Proceedings of the Annual Meeting of the Georgia Association of Mathematics Teacher Educators

Volume 13
Issue 1 *13th Annual Proceedings*

Article 3

2019

An Alternative Approach to the Traditional Internship

Basil M. Conway
Columbus State University, conway_basil@columbusstate.edu

David Erikson
University of Montana, David.Erikson@mso.umt.edu

Christopher Parrish
University of South Alabama, parrish@southalabama.edu

Marilyn Strutchens
Auburn University, strutme@auburn.edu

Jennifer Whitfield
Texas A & M University - College Station, jwhitfld@tamu.edu

DOI
10.20429/gamte.2019.130103

An Alternative Approach to the Traditional Internship

Basil Conway IV
Columbus State University
conway_basil@columbusstate.edu

David Erickson
University of Montana
David.Erickson@mso.umt.edu

Christopher Parish
University of South Alabama
parrish@southalabama.edu

Marilyn Strutchens
Auburn University
strutme@auburn.edu

Jennifer Whitfield
Texas A&M University
jwhitfld@tamu.edu

Abstract

This paper reports the benefits and challenges of incorporating a paired-placement model at four different post-secondary teacher preparation programs in secondary mathematics education. The paired-placement model places two secondary mathematics clinical teachers with one mentor (or cooperating) teacher during their internship experience. Benefits exhibited were increased collaboration, more knowledgeable cooperating teachers, increased sense of community, teaming, pedagogical risk-taking, increased reflective practice, established natural professional learning communities, Plan-Do-Study-Act Cycle (PDSA), and increased accountability. Challenges found through the PDSA cycle include personnel issues, number of days teaching, perceived classroom management preparation, preparing university supervisors, mentors, and teacher candidates, and support for collaboration afterward.

Introduction

Many teacher preparation programs use the traditional model for clinical teaching, also known as an apprentice-type model for clinical teaching. This model consists of a teacher candidate going into a mentor teacher's classroom for 8-15 weeks and gradually taking over the teaching responsibilities of the classroom. During this time, the teacher candidate receives feedback about his or her teaching practice from both the mentor teacher and the university supervisor. This apprentice-type model for clinical teaching can either be very beneficial or futile for the teacher candidates. The success of the model depends upon many variables, one of which is the quality of the mentor teacher. The teacher candidate depends on the mentor teacher to model effective instructional practices, to offer advice and helpful tips on facilitating student learning, to engage in reflection exercises, and to aid him or her in developing the craft of teaching (Leatham & Peterson, 2009). Finding sufficient numbers of quality mentor teachers, thus ensuring a meaningful clinical teaching experience for the teacher candidates, can be challenging. These limitations and challenges to the traditional, apprentice-type model for clinical teaching highlight the need for researchers to explore other, non-traditional models for clinical teaching that may provide a more collaborative, reflective, and focused approach to clinical teaching that would ultimately provide a rich and meaningful culminating experience for teacher candidates.

To address the need for further exploration of non-traditional models of clinical teaching, a network of researchers across different universities created modified versions of the paired-placement model for clinical teaching. In the paired-placement model, two secondary mathematics teacher candidates are paired with one mentor (or cooperating) teacher. This trio of

teachers works collaboratively and develops skills and strategies for co-planning and co-teaching whereby all three work daily together to address student learning as a team.

This study focuses on the clinical experience aspect of teacher preparation because it is the culminating, most immersive, and the most powerful component of teacher preparation as reported by many newly certified teachers (Wilson, Floden, & Ferrini-Mundy, 2001). The purpose behind this study was to determine if the shift in paradigm from the traditional model to the paired-placement model could be accomplished, and if so, what aspects of the paired-placement model contributed to and limited teacher candidates' preparedness to teach. This report summarizes research across a Network Improvement Community (NIC) of four universities on the use of the paired-placement model and summarizes research related to the paired-placement model.

Literature Review

It is during the clinical teaching experience that many teacher candidates develop the craft of teaching. Leatham and Peterson (2010) described this as the ability to design lessons that involve important mathematical ideas, design tasks that will help students to access those ideas, and to successfully carry out the lesson. Thus, during the clinical teaching experience pre-service teachers must develop skills to effectively launch the lesson, facilitate student engagement, orchestrate meaningful mathematical discussions, and help to make explicit the mathematical understanding students are constructing (Leatham & Peterson, 2010). Furthermore some mathematics teacher educators – those who prepare the teacher candidates – may not be satisfied with the traditional, apprentice-type model because (a) sometimes the purposes of clinical teaching may not be explicit, (b) teacher candidates may find themselves focusing more on classroom management issues rather than other important aspects of effectively orchestrating the

lesson (e.g., student thinking, effective questioning, etc.), (c) teacher candidates may focus more on their own preparation and knowledge instead of the students' thinking, (d) the model can leave the teacher candidate feeling isolated if they are left alone too much or are not spending much time collaborating with their mentor teacher, and (e) sometimes the clinical teaching experience may be perceived as not having a lead instructor since the distinct roles of the faculty, mentor teacher, and university supervisor may be unclear (Leatham & Peterson, 2010). Thus, alternative models to the traditional, apprentice-type model, internship should be considered.

