, 200, 212, 219, 221, 234-236, 239, 242-245, 252, 256-257, 259, 262, 264-265, 275, 284, 300, 304-306, 311, 313, 316-319, 338, 341, 343, 345, 347-359, 362-363, 365-366, 379, 384-385, 420, 428, 439, 442-444, 469-470, 475, 481
Kansas 10, 135, 139, 298, 474, 481
Kentucky 2, 5-6, 69, 285, 480
knowledge 26, 40, 67, 71, 74, 115, 118-119, 123, 142, 144, 152-153, 175, 182-183, 185, 187-188, 191, 195, 197, 204, 207, 209-210, 225-227, 234, 240-241, 243-247, 249, 251, 256, 259, 261, 267-268, 270, 272-273, 280-281, 286, 290-291, 294-295, 299, 312, 314, 319, 330, 336, 348-350, 356-357, 370, 379, 381-382, 384-385, 387, 392, 395-397, 405-407, 409-412, 419, 421, 426-427, 432-434, 438-439, 441, 450-451, 455-457, 461-463, 466, 470
Laboratory 90, 101, 109, 133, 195, 299
Labrador 28, 37, 41, 43, 46
Landmark 54, 76, 114, 131
landscape 2-3, 20, 42, 53, 156, 175, 215, 250, 285, 297, 365, 367-369, 373-375, 387, 410, 423, 428, 430, 447, 450
language 40, 46, 54, 103, 109, 136, 181, 184-186, 192, 196, 199-200, 261, 350, 388, 394-397, 404, 409, 413, 428, 478
laptop 392, 407-408, 412-413
laptops 407, 412
law 6, 8, 54-55, 58-59, 63-64, 79, 123, 156, 239, 297
leaders 21, 72, 203, 262, 283, 285-291, 293-299, 301, 400, 403-405, 439, 471, 476-477
leadership 58, 74, 78, 175, 195, 260, 262, 279, 286-291, 294-301, 340, 362, 366, 368, 385, 394, 402, 407, 410, 425, 437, 442, 448, 458, 471, 473, 475, 477, 479-480
learner 60, 62, 99, 105, 109, 120, 124, 175, 201, 207-209, 272, 340, 343, 369-370, 375, 377-378, 381-384, 387, 391-393, 410, 417-419, 426, 430, 435, 438, 448-452, 454, 456, 461-462, 476
learners 47, 66, 70, 72, 74, 85, 101-102, 105-107, 109-110, 112-115, 119, 122-125, 127, 130-132, 166, 174, 180-182, 186-188, 190, 192-193, 199, 204, 210, 217, 226, 255, 258, 274, 278, 288, 295, 325-326, 340, 352, 355, 366-367, 369-379, 381-383, 385-387, 391, 405-406, 409-410, 416, 419, 423-424, 426-427, 431-432, 434-435, 437, 447-449, 451-452, 455-456, 459, 461, 470, 476, 479-480
learning analytics 60-62, 72-73, 80, 83, 98, 353
learning coaches 96, 151-153, 304, 306, 313, 321, 326

legislation 7, 9, 15, 51, 54-56, 59, 61, 63, 65, 67-68, 71, 78-79, 114, 214, 294, 377
lesson, lessons 15, 22, 39-40, 85, 99, 102, 128, 134, 151, 153, 168, 182, 195-196, 199, 240, 242, 247-250, 256, 259, 260, 261-264, 262, 264, 275, 279-280, 287, 333, 341, 351, 353, 380, 395, 399, 403, 408, 451
librarian, librarians 139, 283-284, 328, 365-379, 368-369, 372-373, 375, 377-379, 382-388, 411, 430, 438, 449, 470, 475
libraries 139, 284, 365-370, 373-388, 441, 443, 452, 465
library 284, 304, 365-379, 381-388, 404, 444, 470, 475
license, licenses 72, 208, 421-422, 428, 435
licensed 72, 213, 238, 336, 356, 421, 423
licensing 72, 423, 435, 478
licensure 75, 213, 241, 290, 356-357
lifelong 35, 188, 217, 367, 384, 399, 431, 434
literacies 185, 187-188, 193-197, 243, 431, 435, 438, 441, 450, 464, 479
literacy 54, 57, 79, 152, 161, 174, 179-181, 183-185, 187-189, 191-197, 199-200, 242, 249, 366, 369, 372, 379-381, 383, 386-389, 391, 395-396, 400, 412, 415-416, 418, 421, 424-425, 427, 431, 434, 437-442, 450, 453, 455, 462-463, 465, 470, 478-479
literacy education 161, 179-181, 192, 465
literature 38, 40, 43-44, 56, 85, 101, 115-122, 124, 126, 137-138, 140, 150, 154-156, 158-159, 161, 163-164, 166, 170, 172, 180-181, 183, 192, 194, 196, 203-204, 207, 234, 237, 245, 247-248, 250-251, 254-255, 258, 267-270, 272, 275, 280, 285-286, 290-291, 294-297, 304-305, 311, 313, 325, 329, 338, 349, 353, 358-360, 365, 368-370, 372, 383-385, 389-390, 404, 411, 415-416, 425-426, 430, 438-439, 447-448, 457, 460, 466
Liverpool 474
location 4, 13, 33, 36, 122, 153, 305, 328, 351, 422, 460
London 48, 185, 187, 195-198, 411
long-term 66, 69, 217, 245, 248, 253, 383, 455
Louisiana 6-8, 18, 71, 133, 167, 176, 294, 297, 344, 481
Maine 20, 67, 70, 76, 78, 482
makers 58, 68, 135, 336-337, 340, 406, 427, 457, 474, 476
Malaspina 44
Malaysia 400
management 11, 14, 45, 47-48, 62, 64-65, 96, 99-100, 151, 182, 229, 269, 272, 280, 288, 290, 297, 306, 314, 322, 326-327, 330, 336, 345-346, 353, 368, 372, 379, 382, 384, 397, 409, 411, 436, 443-444, 451, 456, 460, 478
manager 424, 449, 476

