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Kayleigh D. Hunter
Georgia Southern University

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*Technology and Student Achievement in STEM Subjects: Perspectives from Teachers
in Grades 3rd-5th*

An Honors Thesis submitted in partial fulfillment of the requirements for Honors in the
College of Education

By:
Kayleigh Hunter

Under the mentorship of
Yasar Bodur, Meca Williams-Johnson, and Michelle Reidel

ABSTRACT

The purpose of this study is to research teachers' perspectives of their role and responsibilities of integrating technology in the classroom and the influence of technology on student achievement. The participants involved in the qualitative research process included seven in-service professional public school teachers. The thirty minute to an hour interviews were piloted using researcher created interview question constructed from previous research on teachers' perceptions of technology. The questions used were created to specifically answer the researcher's topic of study; some questions are regarding whether teachers believe success is technology driven and what benefits they think technology brings. The teachers being interviewed were presented with a consent form outlining the purpose of the study and they will be assured of full confidentiality. Individual teacher interviews were used to determine the viewpoints of technology implemented in the classroom. This qualitative investigation study examined how technology is used and integrated into the southeast Georgia's elementary classroom and the influence of technology on student achievement, specifically the role of teachers' perspectives on technology and which device do they use most often.

Thesis Mentor: _____

Dr. Meca Williams-Johnson

Honors Director: _____

Dr. Steven Engel

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Typically the current use of technology among youth in the United States is a form of entertainment such as Snapchat or Twitter. Children play Angry Birds on iPads and Android devices and most listen to music on MP3 players or iPods. These forms of entertainment are largely perceived as negative distractors and many adults perceive young Americans as materialistic, shallow, and uneducated. Some older Americans feel that the root to young Americans withdrawal from society is technology (Rickman, 2011). Technology is in children's lives every day, and it is introduced at a very young age. "Youngsters" like myself, guiltily love to become absorbed into devices. The researcher feels that these devices should go from the stereotypical brainwashing mechanisms on our youth to enhancing learning and development.

The purpose of this study was to investigate teachers' perspectives of technology use and how it supports student achievement in STEM (science, technology, engineering, and mathematics) subjects among grades third through fifth. These subjects are focused on because they seem most prevalent for the age groups selected. Lately, the importance of STEM subjects has been largely emphasized by the government. Currently, teachers are using interactive whiteboards as a widely used resource in current elementary school classrooms. These interactive whiteboards have become very popular and are used to show visual examples that also allow the students to have access to multiple sources through the internet. What will be the next popular technology trend in elementary school classrooms? The researcher investigated how different technologies are being integrated into classroom curricula.

The topic of STEM classes is popular lately in educational journals, news broadcasts, and online articles. The discussion of the importance of STEM subjects is

everywhere. Teachers are now being told to emphasize science, technology, engineering, and math subjects to their students so our society will one day have the type of workforce needed. Murphy (2011) stated the following,

“If the United States is to maintain its economic power, then we will need a STEM-educated workforce that can meet the demands of business in an increasingly complex and technology-driven economy. In fact, a study by Georgetown University Center on Education and the Workforce shows that by 2018, 8 million jobs in the U.S. economy will require a college degree in STEM”.

Some of the most resourceful and important careers in the world come from STEM subjects. As the world becomes more technologically dependent, our country is becoming heavily reliant on the skilled workers in STEM fields. These workers need to be proficient and knowledgeable in their careers to help our country thrive. As a result for the current and future need for STEM workers, “the fate of our nation depends on the use of technology and also the number of native workers in STEM fields” (Hossain & Robinson, 2012). A nation that is technology-driven and has a skilled workforce in STEM has two major advantages to become more innovative. The United States possesses the most innovative and technologically capable economy in the world (Hossain & Robinson, 2012).

“Despite of a glorious record of achievement in technology, the US lags behind many less developed nations in STEM education in elementary, secondary and higher education. As the US invests more money and efforts to promote improvement in STEM education, the number of foreign students and workers in these fields is increasing significantly” (Hossain & Robinson, 2012).

The main goal for teachers teaching STEM subjects is to ignite a passion for these subjects in their students. STEM subjects are the subjects in school that students have been seen to struggle with the most. According to The Commuter, “The gap between people who perform mathematical operations without any difficulties and those who have the hardest time understanding essential math concepts is growing at a disturbing pace in the United States” (2014). Teachers need to find a way to make these subjects interesting, so students will have an easier time grasping the materials. With technological advances emerging in classrooms, students can be exposed to engaging lessons in these rigorous subjects.