Bullough et. al (2003) compared the traditional model of teaching with a peer teaching model in which two student teachers work with one mentor teacher through interviews and observations. Bullough et. al (2003) reported that the peer teaching model had positive impact on classroom students and for student teachers. Specifically, student teachers and mentors reported increased support by having their peers in the same classroom; increases in pedagogical risk taking; opportunities for on-going conversation about teaching during their internship; increases in better classroom management; and experiences in learning how to collaborate to improve practice (Bullough et. al, 2003). However, challenges were shared with the peer teaching model: K-12 student transition from team teaching to one teacher, belief in the model to effectively prepare teachers to teach alone; partnering students with different personalities; and training mentor teachers to support positive facilitation of student collaboration (Bullough et. al, 2003). Though challenges were discussed, Bullough et. al (2003) reported an adequate trade-off that could be modified through further implementation and inclusion of strategies to reduce challenges.

Goodnough, Osmond, Dibbon, Glassman, and Stevens (2009) similarly explored a triad model with student teaching in which two pre-service teachers were paired with one cooperating

teacher. In this model, the triad worked for a 12 week period. Both pre-service and cooperating teachers reported positive aspects of learning from each other, providing professional support, increasing outcomes for K-12 students, detailed feedback about the art of teaching, and increasing pre-service teacher confidence. Mentor teachers and pre-service teachers also reported limitations and concerns. Those in the triad model described concerns of dependency, confusion about classroom management during the experience, loss of individuality, and competition between the pre-service teachers.

Gardner and Robinson (2009) looked at the paired-placement field placement model in an urban school district. Using qualitative techniques with data field notes, multiple observations, interviews, and work samples Gardener and Robinson (2009) found that paired-placements promoted multiple perspectives, led to increased dialogue about teaching and learning, and facilitated the implementation of student-centered pedagogies. Similar to other research on paired-placements, Gardner and Robinson (2009) found strong potential for the model to nurture and develop skills of collaboration.

Mau (2013) described how she felt constant criticism during her traditional internship placement. Thus, she sought to develop experiences for her teacher candidates that reduced this experience for future teachers. To do this, Mau (2013) purposefully chose mentor teachers that aligned with effective teaching practices; however, this was not always achieved due to the difficulty in finding the number of teachers needed for placements. Reflecting on the research benefits of the paired-placement models, she placed students in pairs with one mentor teacher which reduced the number of mentor teachers needed; engaged student teachers in more frequent and varied communication; increased their willingness to take pedagogic risks; improved student teachers level of reflection; fostered collaboration and cooperation in the teaching action;

modified teaching to increase K-12 student learning; increased better classroom management; created strategies to handle tensions in perspective and performance; and conveyed worry that a paired-placement did not reflect the reality of employment as a teacher.

Guise, Habib, Thiessen, and Robbins (2017) studied the impact of the paired-placement model on teacher candidates' ability to co-teach in secondary science and English classes. Guise et al (2017) chose both the humanities and arts as part of their study of implementing the research in case subject matter influenced the co-teaching implementation. The researchers provided three workshops related to co-teaching strategies. Guise et al. (2017) collected weekly reflections, observation rubrics, and semi-structured interviews to help understand the impact. Across the eight pairs, different degrees of understanding and buy-in to the co-teaching model were evident. Three eighths of the placements resembled a "traditional student teaching" model where the master teacher gradually releases responsibilities to the student teachers. One of the eight pairs reported a "blended experience" where there was a mixture of traditional student teaching and co-teaching. Two of the eight pairs fell into a "continuum category" where they implemented a variety of co-planning and co-instructional strategies and used most strategies at least once. The last two of eight pairs were similar to the continuum category; however, these students had mentors that purposefully provided opportunities to assist, lead, and collaborate at different moments in the field experience. Mentors in this subset displayed a growth mindset, positioning themselves alongside their pre-service teachers as lifelong learners.

Given the existing literature, the paired-placement model shows promise for positively impacting student teacher preparation for teaching and increasing K-12 student learning. In particular, the model strongly supports reform efforts geared towards increasing collaboration in the field (Gardner & Robinson, 2009). In addition, the paired-placement model shows promise

for helping to alleviate possible issues that many higher education institutions may be facing (Mau, 2013). The remaining portion of this report will focus on a partnership of higher education institutions who have implemented the paired-placement model to prepare student teachers in mathematics education.