Manitoba 32
Maryland 482
Massachusetts 9, 15, 20, 65, 67-68, 157, 212, 438, 442
Massive Open Online Courses 415-416, 418, 421, 426, 437, 439
mastery 70, 77, 151, 395, 404, 449
materials 27-28, 31, 61, 73, 123-124, 167, 186, 214, 252, 314, 326, 328, 337, 366, 370, 372, 375-376, 380, 383, 404, 407, 417, 421, 423-425, 428-431, 451, 458
mathematical learning 163-164, 168, 170-173, 177
mathematics achievement 151, 164, 166-168, 170, 177, 400
mathematics education 66, 164-166, 169, 174-175, 470, 475, 477
meaning 13, 100, 183, 185, 188-189, 191, 196, 281, 301, 432, 434, 439
meaningful 25, 33, 38, 121, 173, 182, 214, 234, 240, 339, 395, 409, 435, 437, 455-456, 474
meeting 21, 31, 46, 48, 54, 57, 79, 110, 115, 121, 197, 203, 207, 251, 258, 271, 293, 298-301, 331, 338, 351, 375, 377, 384, 417, 455-456, 465
mentor, mentors 94, 102, 110, 122, 131,167, 227-228, 238-239, 260, 267-278, 269-276, 278-280, 283, 284, 315, 326, 327, 334, 371
mentored 276, 281, 337
mentoring 101, 107, 109, 128, 224, 240, 260, 262, 265, 267-281, 284, 337-338, 341, 461, 472
Mexico 15, 34, 68, 133, 398, 400
Michigan 5, 7, 9, 14, 16, 20, 22, 39, 56, 61, 67-68, 70-71, 77, 91, 98-99, 101-102, 129, 195, 225, 242, 260-261, 334, 341, 361, 366, 439, 469, 482
Microsoft 151, 391, 407, 422, 471, 476-477
Ministries 476-477
Ministry 28-29, 36-37, 44-48, 475
Minnesota 7, 19, 71, 85, 103, 239, 482
minorities 54, 280
minority 55, 61, 63, 172, 226, 237
Mississippi 471
Missouri 6, 478, 482
m-learning 392, 396-398, 404, 406, 410
mobile 3, 175, 357, 369, 382, 389, 391-413, 418, 462, 471, 476-477
mobile learning 175, 389, 391-405, 407-411, 413, 471, 476-477
mobility 378, 406
modeling 89, 173, 227, 240, 252-253, 307, 314, 351

models 3, 13, 15, 26-27, 31-32, 49, 55-56, 61, 66-67, 73, 85, 90, 92, 98, 131, 172, 197-198, 206, 216, 219, 224-225, 238, 243, 247, 250-251, 255-256, 265, 275, 281, 284, 287, 294-295, 305, 325-326, 328, 330, 335, 339, 342, 345, 347, 349, 354-355, 358-360, 367, 377, 381-385, 397, 405-406, 416, 420, 431, 436, 441, 443, 457, 462-463
monitoring 119, 182, 214, 218, 294, 312, 325, 327, 332, 335, 339, 351, 429, 465
Montana 20, 336
motivation 117-118, 121, 128, 130-131, 166-167, 201, 206, 210, 276, 279, 332, 334-335, 337, 344, 350, 394, 458, 466
movement 37, 47, 54, 58, 60, 67-68, 166, 201, 204, 210, 218, 245-246, 255-256, 296, 418-419, 423, 430, 438, 471
multimedia 46, 151, 175, 182, 199, 242, 387, 396, 441, 444, 449, 476
multimodal 185, 187-188, 191, 194-197, 199-200, 431, 434, 438, 441
Museum 152, 158, 388
National 11, 15, 28-30, 34-35, 37, 44, 47-49, 53-54, 57-62, 64, 66-67, 70-72, 75-79, 85, 90, 102-103, 107, 109, 111, 114, 118, 122, 127-128, 130-133, 136, 159, 164, 173-176, 189, 197, 200, 202-204, 210, 212, 219-221, 228, 234-235, 237-243, 246, 249-252, 261-262, 291, 296-301, 309, 320-321, 323, 343-345, 354-355, 361-363, 367, 371, 373-374, 386, 388, 394, 398-401, 406, 422, 427, 439-440, 444, 465, 471-477, 479-482
navigate 105, 124, 376, 379-380, 450, 455, 461-462, 474
Nebraska 1
necessary 29, 59, 62, 67, 71, 74, 77, 100, 123, 136, 145, 150-151, 155, 165, 179, 183, 185, 188-189, 191, 193, 204, 207, 228, 234, 237-240, 245-246, 270-272, 278, 297, 316-317, 325, 327, 336, 348-349, 352, 354, 356, 367, 371, 374-375, 381, 426, 430-431, 436, 450, 460
negative 16, 153, 163-164, 180, 210, 212, 253, 308, 311-312, 314, 358-359
network 11, 18, 28, 35, 39, 42, 44, 47, 49, 109, 111, 122, 131, 240, 377, 379, 416, 424, 432, 439, 450, 452, 458-461, 463, 475, 478
networked 28, 34, 194, 197, 380, 390, 416, 418, 420, 427, 429, 437-438, 444, 447, 449-453, 455-464, 466, 473, 480
networked learning 390, 416, 429, 444, 447, 450-453, 456, 458-462, 464, 466, 473, 480
networking 184, 258, 426, 429, 440, 452-453
networks 43, 66, 74, 102-103, 157, 193, 195, 248, 356, 371-372, 377, 419, 426-427, 429, 433, 437, 439-440, 453, 462
Nevada 12
New Hampshire 70
New Jersey 63

New Mexico 15, 68, 133
New York 19, 41-42, 44-45, 47, 70, 75, 157, 194-198, 221, 259, 262-263, 265, 299, 322-323, 342-344, 361-362, 408-409, 412, 438, 444, 473, 482
New Zealand 27-28, 30-32, 34-37, 41-44, 46-49, 410, 477
non-completers 108
nonprofit 1, 5, 478
non-profit 67, 481
North Carolina 5, 15, 20, 68, 91-92, 95, 98, 102, 164, 174, 408
North Dakota 1
objectives 116, 120, 123, 171, 355, 404, 419, 448-449, 453, 463
offering 1-2, 6, 8, 10-11, 20, 76, 93, 109, 125, 130, 137, 197, 208, 213, 235, 243, 289, 293, 343, 347, 355, 362, 366, 370, 378, 383
offerings 2-3, 10, 12, 14, 25, 32, 94, 163, 166
officer 473, 475, 480
officers 77, 367, 386
offline 181, 193, 292, 305, 362, 425
Ohio 2, 10, 27, 70
Oklahoma 72, 133, 343
one-on-one 96, 208, 277, 458
online 1-23, 25-49, 51-53, 55-76, 78, 80, 83-107, 109-110, 112-115, 117-142, 144-146, 148, 150-159, 161-177, 179-204, 206-221, 223-229, 234-246, 249-265, 267-268, 274-281, 283-301, 303-323, 325-341, 343-363, 365-390, 392, 398, 407-408, 410, 415-416, 418, 420-421, 423, 425-431, 434-437, 439-444, 449-454, 456, 459-460, 462-463, 465, 469-482
online learning 1-2, 4, 6, 9-10, 13, 15-17, 19, 21-22, 25-26, 28-38, 41-48, 52, 56-59, 62-63, 68, 72, 76, 80, 84-86, 88-91, 93, 97, 100-104, 107, 109-110, 112-115, 117-135, 137-139, 141-142, 144-145, 148, 150, 152-158, 162-163, 177, 179, 181, 183, 187, 193, 195, 197-198, 200, 211-215, 219, 221, 224, 226, 228, 234-240, 242-245, 251-252, 256-257, 259-260, 262, 264-265, 275, 278-279, 281, 284-288, 291, 293-300, 304-306, 311, 313-314, 316-320, 322-323, 325-327, 334, 336, 338, 340-341, 343-345, 347-359, 362-363, 365-371, 373-376, 379, 383-387, 407-408, 415-416, 420, 428-431, 435, 439, 441-444, 449-450, 459, 469-482
Online Learning Research 17, 153, 420, 469, 472-474, 481
online pedagogy 213, 216, 229, 234, 237, 255, 474
online physical education 201, 203-204, 211, 218-220, 471-472
online schools 1, 3, 8-10, 12, 18-22, 29, 35, 39, 55, 61, 63-65, 68-69, 75, 90, 159, 177,