Usually video games have a stereotype for becoming addictive, making children become violent, and keeping children glued to their televisions for hours at a time. Now, video games can be used to foster learning and engagement in STEM subjects. Krigman (2013) states,

“Games designed to teach STEM vary greatly in complexity and scope; most target students in kindergarten through 12th grade. On the simpler side, Filament Games teaches the basics of plant biology through Reach for the Sun, in which players have to balance the right amount of starch, water and nutrients to enable their plant to grow and reproduce. On the more challenging end, the Glass Lab, a partnership between elite educational practitioners and the top players in the gaming industry, is tackling pollution management through a new initiative with the popular game SimCity” (p. 1).

Using video games to engage students in complex but fun STEM subjects is a fresh and new concept that could potentially grasp students’ interest.

The integration of technology into the classroom is necessary for students to learn. Students and teachers can both benefit from using technology in their classroom. Technology in classrooms can be used as a resource to conduct education. Technology can be an important tool in the classroom, but the researcher wanted factual information to confirm the hypothesis. The researcher discovered teachers' perspectives of their role and responsibility of integrating technology in the classroom, the influence of technology on student achievement in STEM subjects between 3rd-5th grade, and the challenges associated with technology usage in the classroom.

Review of the Literature

The purpose of this section is to review selected literature relevant to the study of teachers' perspectives of their role and responsibility of integrating technology in the classroom and the influence of technology on student success. Topics addressed include teachers' beliefs and knowledge about technology, self-directed learning, and technology's influence on student achievement.

Teachers' Beliefs

Teachers' beliefs tend to lead to their influence of instructional and technology integration practices in their classrooms. Teachers' beliefs of technology are essentially how they feel technology can help them achieve important instructional goals (Creating Effective Teaching and Learning Environments, p. 89). This study examined how and why teachers used technology to enhance teaching and learning. The beliefs that influenced teachers' decisions to use technology were "motivated by a desire to improve as a professional, ultimately impacting student learning" (Ottenbreit-Leftwitch, 2010). Throughout the study, teachers were seen using technology for engagement, motivation,

enhancing student comprehension, and also equipping students with technology skills for their future.

Teachers in this study believe that when technology is implemented in the classroom, it can engage and motivate students. The teachers stated that students invest more effort and time in activities that are technology based (Ottenbreit-Leftwich, 2010). According to Ottenbreit-Leftwich (2010), when technology is used in lessons it has resulted in a decrease in behavior problems. The participant teachers also tested the use of technology as a resource to teach their students to be tech savvy. It is stated in the study that technology can “expand opportunities for students, broaden the information they have available, better connect them with real-world issues and activities, provide them with opportunities for creativity, extend how they communicate and collaborate, and in general, better prepare them for the lives they will lead in the technology-rich 21st century” (Ottenbreit-Leftwich, 2010). If other teachers were aware that technology would prepare their students for the future, Ottenbreit-Leftwich feels that it might increase the teachers’ use of technology in their classrooms (2010). Overall, the eight teachers in the study believed that technology was beneficial in their classrooms.

Teachers’ Knowledge

A recent study has researched differences in terms of technology readiness across teachers in Taiwan. The researchers searched for technology readiness in traits such as age, class size, education, experience, gender, nationality, and work location.

Technology readiness is “the overall mental state of an individual with respect to technology in general” (Lee, Lin, Lin, 2015). It is broken down into four dimensions:

“(1) optimism, which refers to “a positive view of technology and a belief that it offers people increased control, flexibility, and efficiency in their lives;” (2) innovativeness, which refers to “a tendency to be a technology pioneer and thought leader;” (3) discomfort, which refers to “a perceived lack of control over technology and a feeling of being overwhelmed by it;” and (4) insecurity, which refers to “a distrust of technology and skepticism about its ability to work properly” (Parasuraman, 2000).

The study intended to incorporate social media into the classrooms. With a majority of the teachers using Facebook, they decided Facebook was the resource of their choice. The teachers were quoted stating, “I create social groups on Facebook,” “I convey news to parents on Facebook,” and “I discuss classroom matters on Facebook,” (Lee, Lin, Lin, 2015). The study broke down the teachers into four groups: pioneers, skeptics, explorers and laggards, and paranoids. The pioneers measure at 12.97% and tend to show high levels of optimism and innovativeness in technology use, but also high levels of insecurity and discomfort. On the other hand, the paranoids measure at 4.60%. The paranoids tend to show more optimism, lower innovativeness, and relatively high insecurity and discomfort. Overall, this study showed that many teachers seem to be willing to use new technologies.