Theoretical Framework and Context

This study was designed as part of the Mathematics Teacher Education-Partnership's (MTE-P) efforts to improve the preparation of secondary teachers of mathematics using a Networked Improvement Community (NIC) approach. This model was developed and used by the Carnegie Foundation for the Advancement of Teaching (Bryk, Gomez, & Grunow, 2011). Developing the craft of teaching is complex and requires careful attention on the part of the teacher candidate, the mentor teacher, the university supervisor, and the university faculty. The MTE-P clinical experiences Research Action Cluster (RAC) has been using the eight mathematics teaching practices (National Council of Teachers of Mathematics [NCTM], 2014) as barometers for whether or not teacher candidates are developing the craft of teaching.

In this study, the NIC model was used by implementing the precepts of design science using Plan-Do-Study-Act (PDSA) cycles, with precepts of networked improvement, so that the improvement cycle could be carried out across a range of contexts or institutions in this framework. As interventions were improved in successive iterations at one university, interventions were spread across the universities involved in this study that fit their own contexts. This design is powerful in its ability to allow multiple institutions and secondary mathematics teacher preparation programs across the country to incorporate the PDSA cycle and paired-placements at their respective institutions.

Researchers at each university used the PDSA cycles to collect data before, during, and after the clinical teaching experience to inform further research and improve implementation of the model. The PDSA cycles incorporated interviews, surveys, teaching evaluations, and reflective journals. At the end of the clinical teaching experience, the PDSA cycle was implemented when all universities participated in a web conference meeting and university researchers allowed each group of participants to share their experience and answer some questions. In addition, summer institutes bring together the university partners to continue the PDSA cycle with new and existing universities.

The participants in the study were secondary mathematics teacher candidates who were enrolled in a university based teacher preparation program. Participants were placed in a middle or high school setting for a minimum of half of a school year with the same mentor teacher. Some participants in the paired-placement model participated in a methods lab together the semester before with the same mentor teacher when possible. Participants at each university were selected differently; some universities only had two secondary mathematics teacher candidates and as such, the two candidates were selected as participants. When possible, the university placed students strategically to decrease tension in the paired-placement model. These participants may have been paired with the same or different gender candidate based on the number of candidates available and willing to participate. Other universities had a larger pool of candidates and either hand selected the participants or took candidates who volunteered to be a part of the study. Universities participating in this project are located in the south-east, north-west, and south-west portions of the United States. This research is ongoing, thus the number of participants continues to increase each semester as the NIC schools complete the PDSA cycles. The research questions that guided the study were:

1. What are the successes and challenges of implementation of the paired-placement model for clinical experiences at each different university?
2. How do the successes and challenges of the paired-placement model compare across the various institutions involved in the study?

Data Sources and Methods of Collection

A variety of data sources were generated from the iterative PDSA cycles. The two main data sources used at each institution were semi-structured interviews and reflective journals. The semi-structured interviews allowed researchers to probe for specific attributes of the paired-placement model while also allowing participants (teacher candidates, mentor teachers, and university supervisors) to freely express their experiences and insights into the model. The guiding questions used by the researchers were:

- How are you working as a team?
- In what ways are you working together?
- How much time do each of you spend planning on your own? Where does this usually occur?
- How much time do you spend planning with your peer? Where does this usually occur?
- How much time do you spend planning with your teacher? Where does this usually occur?
- How much time do you spend planning with your peer and cooperating teacher? Where does this usually occur?
- How did the time spent planning impact your teaching?
- What suggestions would you give others in this situation for planning?
- How has the paired-placement impacted student learning?

- What occurs after a lesson has taken place? Is there discussion on student work? Is there reflection on student discourse? Are there instructional next steps? Are there plans for improving the learning environment overall? Is there discussion on management issues?
- How often do you discuss implementation of the standards for mathematical practice? In what ways do you discuss them?
- What mathematics teaching practices have you discussed? How do you move each other forward when you see that a practice is not implemented as well it could be?
- What impact has the implementation of the standards for mathematical practice had on student learning and engagement?

Researchers at each university complied and analyzed their data individually and then convened at multiple face-to-face and virtual meetings to compare the results across institutions. The total number of artifacts for each institution was not collected and shared to protect participants and institutional confidentiality. Teacher candidates completed interviews and questionnaires at each institution at both the mid-term and end of internship in regard to these questions. Researchers at each institution used a priori and axial coding when reviewing student responses to questions. A priori and axial codes were developed from the existing research literature and through the PDSA cycles. These codes will be summarized in the following sections in relationship to both benefits and challenges of the paired-placement model in terms of teacher candidates, internship supervisors, and internship mentor teachers.

Results and/or Conclusions

Overall, each university found that the paired-placement model provided a rich, meaningful, and collaborative experience for the pairs of teacher candidates. The interview data suggested that the pairs of teacher candidates worked cooperatively more than they initially

thought they would. The following snippets of interviews are direct quotes from participants of the paired-placement model and represent common themes found across universities.