213, 286, 290, 309, 313, 316, 328, 338, 356, 365-367, 371, 381-382, 476
online teachers 15, 71, 73, 78, 90-91, 94-96, 98, 102-103, 129, 131-132, 167, 182, 208, 210, 213, 226-227, 237-238, 240, 242-246, 250-256, 258, 260, 264, 267-268, 275-279, 290, 326, 329-330, 332, 337
online teaching 42, 71, 76, 83, 85, 89, 92-93, 95, 100, 114, 122, 199, 221, 226-229, 234, 236-240, 242-244, 251-252, 254-255, 262, 264, 276, 286, 292, 301, 321, 374, 476, 479
on-site facilitators 97, 328, 330-339, 341
open education 386, 389, 418, 421, 427-428, 438, 440, 443
open education resources 386, 389, 421, 427-428
open learning 103, 158, 389-390, 415-421, 423-437, 443, 480
open research 418
open scholarship 418, 421
option, options 3-4, 6-9, 10-11, 12,13, 19, 22, 32, 63, 65, 67, 70, 72-73, 88, 109, 120, 124, 136, 154, 156, 170, 201, 211, 213, 225, 236-237, 252- 253, 284, 287, 289, 290, 328-329, 365, 368, 420, 432, 452, 478
Oregon 70, 195
others 12, 15, 29, 33, 59, 68, 78, 93, 98-99, 164, 167, 171, 184, 187, 204, 210, 247-248, 250, 268, 270-272, 274, 286-287, 296, 308, 314, 316, 319, 333, 337, 369, 371, 383, 390, 397, 406, 416, 419, 421-422, 429, 435, 448, 450, 452-454, 456, 458, 460, 471, 478
outcomes 8, 13, 15-16, 21-22, 60-62, 72-73, 87, 92, 98-99, 101, 104-107, 114-115, 119, 121, 125-127, 129-130, 132-134, 136, 141, 158, 163-164, 167, 172, 183, 194, 219, 221, 254, 256, 262, 268-269, 278, 288-289, 311-312, 314, 317, 321, 323, 325, 327, 329, 334-335, 340, 344, 359, 391, 405, 411, 420, 426, 457, 470, 479
outside 14, 26-27, 30, 33, 35-36, 39, 65, 69, 74, 84, 142, 151, 181, 187, 234, 246, 259, 303, 330, 350, 359, 412, 420, 422, 437, 459
ownership 62, 380, 425, 427, 429, 434-435, 449
parent, parents 43, 63, 92, 104, 121, 130, 142, 145, 148, 150-153, 166, 203, 211-215, 218, 252, 283-284, 291, 303-304, 306-322, 309-310, 312-315, 317-323, 327-328, 334, 339, 348, 349, 351, 400, 430, 434, 459-460, 474
parental 101, 121, 283-284, 303-323, 334, 474
parenting 321, 478
parent involvement 215, 303, 320-321
part-time 2-4, 7, 90, 99, 215, 250, 295, 471
pattern, patterns 13, 19, 96, 107-108, 132, 140, 155, 181, 204, 225, 270, 273, 320, 352, 409, 426, 449, 466, 476
pedagogies 190, 209, 213, 255, 398, 404-405, 431, 476, 480

pedagogy 15, 45, 94, 101, 137, 172, 185, 193, 198, 213, 216, 229, 234, 237, 241, 246, 255, 260, 272, 288, 314, 355, 391-392, 405, 408, 412, 418-419, 432-434, 436, 438-439, 441, 443, 461, 474
Pediatrics 212, 218
Pennsylvania 2, 8-10, 69, 113, 264, 321, 475
perception 37, 39, 289, 313, 316, 359, 395
personalization 370, 381-382, 389-390, 394, 410, 447-448
personalized learning 59, 70, 77, 80, 390, 392, 394, 397, 405, 413, 448
personal learning environments 447-449, 453-455, 457-460, 462-463, 465-466, 473
personal learning networks 193
personnel 110, 115, 121, 124-125, 251, 293, 330, 336, 352, 381
philosophy 157, 290, 355, 458
physical 11-13, 16, 18, 66, 69, 96, 122, 162, 172, 183, 201-204, 206-221, 316, 327-328, 330, 332, 343, 358-359, 367, 369-370, 373, 378, 392, 404, 419, 471-472
physically 68, 204, 206-207, 212, 218, 328, 331-332
physics 258
planning 45-47, 79, 109, 113, 116-117, 121, 128, 131-132, 156, 182, 204, 215, 247, 252, 274, 290, 299, 359, 368, 373, 395, 401, 404, 441, 477
platform, platforms 151, 153, 174, 183-184, 190, 299, 356, 379-381, 449
PLE 449, 451-453, 457-458, 465
policies 39-40, 47, 51-53, 56-58, 60, 62-65, 67-69, 71-74, 114, 123, 125, 141, 150, 156, 202, 211, 268, 304, 309, 316, 336, 359, 369, 400-401, 404, 427-430, 448, 453, 457-458, 462
policy 1-3, 6-7, 9, 14, 23, 42, 46, 48-49, 51-53, 55-66, 68-81, 85, 102-105, 107, 110, 113-114, 124, 129, 131-132, 134-135, 142, 148-150, 157, 166, 171, 175, 177, 200-202, 211-213, 218, 221, 225-226, 237, 241, 244-246, 254, 258, 264-265, 267-268, 277, 293-297, 303-304, 311, 316-317, 319-321, 323, 325, 335-337, 340, 342, 345, 354, 356, 360, 362, 374, 390, 394, 399, 401-403, 406-407, 415-416, 418, 420, 422-423, 427-430, 435, 437, 440-442, 447-448, 454, 457-458, 463, 474-482
political 51, 74, 211, 459
politics 46, 53, 77-78, 323
population 5, 10-11, 52, 66, 89-93, 118, 124, 126, 135-136, 138, 146, 207, 307-308, 319, 335, 352
portfolios 183, 288, 395
practice, practices 2, 3, 22, 23, 25, 37, 42, 45, 46, 48-49, 58, 70, 72, 73-74, 77, 78, 80, 85, 91, 94, 97, 99-100, 100-102,103-105, 107, 110, 112-119, 113-115, 121, 123, 124, 125-