Technology Influence on Student Engagement

Although I researched the influence of technology in elementary school classes, Jerry Sun researched the influence of polling technologies on student engagement in undergraduate and graduate classes in Taiwan. Rather than lecturing students and waiting on someone to raise their hand in large lecture halls, technologies have been

implemented for polling anonymous responses. Sun states, “(without technology) participants were either reluctant to respond to a question posted in class until others had responded... (with technology) several studies have shown an increase in student engagement in classes incorporating electronic feedback devices.” (2013). These electronic devices or otherwise known as clickers, are small devices that record student responses immediately to questions. The professors get instant feedback which helps them to determine if their students are understanding the material.

Sun’s study conducted an in-class experiment to observe responses of students during class activities. To assess the students’ responses, the researcher analyzed their brainwaves to determine differences between the effects of clickers and mobile polling feedback devices. Sun collected data from two courses where students used clickers or mobile polling (cell phones) to provide feedback. At the beginning and end of the experiment, two surveys were given. The questions revolved around the six cognitive processes such as remembering, understanding, applying, analyzing, evaluating, and creating. The reasoning behind this form of questioning was for instructors to observe whether or not their students understood the content. There was also a post- test given to measure student achievement. A total of 32 students from 16 different classes volunteered to wear the brainwave headphones. One student responded to the in-class polls with the clicker and the other student responded with a cell phone. The results showed that students in the cell phone group showed reduced levels of anxiety while the clicker did not indicate many changes. The study did not explain why the cell phones were successful, but it is speculated the student was possibly relaxed with the idea that they could have a device familiar to them to use in class.

Self-Directed Learning

In 2008, Wan Ng researched on the topic of self-directed learning with web based sites. The researcher studied a 7th grade class that used computer programs to guide their own learning about simple machines. Ng (2008) states at the beginning, “There are indications that positive impact on learning can occur when ICT (information communication technology) is linked to pedagogy”. The study explored how the students self-directed their own learning with intervention from the teacher. According to Ng (2008), “A benefit of self-directed learning is the development of autonomous learners who are able to control and take responsibility for their own learning” (p. 24). After completing the activities on the computers, the students had an overwhelming positive response to this method of teaching: 85% of the students felt that learning on the computer was beneficial, and 95% of the students enjoyed learning at their own pace (Ng, 2008, p. 28).

On the websites provided, there were ample written materials, but the written materials did not help the students achieve as much as the interactivity. The number one ranked website among the students was EdHeads because the students had multiple choices of activities, and the website also reviewed the material that the students did not understand. The students liked that they could review the material on their own. Student 9 was asked if learning online was a good type of learning, and the student responded, “Yeah because if you don’t get something you can read through it again on the computer, whereas if the teacher were speaking you’d have to keep up, you can’t stop him” (Ng, 2008, pg. 29).

Although the students enjoyed learning on the computers, their teacher did not feel that the computers were sufficient. He stated that, “The students’ engagement and interest in this self-directed learning exercise with the computer was high but understanding was low” (Ng, 2008, pg. 29). The teacher felt that since his students could not answer his desired questions, he felt learning from the websites was ineffective.

Conclusion

This literature review focused on the importance of implementing technology into the classroom. These studies researched why teachers use technology to enhance learning, the technology readiness among teachers in other countries, the influence of technological devices in the classroom, and how students can become engaged and guide their own learning with computer programs. The purpose of my study was to investigate teachers’ perspectives of technology use and how it supports student achievement in STEM subjects between grades third through fifth. The following research questions guided the study:

- (1) What are teachers’ perspectives on the benefits of technology on student achievement in STEM subjects?
- (2) What are teachers’ perspectives on the challenges associated with using technology in teaching STEM subjects?

Methodology

Research Design

According to Wyse (2011), “[Qualitative Research](#) is primarily exploratory research. It is used to gain an understanding of underlying reasons, opinions, and motivations... Qualitative research is also used to uncover trends in thought and

opinions, and dive deeper into the problem.” This study investigated teachers’ perspectives of technology use and how it supports student achievement in STEM subjects between grades third through fifth.