Benefits - More Knowledgeable Cooperating Teachers

Teacher preparation programs face significant challenges in providing secondary mathematics teacher candidates with quality clinical experiences. The problem is two-fold: There is an *inadequate supply* of *quality* mentor teachers to oversee the experiences. This is related to the quantity of teachers who are well versed in implementing the CCSS and state standards, especially embedding the standards for mathematical practice into their teaching of content standards on a daily basis (Strutchens, Sears, Zelkowski, and Ellis, 2017).

During meetings the researchers often highlighted the ability to place teacher candidates in strong mentor teacher classrooms. Though this was not always the case, the NIC teams strategically placed paired students in strong mentor teacher classrooms to maximize their impact on the teacher candidates. Even when the paired-placement model was incorporated with mentor teachers who did not embed the mathematical practice standards, cooperative teachers shared about their ability to learn from the interns. One mentor teacher stated, "I think this was the best thing that could have ever happened to me. I had to step up my game... I got to see a different side of my students." A different mentor teacher stated, "I felt more accountable for holding students accountable to these mathematical teaching practices and practice standards myself. I felt the role of being a 'Master' mentor teacher being that much more important because I was entrusted with two of AU's interns."

Using the paired-placement allows for NIC schools to do two things. First, it reduced the number of quality mentor teachers needed. This allowed for schools to pick some of the best mentor teachers available in their area. Second, it allowed for professional growth for mentors in addition to the teacher candidates as a PLC of learners in both teaching practice and mentors as

teacher educators. Mentor teachers exhibited and attempted to use best practices more often in their own class and fostered discussions during collaboration with teacher candidates that improved practice when implementing the paired-placement model.

Benefits - Increased Collaboration

Teacher candidates were overwhelmingly positive about the paired-placement model's ability to increase collaboration. During the interviews one teacher candidate stated, "This creates a more collaborative learning environment for both the teachers as well as the students" and when referring to herself and the other teacher candidate, "The two of us have been able to apply many teaching strategies and see what works well with our students." Both teacher candidates were more than reluctant to enter this experience, but within the first seven weeks, would not have traded for any other experience. Similarly, a teacher candidate stated, "One obstacle that I had to overcome is learning to plan together … This actually helped us learn to work with others more effectively."

The paired-placement forced collaboration between the two teacher candidates. Unlike many other collaborative models, the paired-placement requires collaboration. Though each institution implemented and required the teaching of courses collaboratively and in different ways, mentor teachers reported on the benefits of forced collaboration produced by the model. One mentor teacher stated, "I believe the forced collaboration of mixing courses throughout the semester was extremely beneficial. Though this was the most difficult aspect of the model we used, it also provided more chances for collaboration and co-teaching." A teacher candidate stated, "Toward the beginning we planned individually, but toward the end we started planning more together. We realized the importance of the two of us knowing how we each taught things and we had better ideas when we planned together." A different teacher candidate stated, "I also think this experience helped me to become a much more collaborative teacher. Before this

semester I would have tended to simply work alone and not work with my fellow teachers. However, this semester I saw the importance of working with peers." These candidates were encouraged to work as a team, and it improved their collaborative ability throughout the semester. In other instances, this collaboration happened immediately.

The following teacher candidate worked very well together with his partner from the onset. He stated, "I believe that one of the reasons that this paired-placement model was successful was because we had the ability to bounce our ideas off of each other. If we are alone in the classroom, we will usually think of an idea and not be able to critique it as much … we have the chance to get a second opinion" from another teacher candidate "that has experienced the same students and environment as you." Teacher candidates having common experiences allowed for deeper and more insightful reflective experiences. Teacher candidates report and reflect on making moves during the teaching experience in which insight was found through their peers, "so I asked my partner if he can think of a different method to teach the lesson and he made a minor change to the way that I was teaching and it made all the difference to the students."

Benefits - Teaming

There are multiple models of team teaching that are expressed in the literature (Baeten and Simons, 2014). Teacher candidates in this research often observed, coached one another, assisted one another in teaching, shared responsibilities in lesson planning and teaching responsibilities. In each classroom and NIC participant this was implemented differently. Allowing multiple team teaching models allowed for those involved in the paired placement to fit their own contexts to the teaching requirements and expectations of each university. Through reviews of interviews a number of benefits were suggested related to team teaching models.

Mentor teachers discussed during interviews how conversations were geared towards the learning of mathematics rather than behavior. Mentor teachers believed that the teacher candidates focused on how they could improve student learning rather than make excuses for why students were not learning based on student characteristics based on the paired-placements ability to construct team teaching opportunities. They believed this was likely due students teaching the same students and seeing the difference in learning with different lead teachers. Mentor teachers commonly reported of discourse related to the teaching and learning of mathematics rather than non-productive discussions of problems with students.