126, 129-133, 130, 132, 134, 137-138, 148, 150, 151,153,159, 161, 163, 164,166, 170, 172, 176, 177, 179-180, 182-183,184, 187-189, 190-193, 195, 196-198, 200-203, 211-212, 312- 218, 214, 221, 225-227, 237, 239- 240, 242- 243, 244, 246-249, 251, 252, 253-256, 254-255, 258-262, 263-265, 268-269, 268-272, 271-272, 274, 276-277, 279-281, 284, 285, 286, 290, 294-299, 296-297, 304- 306, 313-314, 316-317, 318 -322, 323, 335, 341- 342, 345, 348-349, 353-358, 360-363, 361, 365, 366-369, 374-375, 377-379, 381-384, 385-386, 389-390, 394-397, 400, 403-405, 407, 411, 413, 415-416, 418-424, 422, 426-432, 430-432, 434, 436-437, 439, 441-442, 444, 447-450, 452-453, 456-458, 461, 464, 474,-476, 477-480
practicing 37, 245, 248, 270, 276, 287, 294, 347, 351, 353, 360-361, 374, 404, 453, 455
practicum 122, 288, 300
predict 52, 93, 182
predictors 64, 132-133
prepare 71, 73, 92, 122, 162, 182, 188, 213, 216, 223, 226, 228, 234, 238-240, 242, 292, 316, 341, 348, 361, 367, 371, 374, 377, 392, 396, 398, 400, 434, 462
prepared 66, 71, 92, 122, 126, 223, 226-227, 238, 241, 276-277, 292, 352, 374, 376, 391, 406, 450, 462, 465
preschool 347, 402
preservice 71, 130, 192, 197, 223, 225, 227-228, 234-243, 248, 262-265, 276, 280, 286-293, 343, 362
preservice administrators 287-289, 291
preservice preparation 236
Preventing 130-131, 157, 336, 362, 434
prevention 109, 111, 126, 128, 130-131, 218, 284, 348, 359-360, 362, 473
primary 8, 27-31, 34-35, 41-42, 47-48, 53, 65, 74, 78, 116, 140, 164, 167, 170, 200, 206-207, 211, 218, 227, 290, 295, 305-306, 328, 339, 342, 347, 349, 381, 394-395, 397, 402, 451, 470, 477
principal, principals 140, 260, 285-288, 286, 290-295, 292-293, 297-301, 300, 363, 366, 478
principal preparation 292-293
principle, principles 31, 33-34, 38, 58, 88, 123, 126, 130, 161, 165, 171, 174, 176, 196, 204, 227-228, 234, 244, 255, 273, 290, 342, 348-349, 354-357, 360-363, 418, 424, 436, 456-457
prisons 108
privacy 62, 77, 80, 431, 435, 459
private 2-3, 5-6, 11, 19, 25, 64-65, 69, 76, 84, 102, 170, 173, 321, 330, 356-357, 476,

480-481
process 15, 42, 61, 96, 116, 135, 138, 140-141, 156, 175, 181, 183-186, 188-191, 200, 214, 227, 234, 247-248, 250, 252, 260, 268-269, 271, 273-274, 276-280, 287, 290, 293, 304, 337, 350-353, 358, 380, 389, 391, 396, 404-405, 423, 432-434, 447-449, 451, 453-457, 459-461, 472, 475
processes 65, 156, 183, 185, 197, 243, 249, 280, 290, 363, 379, 390, 394, 405, 407, 412, 425, 435, 441, 447, 453, 455, 457, 459-462, 473
processing 184, 189, 200
professional development 2-3, 5, 10, 22, 47, 57, 71, 78, 90-91, 94, 102-103, 113, 115, 119, 122-123, 125-126, 129, 132, 192, 223-224, 237, 239-240, 242-243, 245-265, 267, 275-279, 293, 295, 297-298, 325, 337, 347, 354, 356, 360-361, 383, 392, 402-406, 411, 420, 424, 427, 430, 452, 458, 461-463, 469, 471-472, 475-476, 480
professional learning 71, 246-247, 249-250, 253-254, 256, 261-262, 289, 294, 371, 377, 402, 405
professor, professors 214-215, 296, 298-299, 299-300, 301, 451, 469-481
program, programs 1-4, 3-14, 6-9, 11-13, 18-21, 25-33, 27-30, 35, 36, 37-40, 44, 48, 52, 54, 55-58, 56-57, 61, 63-74, 68, 70-71, 73, 76, 78, 79, 84, 86, 90, 93-94, 96, 99, 101-102, 104, 107, 109-110, 112, 114-115, 117-118, 120-126, 123, 130-133, 136, 138, 151, 153,158, 162, 165,169, 175-176, 181-182, 184, 190, 195-197, 199, 201, 203, 210-211, 215, 217, 223-228, 223-228, 234-241, 238-240, 243-245, 247-248,247, 250, 252-253, 258-260, 262-263, 265, 267-269, 272-273, 275, 279-281, 283, 286-289, 292, 297, 286-296, 298-299, 299-300, 301, 304, 305, 310, 325-330, 331-332, 334-335, 336, 337, 338-339, 341-342, 343-344, 348, 350-351, 355-357, 358, 360-362, 366, 368, 374-378, 382, 392, 394-395, 398, 400-402, 403-404, 405, 408, 415-416, 437, 441, 449, 452, 458, 461, 470-471, 473, 476-478, 480-481
progress 20, 120, 152, 182, 217, 228, 237, 239, 276, 313, 327, 341, 351, 353, 355, 407, 424, 458-459, 463
project, projects 2, 4, 20, 22, 29, 35, 40, 45, 47, 49, 68, 71, 76, 98,132, 141, 200, 235, 243, 260, 264, 272, 287, 355, 370, 382, 385, 404, 422, 436-437, 430, 436, 443, 449, 453-455, 464, 469, 470, 472, 474, 476, 480-481
protocols 73-74, 94, 142, 154, 249, 263, 356
proven 40, 119, 126, 207, 240, 319
provider, providers 3, 5-8, 6, 11, 15, 18-20, 30, 35, 61, 65, 69-70, 84-85, 87, 90, 94, 93, 98-99, 241, 255, 293-294, 336, 356, 373, 375, 405
province 28, 30-31, 33-34
psychology 197-199, 219, 284, 320-321, 347-349, 353-357, 360-363, 384, 408, 439,