Participants

Participants	Years of Experience	Race	Gender
STEM lab teacher	20 years	Caucasian	Female
3rd grade teacher	3 years	Caucasian	Female
3rd grade teacher	6 years	Caucasian	Female
4th science teacher	33 years	Caucasian	Female
4th math teacher	15 years	African American	Female
5th science teacher	3 years	African American	Male
5th math teacher	13 years	Caucasian	Female

The participants involved in the qualitative research process included seven teachers working in rural schools in southeast Georgia varying in the amount of experience in the classroom. The researcher chose one STEM (science, technology, engineering, and math) lab teacher and two teachers from 3rd, 4th, and 5th grade. The teachers were individually interviewed. The researcher initially planned to select one novice and one experienced teacher from each grade level, but with the given teachers who were willing to participate this was not possible. The experience from the teachers varied. An experienced teacher is defined as one with over ten years of experience, while the novice teacher is defined as one with less than five years. The teachers are current in-service professionals working in public schools.

Instruments

Instruments used for this study were researcher created interview questions. The interview questions were created from previous research on teachers' perceptions of technology. The questions were reviewed and revised with the help of the researcher's research professor. Some of the questions used in the interviews were:

1. How do you think technology influences student success?
2. How do you use technology in your STEM classroom?
3. What do you think are benefits of using technology in STEM?
4. What are the challenges of using technology in STEM subjects?
5. If not, why do you not use technology?
6. How comfortable do you feel with implementing technology into your lessons?
7. Do you feel a responsibility for teaching your students how to use technology along with the other curricula?
8. How do students respond to using technology in the classroom?

These questions were created to specifically answer the researcher's topic of study.

The researcher also questioned teachers on their personal knowledge about technology. For example, to what degree are teachers knowledgeable about the use of technology in STEM subjects? Based on if the teachers are experienced with technology, the researcher sought to discover how these teachers gained their knowledge. Were there professional development opportunities, did they learn on their own, or did a fellow teacher have to assist them?

Procedures

Prior to interviewing, the researcher received IRB approval and gave a pilot interview to ensure the interview questions were appropriate. The researcher then

compiled a list of potential math and science teachers to interview. Next, the researcher sent a recruitment email to math and science 3rd through 5th grade teachers that fit the demographics of the study, and the researcher asked about the number of years of teaching. Based on which teachers gave consent to be interviewed, the researcher selected the teachers to be interviewed based on years of teaching experience. The teachers chosen to be interviewed were presented with a consent form with the purpose of the study and were assured of full confidentiality. Individual teacher interviews were used to determine the viewpoints of technology implemented in the classroom. The digital records were transcribed for future analysis.

Analysis

All individual interviews were conducted in person by the researcher. Individual interviews were recorded and then transcribed. The transcripts were later analyzed to track similar patterns and themes based on the topic of teachers' perspectives of technology in the classroom. The researcher performed a coding process while looking for details embedded within the data. From the codes, the researcher looked for patterns, and based on patterns, the researcher established themes.

Summary

This study was a qualitative investigation. The study examined how technology is used and integrated into the southeast Georgia's elementary classroom and the influence of technology on student achievement. This research specifically looked towards the role of teachers' perspectives on technology on student success in STEM subjects and which device they use most often. The researcher hypothesized that if technology is implemented in the classroom, then the students will have better

engagement, motivation, instructional materials, communication, interaction, and application of real world skills.

Findings

Research Questions:

(1) What are teachers' perspectives on the benefits of technology on student achievement in STEM subjects?

(2) What are teachers' perspectives on the challenges associated with using technology in teaching STEM subjects?

The research questions that guided the interviews focused on the teachers' perceptions and challenges of using technology in STEM subject classrooms. The data collected came from 3rd-5th grade teachers in southeast Georgia ranging in years of experience, race, age, and gender. In the next section, the researcher will discuss in greater detail the specific findings among participants.

The participants included a STEM lab teacher, two 3rd grade teachers, 4th grade science teacher, 4th grade math teacher, 5th grade science teacher, and a 5th grade math teacher. The levels and years of experience varied among the participants, their ages ranged from mid 20s to late 60s, and there were six females and one male participant. Overall, the teachers felt that technology is an asset to the classroom, but it can be overwhelming to use when first given.

The experienced STEM lab teacher's perspectives of technology were positive. She uses technology avidly in her lessons and she feels that when she implements technology into her lessons the students are more engaged. She also feels that by using technology in her lessons, she is preparing the students for their future learning and

career choices. According to this STEM teacher (2017), “There are different things you can do with technology, and I’m hoping it will open some eyes to ‘hey, I haven’t thought about that’. I really like doing that, and I could make a career out of it. . . . I’m trying to show kids that hey if you like doing this, this is a career path” (p. 4).