A university supervisor shared that high school students "benefit by having two additional teachers present to monitor their progress and provide assistance as needed." With required standardized testing, this added support for learning mathematics in the classroom was also welcomed. A cooperating teacher from another institution stated, "Whenever there were three people floating in class it was good for the students." Having extra teachers in the room was important in quality as well. A teacher candidate said, "When we worded things differently the students could hear the difference… The students would get various explanations." Having varied views and ways to teach required students to think deeply about and understand the mathematics.

Benefits - Increased Reflective Practice

Mentors, supervisors, and other district personnel are often reluctant to move from traditional models. A supervisor, principal, and teacher for over forty years stated in his interview,

> I have served in the one-to-one internship for many years, and I was reluctant at the beginning until I made my first visit. I was pleasantly surprised when I made my first observation and post conference. This process allows the interns to plan together and to

> plan with their CT [cooperating teacher]. It also permits them to critique each other, share ideas, team-teach, and explore different strategies and critique the process. This is an ongoing collaboration between teachers, and to me is valuable for interns.

One of the critical components of a professional teacher is reflection that improves practice. A teacher candidate stated,

> I am so glad that I got to have the experience of doing my internship alongside a peer. I truly believe that I learned more than I would have if I had been on my own. We constantly reflected with one another whether it was in the car to or from the school or in a more formal reflection time.

This reflective practice often happened inside and outside the classroom likely due to the shared experience the paired-placement presented. A similar teacher candidate in a different experience stated, "We were continually talking to one another about our experiences. . . . After each class we talked about what worked and what did not without realizing that we were reflecting on our teaching, which helped us improve." The experience of increased reflective practice directly moved teacher candidates towards improving teacher practice.

Benefits - Pedagogical Risk-Taking

Mentor teachers also reported increased pedagogical risk taking either in practice or in actual content taught. One mentor teacher stated, "I think this was the best thing that could have ever happened to me. I had to step up my game." A mentor teacher reported the incorporation of a social justice lesson during his interview that may not have taken place without the interactions of the placement. Mentor teachers who had experienced the traditional internship placement model and the paired-placement model discussed the shift in discourse among the teacher candidates. A teacher candidate stated, "I was able to bounce ideas off of my partner, and we were able to come up with different approaches that I have not thought of before. It made me

teach a subject differently than I would normally teach and try new techniques that my partner used. I would not have seen these types of techniques if I was not in the paired-placement internship. It made me work out of my comfort zone, and I was able to feel more confident, because if I misspoke my partner could correct me."

Teacher candidates will potentially be at varying levels of what may be seen as risk-taking for themselves. The paired-placement model seemed to support the teacher candidates and potentially even the mentor teachers' sense of risk taking. This risk taking was seen through the incorporation of different teaching strategies, reform oriented teaching, classroom discourse, inclusion of social justice lessons, and classroom groupings.

Benefits - Increase in Accountability

Rather than be an authoritative figure in the discussion with teacher candidates, mentor teachers served as moderators of discourse. A mentor teacher stated, "I believe the internship model also held the two interns accountable to one another for using teaching practices. They knew what was expected from their supervisors because they both were a part of the same program." A university supervisor stated there was "an unspoken accountability between the interns to use best teaching methods." It is believed that this increase in accountability comes from shared experiences during methods coursework. A mentor teacher stated that "Because I was a graduate student from the same program my interns were coming from… I felt more accountable for holding students accountable." The paired-placement provided someone in the classroom each day who was taught and presumably held the same vision for teaching mathematics as themselves. A teacher candidate stated, "The paired-placement also helped hold me accountable… So, I was not as afraid to take risks because I did not [have the] fear of teaching the wrong information, when I had someone who could check me as I was teaching."

Benefits - Established Natural Professional Learning Community

A professional learning community (PLC) is a group of educators that meet regularly to share expertise and work collaboratively to improve teaching skills and academic performance of students (DuFour, 2004). These type of communities are often mandated by districts and happen systematically. The difficulty in PLCs is often dissimilarity in shared experiences. The paired-placement provides a natural PLC where the triad of teachers have common experiences and students. Mentor teachers shared their realization of how the paired-placement model emphasized collaboration and coordination. One mentor teacher stated, "Three teachers cooperating for the betterment of the students, … collaborating for lessons (ideas/feedback), [and] 'forcing' a PLC model within the classroom." This mentor teacher recognized the relationship and development of a natural PLC. Having a built-in professional learning community within his classroom was welcomed over the contrived PLC the district required.