441, 443, 469-470, 473, 479, 481
publishing 40, 155, 194, 196, 342-343, 345, 410, 412, 422, 429, 469
purpose 39, 63, 110, 136, 139, 141, 183-184, 188, 201, 204, 245, 267, 293, 298, 305, 354, 379, 419, 434, 455-456
qualified 57, 65, 70, 108, 164, 223, 238, 314, 336, 356, 375, 399, 401
quality 22-23, 33, 37, 43-44, 54, 57-59, 61-63, 66, 69, 71-73, 76, 97, 102, 105, 107-108, 114, 122, 129, 142, 154-156, 180, 202, 213-214, 216, 219, 226-228, 234, 237, 239-240, 242, 246, 248, 251-254, 261-262, 264, 267, 283, 287-288, 292-296, 298, 317, 319, 337, 343, 354, 370, 372-373, 378, 380-382, 396, 398, 402, 412-413, 436, 460-461, 471, 475, 478
questions 64, 70, 72, 84, 91-92, 95-96, 98, 100, 138, 154-155, 210-212, 214-217, 248, 256, 259, 271, 273-274, 286, 288, 290-291, 294, 297, 322-323, 330-331, 403-404, 425, 429, 450, 460
quizzes 98, 165, 206
reading 11, 60-61, 129, 135, 140, 152-153, 157, 179-181, 183, 186-192, 194-200, 212, 241-243, 248, 374, 377, 395, 400-401, 408-410, 425, 428, 431, 434, 439, 441, 449, 454, 465
reading instruction 179-181, 190, 195
record 60, 76, 129, 136, 151, 200, 217, 258-259, 263-264, 320-321, 360, 410, 441
recovery 2, 11, 102, 110, 129, 134, 136, 164, 293, 334, 341, 344, 361
Recreation 120, 202, 218-220, 471
reflect 73, 187, 193, 227, 235, 253, 269, 271, 290, 370, 374, 396-397, 434, 456-457
reflection 227, 242, 248, 273, 276, 289, 300, 325, 373, 378, 395-396, 456
reflective 188, 259-261, 269, 281, 288, 379, 431, 434
reform 38, 51-54, 56, 58-60, 62, 64, 66-67, 72, 74-76, 78-80, 132, 249, 259, 262-263, 281, 294, 362, 400, 417, 479
regional 11, 28, 30-31, 44, 48, 101, 194-195, 228, 244, 252, 264, 415, 417, 422, 428, 475, 477, 481
regulation 40, 76, 102, 321, 460
religious 58
remote 19, 27, 46, 202, 399, 460
report, reports 8-10, 11,13, 15, 21-22, 23, 30, 32-33, 37-38, 39, 41, 43, 47, 49, 52-54, 56-60, 59, 66, 69, 72, 74, 75-78, 79, 80, 84-86, 101, 103, 108, 128, 132, 136, 140-142, 155, 163, 173-174, 176-177, 194, 200, 202, 247, 250-253, 255, 261, 269, 275, 279, 287, 290, 298, 304, 311, 322, 332, 336, 342, 366, 388, 399, 407, 418, 420, 424, 428, 437, 439, 442-443, 448, 454, 464, 478, 482

reported 7, 15, 35, 56, 90, 103, 112, 122, 139, 145, 148, 154-156, 164, 166-169, 171, 176, 208-209, 235, 251, 288, 292-294, 310-312, 315, 334-335, 358, 371
reporting 14, 62, 68, 75, 92, 112, 155, 252, 335, 473-474
repository 343, 451
research 15-17, 21-23, 25, 29, 33, 38-42, 44-46, 48-49, 51, 61, 67, 73-75, 77-78, 83-86, 88-89, 91, 93-96, 100-101, 105-107, 110, 112, 114-115, 117, 120-121, 124-127, 132, 134-142, 144, 148, 150-159, 161, 163-167, 169-177, 179-184, 186, 188-204, 209, 211, 214-219, 223-226, 234-235, 239-251, 253-256, 258-265, 267-270, 275-281, 283-287, 289-290, 294-301, 303-305, 307-313, 316-321, 323, 325, 329-331, 333-348, 352-353, 355, 358-363, 365-375, 377-387, 389-392, 394-398, 403-413, 415-416, 418-422, 427, 430-432, 434-440, 442-444, 447-449, 451, 453-454, 457, 459-466, 469-481
research design 141, 144, 167
researched 40, 115, 216, 454, 475
researcher 22, 39, 96, 156-157, 172, 241, 258, 260-261, 279, 342, 378, 412, 442, 469-470, 475, 478, 482
Research Framework 125
research methods 83, 150, 158, 256, 405
resource 11, 66-67, 71, 77, 84, 166, 185, 188, 280, 292-293, 327, 366, 372-373, 397, 423-424, 462, 482
resources 8, 19-20, 28, 36, 39-40, 43, 57, 77, 95, 123, 164-166, 182, 185, 193, 215, 220, 226, 242, 284, 290, 314, 337, 359, 365-369, 372-373, 375-381, 383-389, 391-392, 394, 396, 400, 415-416, 418-425, 427-428, 430, 435-440, 443-445, 447-452, 454-455, 459-460, 463-464, 470, 474-475, 480
respect 71, 80, 271, 274
response, responses 7, 9-10, 33, 54, 60, 65-66, 69, 89-93, 97, 98,146, 148, 155, 181, 184, 200-201, 203, 209, 235-236, 300, 309, 325, 331, 334, 351, 358-359, 361-362, 443, 454
responsive 287, 294, 355, 382, 392
retention 59, 94, 126, 201, 208, 342, 359, 363, 372
revision 58, 182, 184, 189-190, 198, 211, 247
rigorous 54-55, 135, 193, 255, 376, 406, 476
safety 66, 118, 217, 308, 347, 358-360, 390, 426-427, 429, 459
scaffold 153, 167, 185, 187,189, 192, 273, 382, 448
scaffolded 184, 227, 455
scarcity 138, 161, 195, 294, 296
schedule, schedules 13, 74, 209, 212, 215, 308, 314, 334
scheduling 56, 58, 107, 109, 217

scholarly 155, 285, 295, 297, 439, 445, 451, 456, 480
scholars 224, 246, 256, 258, 277, 286, 288, 295-297, 338
school, schools 1-3, 5-6, 8-16, 1-15, 18-22, 25-36, 28-29, 33-36, 38, 39-49, 42-49, 51-58, 59-73, 63-69, 72, 74-75, 76-79, 80, 84, 85-87, 90-99, 101-104, 107-110, 112-115, 117-119, 120-134, 136, 140, 144-145, 150-151, 153-154, 156-159, 163-166, 170, 173-177, 179-181, 180-183, 186-187, 189-191, 194-196, 199-201, 203-204, 207-214, 211, 213, 215, 216, 218-220, 225, 228, 235-236, 238, 240-243, 245-246, 248-250, 252, 254-255, 258-260, 262-263, 264- 265, 267, 268, 272-274, 275, 276, 278, 280, 283-301, 303-304, 306-321, 311, 313, 315-323, 323, 327-337, 340-345, 347-363, 365-371, 373-388, 391-392, 394-395, 397-401, 402-405, 408-410, 413,415-416, 424, 428-430, 435, 437-439, 441-444, 453-454, 457-460, 462-466, 469-473, 472-476, 475-482
school administration 286, 289
school administrators 71, 94, 118, 211, 285-286, 289, 291-298, 301, 316, 336, 362, 477
schooling 34, 43-44, 47, 49, 55, 76, 84, 92, 101-102, 126-128, 131, 153, 163, 170, 216, 225, 235, 241-242, 254, 260-261, 295, 297, 299, 303-306, 308, 310-313, 316, 318-322, 338, 340-342, 359, 362, 398, 400, 405, 407, 469-470, 476, 478
school leaders 286-291, 293-294, 296-298, 439, 477
school leadership 260, 262, 286-291, 295-297, 299-300, 410
school psychology 284, 347-349, 353-357, 361-363, 473, 479, 481
school psychology training 355
school reform 62, 80, 132, 249, 259, 262-263
science 45-46, 54, 60, 66, 78, 90, 101-103, 157, 161-162, 174-176, 194, 198, 219, 258, 263, 265, 300, 345, 397, 408-409, 413, 428, 442, 444-445, 449, 458, 460, 463-465,
sciences 118-119, 122, 128, 130, 174, 177, 322, 388, 394-395, 408, 411, 439, 469, 477-478
scores 8, 15, 62, 86, 88, 93, 113, 151, 207, 400, 406, 461
secondary 22, 25-26, 28-29, 31, 35-36, 38, 41-43, 45-47, 54-55, 57, 60-61, 70, 77-79, 90-91, 101-103, 112, 125, 133, 140, 161, 163, 166, 172-174, 176, 201, 206, 208, 211-212, 214, 217-219, 293, 296-297, 304, 344, 373, 394-395, 397-398, 408, 426, 451, 478-480
self-paced 85, 96, 208, 216, 392
self-regulation 131, 228, 325, 327, 449, 455, 457, 460, 466
seminal 57, 165, 208
semiotic 185, 194, 196-197, 438
services 20, 31, 35, 48, 54, 62, 65, 79, 113-114, 115, 118-119, 120, 122, 123, 133, 136, 138, 148, 284, 307, 343, 347-349, 351, 353-358, 360-362, 365-367, 369-372, 374-378,

381-384, 387-388, 392, 398, 423, 452, 474, 478, 480-481
setting, settings 11, 86, 88, 94, 112-113, 115, 118-119, 123, 125, 135-138, 140, 145,150-151, 154-156, 164-165, 171-172, 179-180, 182-183, 186, 189, 191-192, 223, 225-226, 228, 234, 237, 239, 241, 265, 283-284, 286, 291, 295-297, 303-304, 307-313, 310, 316-317, 319-320, 328-330, 338, 340, 347, 348, 352-354, 356-357, 361, 362, 366-368, 370, 371, 374-376, 381, 383, 397, 419, 422, 425, 427, 432, 435-436, 447, 455, 465, 470, 473
sharing 3, 165, 188, 209, 248, 381, 403, 406-407, 421, 423-424, 428-430, 435, 440, 452, 456
Singapore 29, 34, 37, 45, 480
situated cognition 226-227, 234, 237, 241, 279
skills 2, 11, 53, 61, 63, 67, 71, 73-74, 77, 113-115, 119, 123, 151-153, 157, 175, 182, 184-185, 187-188, 191-192, 201, 204, 207, 210-211, 213, 215-219, 226-229, 234, 237-240, 248, 251-252, 269-270, 273, 275, 290-292, 294, 307, 312, 316-317, 326-327, 336, 349-350, 352, 355, 363, 366-368, 371-372, 374-375, 379, 381-382, 384, 386-387, 391, 394-397, 399-400, 404-406, 417, 419, 424-426, 430-431, 434, 436-437, 442, 449-450, 453-455, 459, 461-462, 466, 471
Sloan-C 442
Slovakia 400
social 43, 56, 58, 74, 97, 118, 129, 151, 153, 157-158, 161-162, 166-167, 169, 172, 182-187, 189-190, 194-198, 200, 204, 211-214, 218, 249, 261-263, 268, 271, 289, 292, 298, 307, 322, 327, 330-331, 336, 343, 349-350, 352, 355-357, 359, 371-372, 375-377, 381-382, 390, 395, 398-399, 411, 413, 417, 427, 429, 431, 437-441, 449-450, 452-453, 456, 458, 465, 471, 473, 475-479
Society 29, 33, 41, 43, 51, 74-76, 78, 102-103, 107-108, 129-130, 132, 187, 198, 200, 203, 221, 225, 228, 238, 241-243, 259, 264, 280, 320, 322, 342, 355, 367, 385, 398-399, 409, 412, 416, 421, 430, 439-440, 442, 445, 447, 449, 464, 466, 469-470, 478-479
Sociology 322-323
software 10, 151, 165, 169, 172, 177, 189, 389-390, 408, 412, 418, 421-423, 427, 465
solution 68, 69, 73, 129, 203, 215-217, 220, 300, 335, 338, 357, 380, 385, 411, 417, 425, 476
solutions 68-69, 129, 203, 215, 357, 380, 385, 476
South Carolina 71, 177
South Dakota 2, 71
South Korea 29-30, 34, 36-37, 40
spaces 88, 96, 162, 179, 188, 191-193, 280, 286-287, 291, 295-297, 367, 370, 373, 376-377, 379, 381-382, 384-385, 429, 434, 461, 478

Spanish 40, 86
specialist 46, 107, 153, 348, 375, 478, 480
standard, standards 18, 20, 41, 54-55, 59-61, 67, 71-74, 76-77, 84,102, 109, 113-114, 120, 122, 125, 129-130, 142, 162, 165, 171, 173-174, 176, 195, 201, 203-204, 206-207, 209-214, 216-217, 219-221, 228-229, 234, 237-240, 242, 247, 252, 254, 261-262, 264, 269, 290, 342, 354, 355-356, 363, 367, 373-374, 377, 379, 382-383, 385-386, 422-423, 428, 430, 434, 436, 438, 440, 442, 474-475, 477-479
states 1-3, 5-12, 14-16, 18-20, 25-36, 38-39, 44, 52, 54-55, 57-61, 64-65, 67-69, 71-72, 74, 90, 94, 101, 107-109, 114, 122, 128, 136, 148, 150, 163-164, 173, 177, 179-181, 193-194, 202-203, 208-209, 211, 215, 219, 235, 238-239, 246, 248, 270, 291-293, 299, 337, 343, 347-348, 356-357, 360-361, 376, 384, 395, 408, 422, 428, 448, 471
statewide 2-3, 5-6, 9-10, 15, 19, 38, 99, 175, 237
strategic 46, 66, 124, 189, 192, 381, 395, 443, 458-459, 477
strategies 23, 42, 94, 107, 110, 115, 119, 122, 124, 126, 131, 134, 137-138, 140-141, 157, 161, 171, 182-183, 186, 188, 191, 195, 202, 204, 216-217, 226-228, 234, 237, 239-241, 246, 250-252, 267-269, 272-278, 280, 284, 314, 316, 333, 336-337, 340-341, 344-345, 350, 361, 363, 381-382, 387, 389-390, 395, 400, 418, 428, 434, 440, 450, 474, 479
strategy 44, 47-49, 74, 128, 141, 144, 151, 154, 157, 199, 267, 274, 298, 317, 476
strengths 189, 349-350, 356, 370, 379, 420
stressed 112, 290, 370, 372
strong 32, 64, 107, 120, 247, 268-269, 271-273, 278, 292, 301, 331, 367-369, 371, 374, 391
structure, structures 64, 72-73, 105, 135, 186-187, 190-191, 208, 214, 240, 239, 249, 250, 288, 290, 297, 318, 328, 436, 460-461, 452, 454, 462
structured 74, 216, 249, 419-420, 427, 447
struggling 95, 105, 131, 199, 308, 311, 319, 332, 348
student, students 1-15, 4-13, 18-22, 25, 26-36, 30, 32-33, 35-38, 40- 43, 45-48,52, 54-55, 57-61, 62, 63-67, 64, 68-70, 72-74, 75, 77-79, 83-96, 86, 92-103, 98-110, 105, 109, 112-113, 112-142, 115-122, 124, 126-129, 131-135, 144-146, 148, 150-159, 151, 156-158, 162-176,165, 167-168, 170, 176-177, 179-194,182, 184-185, 190, 192, 194, 196, 198-199, 201-204, 202-203, 206-208, 206-221, 210-220, 223, 226-228, 227-229, 234, 236-240,241, 244-247, 249-250, 251-252, 254, 256, 259, 262-263, 268-269, 271, 272, 276, 278-279, 283-289, 291, 293-294, 295, 298-299, 301, 303-312, 307-321,314-321, 325-328, 325-344, 331-332, 334-336, 338-344, 346, 347-349, 348-354, 355, 357-360, 361-363, 365, 366-370, 368-369, 372-374, 372-380, 385-387, 378, 380-381, 384-385, 387, 390-392, 394-400, 402, 404-411, 408-409, 411-412, 413, 418-421, 423-425, 427-