PLCs should encourage reflection and improvement in teaching practice. A teacher candidate stated, "It has been wonderful having two people to reflect with me about my lessons and to give me constructive criticism. Both Mrs. Brown [pseudonym] and the other intern see different things in my teaching that helps me to become a better teacher." The paired-placement has allowed for a natural creation of reflection where teacher candidates share expertise among themselves and their mentor teacher while improving both their teaching skills and academic performance of their students.

Benefits - Increased Sense of Community

Teacher candidates in the paired-placement model often see one another as resources. Working closely with one another they are able to exchange ideas and learning experiences among one another. One teacher candidate stated, "[we asked] for advice from each other and got input and encouragement from each other." A common theme throughout the paired-

placement discussions was a sense of community. A community of educators working together to improve not only teaching practice, but student learning. I believe one mentor teacher during an interview expresses this well:

> With us exchanging lead teaching responsibilities of classes often and using one another's lesson plans throughout the semester, it became apparent for the need to make lesson goals and standards focused. We had discussions most every day on what was expected for students to leave the class with both in practice and in mathematics. We had discussions around assessment and proper measurements. Teaching the same lesson to different classes brought up many conversations on why a lesson worked well with one class and not another concerning our own teaching practices… At the end of the internship, this came out without my prompting. The two students would teach from one another's lesson plans and offer suggestions towards improvement of student learning. The students having taught the same students during the semester left no excuse for students' ability to learn. The discussion was much more focused on what the teacher could have done rather than make excuses based on students.

Not only did this sense of community happen inside the classroom with the triad of teachers, it happened outside class as well. A teacher candidate discussed collaboration that encouraged reflection outside of school, "We carpooled a lot and on the way back from school we could discuss the day. This helped us build community and reflect on previous days, ask each other questions and opinions. This helped us catch something that one didn't." What separated this coding theme from collaboration for the NIC team was its sense of reflection and encouragement to improve practice.

Challenges - Personnel Issues

With two teacher candidates being placed in the same class for internship, it often required a fast ramp up into teaching. Cooperating teachers stated that "it would be good for the student teachers to do their practicum experience with their cooperating teacher for the internship so that they would already be acclimated to the students and the school prior to the internship." During the PDSA cycles, NIC schools have revised methods plans and tried to do this when possible. This also required a need for more flexibility of when student teachers can take over classes and the number of days that they need to teach consecutively.

One supervisor noticed issues during the transition of teachers from topic to topic or class to class. This issue may arise from lack of collaboration or team teaching. He offered this advice,

> "Do not let transitions from you to other intern lead you away from helping the students gain a conceptual understanding of the material. If you need to finish a topic before the other intern takes over, be clear on what goals and main ideas you want to cover. If the students need more time on one topic then do not push that away but allow the students to work through their reasoning and gain a conceptual understanding. Be clear on your transition and make sure all the material connects."

The supervisor shared insight from the teacher candidates' expression that students often thought teacher candidates' topics were not related. Preparing and discussing transitions between teaching experiences in the paired-placement model is important.

In addition, thoughtful planning of which students should be paired together was seen to be important during PDSA cycles. Student interns with conflicting personalities may experience reduced ability to collaborate effectively. These personalities can also inhibit K-12 student learning. A university supervisor offered this advice during an interview,

> Be patient with how you connect with your students! You will connect differently with the students than the other intern. However, connecting to students in different ways is great! You might connect better with students who have the same interests or are the same gender. Do not compare! This is the hardest for paired internship, but comparison is the thief of joy. There is so much wisdom that both of you can bring to the classroom when it is used together.

Working together in spite of differences in beliefs, values, and abilities is important in the paired-placement model. Placement of teachers in the paired-placement model can improve its positive attributes by pairing interns who get along together and share values/beliefs.

Challenges - Number of Days Teaching Alone

PDSA cycles and early implementation of the paired-placement requires strategic planning. Many states require a specific number of days teacher candidates must teach during their internship experience. In the three states in which these NIC schools operate, this has been manageable but required effort to ensure the program meets state policies. Often these days must be consecutive and as a solo teacher, but in some states they are not required to teach in isolation. It is imperative that teacher education communities using this model check with state education policy mandates to ensure teacher candidates meet the minimum qualifications of their state.

Challenges - Perceived Preparation of Classroom Management

Though the benefits during interviews with mentor teachers were numerous, we also desired to learn about concerns and challenges. Some mentor teachers were concerned whether teacher candidates would be able to control the classroom when they or their paired students were not in the class. However, what is often a result is a shift from a need to discuss classroom management to improving pedagogical practice and risk taking. A teacher candidate said this well, “One of the benefits for the paired-placement model was that there was less of a struggle

with managing the classroom. This allowed for me to try different approaches that normally I would not have taken." Similarly, mentors believed there was a need for individual or isolated teaching experiences.