432, 429-430, 434-437, 439-441, 443, 447-460, 448-449, 451, 453-463, 462-463, 470-471, 472-473, 475-477, 478, 479, 480-482
student achievement 1, 15, 38, 41, 43, 55, 57, 64, 121-122, 128, 135, 176-177, 213, 220, 245, 247, 262, 269, 283-285, 303-304, 308, 311-312, 314, 317-320, 341, 343, 365, 368-369, 394, 419
student control 4, 13, 36, 105, 167-168, 305, 448
student relationships 289
studies 11, 15-16, 22, 39, 42-43, 45-46, 73, 83-86, 88-89, 94-100, 104, 112, 115, 117, 124-125, 131, 135, 137-139, 141-147, 149-151, 153-157, 161-162, 164, 166-172, 175, 181-183, 191, 198, 200, 203-204, 206-209, 211, 214-216, 234, 236-237, 239-240, 244, 248-250, 252, 256, 258, 260, 274, 278, 284, 286, 289-291, 293-294, 300, 303, 307-313, 316-320, 322, 338, 345, 352-353, 359, 365, 368, 371-373, 375, 380-382, 391, 394-398, 405-406, 410, 413, 418, 435, 441, 443, 460, 470, 478
subject, subjects 4, 9, 13, 60, 64-65, 86, 92, 94-96, 99, 103, 120, 139, 142, 144, 176, 188, 201-203, 206, 208, 212, 215, 247, 251, 305, 314, 337, 428, 433, 452, 454, 460-461
succeed 92-93, 124, 152, 223, 254, 325-326, 337, 347, 352
successful 18, 21, 40-41, 56, 72-74, 94, 98, 100, 104, 116, 120, 124-125, 130, 132, 164, 179, 189, 194, 215, 218, 226, 229, 234, 237-238, 240, 263, 269, 271-272, 274, 280, 288, 299, 307, 312, 315-316, 327, 331, 339, 344, 367, 375, 391, 403, 405-406, 428, 436, 451, 470-471, 477
superintendent preparation 286
superintendents 285-288, 291-292, 294, 297-298
supplemental 2-7, 11-12, 19, 25, 27, 29-30, 38, 52, 56, 58, 64-65, 68-69, 88, 250, 293, 307, 319, 334, 344
support 2, 12, 20, 32, 34, 39-40, 52, 54, 57-62, 66-67, 70, 86, 88, 93, 102, 105, 107, 110, 114-115, 117-118, 121-122, 124-125, 129, 131, 142, 144, 151-153, 156, 165, 168, 174, 176, 184, 186, 188-190, 192-193, 199, 208, 214, 227, 234, 239, 246, 250, 252-253, 255, 262, 265, 267-270, 272-273, 275-276, 280-281, 283-284, 290-291, 296, 301, 306, 308-319, 325-327, 330, 333-339, 341, 343, 347-349, 352, 355, 365-366, 370-372, 378-381, 383, 394-395, 401, 403, 405-411, 421, 423, 428-429, 431-432, 434, 447, 449, 451-453, 455-456, 458, 460-463, 470, 473
supporting 6, 52, 62, 94, 108, 119, 128, 169, 192-193, 196, 252, 260, 265, 275-277, 279, 307, 313-314, 317, 319, 332, 334, 342, 367, 370-371, 379, 382, 385, 426-428, 439, 453, 455, 460
supports 12, 114, 121, 123, 152, 154, 227, 246, 254, 274, 295, 317, 348-349, 352, 373, 377, 418, 420, 449, 456-457, 461

support systems 470
survey 42, 47, 76, 89-93, 96, 99, 130, 132, 145-146, 148, 155, 157, 197, 235, 242-243, 245, 250-251, 258, 288, 300, 334, 343, 362, 371, 374, 442
surveyed 88-89, 91, 93, 228, 235, 291-293, 329, 333
surveys 83, 89-94, 98-100, 155, 235, 242, 256, 288, 292-293
synthesis 112, 115, 137, 141, 164, 180-181, 183, 202, 204, 211, 234, 250, 256, 258, 267-268, 275, 286, 304, 329, 345, 353, 369-370, 396, 409, 418, 447-448, 452, 454
systematic 35, 58, 126, 128, 154, 156, 228, 246, 248, 260, 304, 350-351, 361, 383
systems 34, 46, 48, 52, 56, 58-59, 62, 65, 67, 72, 75, 80, 96, 99, 152, 168, 171, 176, 195-196, 198, 239, 280, 285, 294, 296, 314, 342, 346, 355, 366, 368-369, 371, 373, 379-380, 395-396, 399-400, 409-411, 418, 470, 478
tablet 392, 397, 409, 412
tablet computing 397
taxonomy 278, 305
teacher 3, 11, 12, 15,19, 29, 33-34, 37, 40-41, 42, 44-46, 45, 47, 49, 51, 53, 56-58, 59, 60, 63-64, 65-66, 68, 70-76, 78, 83-84, 86-96, 88, 92-93, 96-104, 98. 100-104, 109, 110, 114-115, 122, 127-132, 137, 145, 151-154, 162, 164-168, 170-171, 174-176, 177, 181-184, 186-187, 188, 189-192, 194-197, 199-200, 202-204, 206-211, 213-219, 221, 223-229, 234-256, 246-250, 253, 256, 258-265, 267-272, 270, 274-280, 275, 278-281, 285, 290-295, 297-299, 308-309, 309-312, 314, 316, 318-322, 326-327, 328-333, 331-333, 336-344, 339-341, 343-344, 347-348, 349-351, 355, 355, 358, 360, 362, 366, 371, 373-373, 377, 379, 381, 383-386, 388, 392, 394, 397-399, 401-408, 408-410, 412-413, 419-421, 423-424, 426, 427-430, 432, 434-436, 438-441, 448-450, 452-464, 457-459, 461-463, 465, 466, 469-476, 472, 474-477, 478-480
teacher preparation 51, 70-71, 73, 114-115, 122, 181-182, 213, 225-226, 234, 237-240, 248, 259, 291, 299, 336, 349, 355, 408, 470, 478
teaching 3, 15, 34, 36-37, 42, 46, 58, 61, 64, 71-74, 76-77, 80, 83-98, 100-104, 107, 109, 114, 119, 122, 127, 129-130, 132-133, 151-152, 157, 161, 163-165, 167, 169, 172-177, 179, 182-185, 187, 191-192, 194-199, 201-204, 206, 208, 213-214, 216, 218-219, 221, 223, 225-229, 234, 236-244, 247-249, 251-255, 259-265, 267, 269-272, 275-281, 286-287, 291-292, 294-295, 298-299, 301, 304, 321-322, 329-330, 333-334, 337, 340-341, 355, 361, 363, 366, 368, 371, 374, 376, 380, 383, 387, 394, 397, 402-403, 405, 407-409, 411-413, 418, 421, 425, 431, 433-434, 438, 440, 443, 447-448, 450-452, 455, 458, 461, 464, 469-472, 474, 476-480
teamwork 288, 290
technology enhanced learning 386, 455

technology for learning 202, 462, 474
telephone 27, 63, 357
television 16, 22, 26-27, 437, 449
Tennessee 6, 61, 65, 67, 481-482
testing 8, 47, 70, 86, 165, 351, 381, 458
Texas 6, 18, 133, 292, 298, 437, 480
textbook 87-88, 152, 206
textbooks 419, 421, 424-425, 428, 451
theory 7, 75, 157, 167, 185, 189, 196-197, 200, 234, 243, 278, 280, 290, 321, 342-343, 361, 411, 418, 424, 430-432, 440-441, 443, 456, 464, 469, 471, 474
tracking 14, 56, 337, 346
trained 88, 182, 223, 236, 275, 292, 335, 337, 348, 352, 354, 358, 481
trainers 90, 278, 481
training 53, 58, 65, 71, 88, 93, 113, 117, 119, 122-123, 126, 137, 153, 182, 189, 204, 207, 209, 211, 213, 219, 226, 236, 239-241, 251, 258, 278, 280, 290-292, 314, 316, 319, 335-337, 347-348, 351, 354-357, 359-363, 374-375, 398, 403, 420, 455, 459, 473, 482
transfer 55, 69, 173, 246, 256, 268, 280, 301, 367, 373, 382, 407, 449
transition 64, 72, 107, 113-114, 116-117, 121, 127-134, 152, 157, 239, 284, 288, 291, 327, 371, 380, 479-481
treatment 88, 163, 167, 170, 172, 292, 335, 352
trends 19, 21, 35, 43-45, 47, 49, 53, 59, 66, 70, 103, 127, 164, 166, 181, 193-194, 196, 244, 258, 322, 342, 345, 413, 421, 428, 439
Turkey 29, 34, 36, 44
tutorials 198, 366, 369, 372, 376, 378-380, 382-383, 451
tutoring 176, 280, 326
tutors 29, 122
Twitter 190, 378, 452, 471, 474, 478, 480
UNESCO 399, 407, 412, 428, 444, 465
UNICEF 412
Utah 3, 7, 18, 25, 66, 71, 77, 428, 444
values 75, 112, 115, 120, 204, 211, 308
variables 30, 88, 93, 99, 129, 156, 318, 338, 350, 465
Vermont 6, 71, 482
Virginia 14-15, 68-69, 234, 474
virtual 1-8, 10-12, 15-16, 18-22, 26, 28-29, 34-37, 39, 41-49, 52, 55-58, 61, 65, 67, 69-70, 77-78, 84-85, 90-99, 101-104, 112, 121, 127-129, 131-133, 136, 151-153, 156, 158, 161,

163-165, 169, 171-174, 176, 179-183, 189-195, 203, 208, 218-221, 225, 228, 235-238, 241-243, 245, 250, 254, 258-261, 263-264, 267-268, 275-276, 278-280, 283, 286-287, 289-291, 293-301, 304-307, 309-312, 316, 320, 322-323, 329-330, 334-336, 340-345, 349, 352, 354, 358-359, 361, 363, 366-371, 373, 375-379, 381-387, 390, 403, 405, 407-408, 411, 419, 438-439, 459-460, 469-472, 478-479, 481
virtual learning commons 366-367, 386
virtual library 366, 368-370, 375, 378-379, 381-382, 384
virtual manipulatives 161, 165, 169, 171-172, 176
virtual physical education 220-221
virtual schooling 43-44, 47, 84, 101-102, 127-128, 131, 235, 241-242, 260-261, 295, 297, 299, 304, 306, 312, 316, 320, 322, 340-342, 407, 469-470, 478
virtual schools 1-3, 5-6, 10, 12, 18-21, 35-36, 41, 43-45, 47, 52, 55-58, 61, 65, 67, 69, 77-78, 84-85, 93-94, 99, 102-103, 121, 131, 158, 179-181, 183, 189-190, 192-194, 236-238, 241, 245, 250, 268, 275, 278, 290-291, 294-295, 297, 299, 301, 304, 316, 320, 322-323, 345, 354, 386, 408, 438, 460, 469, 471, 481
vision 37, 73, 165, 194, 234, 237, 264, 270, 379, 394, 399, 402-403, 442, 476
visual 134, 136, 182, 185, 187, 189
vocabulary 186-187, 190, 195, 199, 395-396
vocational 47, 65, 132, 134, 162, 176
Washington 14, 43-44, 46, 77, 79-80, 103-104, 127-128, 130-132, 134, 173-174, 176, 194, 198, 200, 243, 264, 279-280, 301, 322, 341, 344-345, 386, 388, 407-408, 410, 413, 438, 471
weaknesses 85, 217, 309, 333, 379, 420
wealth 155, 250, 256, 272, 276
web-based 36, 41, 57, 66, 80, 101, 130, 158, 165, 176, 180, 228, 235, 411, 442, 450, 452, 456-457, 464
websites 90, 93, 190, 212, 357, 375, 378, 429, 451, 453, 458
West Virginia 15, 68
Wikipedia 79, 299, 425, 439, 443
Wisconsin 9, 19, 27, 71, 198, 239, 290, 299
workflow 378, 381
working 47, 85, 90, 95, 105, 122-123, 151, 192, 209, 238, 247, 252-253, 255, 273, 277, 296, 298, 312, 326, 328, 332, 349-350, 354, 356, 372, 404, 442, 455-456, 470-471, 474, 478
workshop 246-247, 412, 477
Worldwide 35, 40, 43, 385, 387, 391, 394, 398, 419, 465, 471, 476

writing 11, 71, 106, 113, 152, 162, 169, 179-181, 183-186, 188-192, 194, 196-200, 224, 241, 262, 284, 365, 369, 390, 395-396, 412, 425, 429, 432, 434, 438-439, 471, 473, 475, 478-479
writing instruction 179-181, 184, 189-190, 197-198
YouTube 190, 454