Teacher candidates also noticed the difficulty of being a teacher in isolation on completing paperwork, grading, administrative duties, student behavior duties, attending meetings, among other responsibilities. A teacher candidate stated, "Also, we have been very spoiled with having each other because on some days Sara will take care of the administrative part of being a teacher while I am teaching. I know this is not how it is going to be so we have been stopping that, so we are able to do it all as a teacher." Though this may seem to "spoil" teacher candidates, the paired-placement model allows the teacher candidate to place more emphasis and time where it is needed, teaching and learning.

Challenges - Preparing University Supervisors, Mentors, and Teacher Candidates

PDSA cycles and the research reviews informed NIC schools of the need to train university supervisors and mentors. This training was most often completed in one setting with both the supervisor and mentors together. Interviews with teacher candidates also exposed the need to prepare them for collaborative teaching as well. A teacher candidate stated,

> I have gained valuable information about co-teaching and the different strategies from my education classes. Having examples of how each different model could be used within the paired-placement model would have helped me and my partner better understand from the beginning of how we should effectively implement co-teaching strategies. I believe that since we do not have as much experience co-teaching it would have been helpful to see how a past co-teaching model or an actual co-teaching school works. Seeing how to co-plan and then co-teach in videos and examples of work would have helped us get

started. Instead we had a learning curve at the beginning of the semester that made the process more challenging.

As the PDSA cycles continue, the NIC network plans to incorporate more collaborative pedagogical techniques, videos, and learning experiences that will contribute to their success in the paired-placement model and in the field.

Challenges - Support for Collaboration Afterward

Teacher candidates hoped that collaboration would be encouraged as they went on to their future positions. A teacher candidate stated, "In the future when I am a full time teacher, I hope I will have great co-workers to reflect and debrief with to help me make the best decisions for my students that I can. I have a feeling most teachers work/think independently about these types of issues, but I have learned that the more people working together the better!" Unfortunately, support of collaboration in the field is not a priority. During a mentor teacher interview, the teacher shared conversation between himself and a paired-placement teacher who had previously graduated,

> "Discussions with this intern have also focused on the lack of collaboration at their school and how they missed the collaboration they had during internship. The intern mentioned the misalignment of other teachers' beliefs about effective mathematics teaching practices and how administration didn't support collaborative efforts."

This particular mentor teacher has shared about the reward he has had of continued mentorship and collaboration afterward with the teacher candidates in the paired-placement. It is hoped that schools will continue to embrace PLC models and improve collaboration between teachers in their schools as more institutions begin to adapt the paired-placement model.

Summary

Across all universities, results indicate that the mentor teachers, teacher candidates, and students liked having three instructors in the classroom. The increased size of the teaching team allowed teacher candidates to focus more on how students learn mathematics and how students think about mathematics rather than classroom management and lesson planning. The teacher candidate that was not leading the class during instruction could take time to observe student behavior and work with students who might otherwise be disengaged. This type of experience was cited as beneficial and possibly missing from the traditional apprentice-model of clinical teaching.

The benefit of the PDSA cycles allowed for institutions to incorporate the model in ways that worked best in their context and individual teacher candidates' placements. The PDSA allowed for continued focus on what was and was not working at different institutions. In one particular setting, student teams taught the entire semester. In other settings, state mandates required isolated consecutive teaching for 10 days for each intern. Similar to the collaborative environments that the paired-placement model forced, the PDSA cycles created many of the same aspects seen in this report. Accountability for proper administration of the paired-placement and training of mentor teachers was evident. Lastly, the PDSA cycle provided opportunities for researchers in this NIC to make changes to their research as it progressed for what worked best rather than a particular research agenda. The following table summarizes the benefits of the paired-placement model at three of the larger institutions in this study.

Positive Attributes Experienced at Each Institution

Attribute	Auburn	JSU	TAMU	UM-Missoula
Increased collaboration	√	√	√	√
More knowledgeable cooperating teachers	√	√	√	√
Increased sense of community	√	√	√	√
Teaming - Shift to focus on secondary math student's learning away from self	√	√	√	√
Pedagogical risk-taking	√	√	√	√
Increased reflective practice	√	√	√	√
Established natural PLC	√	√	√	√
Plan-Do-Study-Act Cycle	√	√	√	√
Increase in accountability	√	√		

Note: Institutions abbreviated as column headers are Auburn University, Jacksonville State University, Texas A&M University, and University of Montana in Missoula respectively. PLC abbreviates Professional Learning Community.

The challenges of implementation across the universities varied. Some of the challenges centered on individual state laws for clinical teaching, mentor teacher buy-in for the non-traditional model, and training university supervisors on the non-traditional model. At some institutions the researchers had to play the role of university supervisor because the training for such a supervisor had not yet been developed. The table below summarizes challenges across institutions:

Challenges Experienced at Each Institution

Attribute	Auburn	JSU	TAMU	UM-Missoula
Personnel Issues – •Get along together •Patience	√	√	√	√
Perceived Preparation of Classroom Management	√	√	√	√
Preparing University Supervisors and Mentors	√	√	√	√
Number of days teaching alone	√	√	√	√
Support for Collaboration Afterward	√	√		

Note: Institutions abbreviated as column headers are Auburn University, Jacksonville State University, Texas A&M University, and University of Montana in Missoula respectively.

Overall the successes of the model were attributed to proper training of the mentor teachers and the pairs of teacher candidates. Educating all stakeholders in the paired-placement model on possible situations that may arise and presenting possible solutions helps to better prepare them for challenges when they arise. Also, carefully pairing up the teacher candidates was cited as an attribute for successful implementation.

Educational or Scientific Importance of the Research

Finding effective models for clinical teaching is vital to the preparation of secondary mathematics teachers (Wilson, Floden, &Ferrini-Mundy, 2001). For some clinical teachers, the traditional apprentice-type model may help them fully develop their craft of teaching, but for others, they may need a different model. Based on evidence in this NIC and the literature, a paired-placement model provides an excellent alternative. The findings from this study inform the mathematics teacher education community on how a non-traditional model of clinical teaching can impact pedagogy and learning. In particular, it confirmed existing literature on the paired-placement model summarized by Mau (2013) that the paired-placement increased

communication; increased their willingness to take pedagogic risks; improved student teachers level of reflection; fostered collaboration and cooperation in the teaching action; modified teaching to increase K-12 student learning; created strategies to handle tensions in perspective and performance; and conveyed worry that a paired-placement did not reflect the reality of employment as a teacher. More importantly it informs other mathematics teacher educators on the successes and challenges of multiple university's implementations, thus providing other institutions a foundation in which they can construct a model that fits their institution.

Though evidence supports the use of the paired-placement model to increase a range of areas, other areas have not been researched or cannot be answered given immediate MTE-P data. First, how do teachers in paired-placements adjust to teaching in a range of environments afterward? How do teachers in paired-placements impact student learning? How do paired-placement students impact student learning in comparison to those who were in traditional placements? How does such a model develop supervisors and mentor teachers? It is hoped that these questions will further guide research on the paired-placement to advance student internship experiences in the future.

References

Bullough, R. V., Young, J., Birrell, J. R., Clark, D. C., Egan, M. W., Erickson, L., Frankovich, M. Brunetti, J. & Welling, M. (2003). Teaching with a peer: A comparison of two models of student teaching. *Teaching and Teacher Education,* 19(1), 57-73.

Bryk, A., Gomez, L. M., & Grunow, A. (2011). In M. T. Hallinan (ed.), *Frontiers in Sociology of Education* (pp. 127-162). Dordrecht, the Netherlands: Springer.

DuFour, R. (2004) What is a professional learning community? *Educational Leadership*, 61(8), 6-11.

Gardiner, W., & Robinson, K. S. (2009). Paired field placements: A means for collaboration. *The New Educator,* 5(1), 81-94.

Goodnough, K., Osmond, P., Dibbon, D., Glassman, M., Stevens, K., (2009). Exploring a triad model of student teaching: Pre-service teacher and cooperating teacher perceptions. *Teaching and Teacher Education*, 25(2), 285-296.

Guise, M., Habib, M., Thiessen, K., & Robbins, A. (2017). Continuum of co-teaching implementation: Moving from traditional student teaching to co-teaching. Teaching and Teacher Education, 66, 370-382.

Leatham, K. R., & Peterson, B. E. (2010). Secondary mathematics mentor teachers' perceptions of the purpose of student teaching. *Journal of Mathematics Teacher Education*, *13*(2), 99-119.

Leatham, K.R., & Peterson, B.E. (2010). Purposefully designing student teaching to focus on students' mathematical thinking. AMTE Monograph 7, *Mathematics Teaching: Putting Research into Practice at All Levels*, pp. 225–239.

Mau, S. (2013). Letter from the editor: Better together? Considering paired-placements for student teaching. *School Science and Mathematics, 113*(2), 53–55.

National Council of Teachers of Mathematics (2014). *Principle to Action: Ensuring Mathematical Success for All*. Reston, VA: NCTM.

Strutchens, M., Sears, R., Zelkowski, J., & Ellis, M. (2017). Clinical experiences. In W.M. Smith, B. R. Lawler, & L. Augustyn (Eds.), Proceedings of the Sixth Annual Mathematics Teacher Education Partnership Conference (pp. 45-48). Washington, DC: Association of Public and Land-grant Universities.

Wilson, S. M., Floden, R. E., & Ferrrini-Mundy, J. (2001). Teacher preparation research: Current knowledge, gaps, and recommendations. Seattle, WA: Center for the Study of Teaching and Policy.