At first she stated that children, usually kindergarteners, are uncomfortable with using technology, but when students are older (3rd-5th) they are very comfortable using technology in her classroom. She believes that technology and technology programs allow her students to show creativity. By building and creating their own designs and inventions, she feels that they are being very expressive and can show critical thinking in their creations. She (2017) found that the students are, “Definitely more creative because within seeing what children can produce, I mean that’s their creativity right there” (p. 5).

The experienced 4th grade science teacher’s perceptions on technology were skeptical. Although she feels that sometimes students’ engagement increases, she does not believe that technology allows the students to have hands on learning experiences. She feels that technology is artificial, and technology has not made her job as a teacher any easier. She stated (2017), “I think it’s [technology] artificial at times, so I try to decide what’s really beneficial or artificial just to say that I used technology” (p.3). She has found a few science programs to be beneficial for the students because they can show step-by-step of a process, but overall she is not a fan of technology.

On the other hand, the novice 5th grade science teacher’s perceptions of technology are positive. He feels that technology has allowed him as a teacher to implement collaborative group work among the students, his students’ engagement increases, and the inquiry based lessons revolved around technology allow for more

creativity from his students. He stated (2017), “I think it [technology] makes it [learning] more creative just because it kind of pushes us to more inquiry based... it has the ability to personalize learning” (p. 3).

The 4th grade math, 5th grade math and 3rd grade teachers all stated that technology enhances productivity among their students. The 4th grade math teacher stated (2017), “I can give them [students] 10 assignments on Google Classroom, and I won’t hear a peep from any of them. They will sit there on that Chromebook and work.” By the students working on the Chromebooks, she believes it makes her job easier because her classroom is becoming increasingly paperless. She believes that online grading is much easier than paper/pencil grading because often times many online programs will grade the assignments for teachers. The students also enjoy practicing independently with the technology tools in her classroom.

The 5th grade math teacher also uses technology to help with the large load of grading papers. She uses remotes that can be connected to her SMARTboard to quiz students. These remotes allow the students to plug in their answers rather than pressing A, B, C, or D. They can type mixed numbers, fractions, and decimals. She stated (2017), “These tools are great because they can be used on the spot. If I have five minutes left at the end of my lesson, I can tell the students to grab a remote and solve a problem that I just came up with. I don’t have to plan ahead to use them.” Once the students submit their answer, the technology immediately grades their responses which lessens the load of grading for her. A 3rd grade teacher stated, “I get more out of a paragraph that they type on a computer verses out of a paragraph they sit in a desk and write”. She believes that

her students are more comfortable on the computer, therefore they can produce better work.

Although overall teachers feel that technology is beneficial, these teachers have personally observed the challenges associated with technology. The main theme with the challenges of technology is when the technology does not work properly, or if the device is dependent on internet access and the internet is down. Another overlapping theme of challenges is that it can be difficult to differentiate lessons when using technology. Unless there are enough devices to give to every child or group children by ability, they feel it is hard to find websites/sources that offer different levels of material for the variety of learners. Teachers have to do their research to find multiple websites/sources that cover the same content that can be beneficial to all learners.

The STEM teacher also feels that finding online sources and programs that are child appropriate is a challenge. She stated that she has to do the proper research on which sources she will allow the students to use because some websites will send the students inappropriate spam. She stated (2017), “Some sites become third party sites and they sell that information and so that’s definitely not a website you want to be logging kids into because they are going to be getting a lot of inappropriate emails” (p. 3). The 5th grade science teacher also stated that the restrictions on websites are beneficial because “the county has certain restrictions on certain websites, so I don’t have to persuade them not to use that” (5th science, 2017, p. 2).

The 4th grade science teacher feels there are multiple challenges associated with using technology in the classroom. Her main beliefs on the challenges of technology are that it is hard to supervise, she has to seek out assistance on how to use the technology,

and that the creativity in both teachers and students is stifled. She feels that when all of her students are on Chromebooks or computers, that it is hard for her to supervise to make sure all students are on task. She believes that it gets overwhelming when she or the students do not know how to use the technology provided. She stated (2017),

“Yeah not knowing how to use it, the students not knowing how to use it, the students abusing it...Those kind of things. Being able to monitor where they’re going when they have a Chromebook sitting in front of them” (p. 4).

While the other participants felt that technology enhanced their students’ creativity, she felt differently. According to the 4th grade science teacher (2017),

“Well, I think we rely a lot on things that are already produced instead of producing them yourself because we think it looks better, it looks perfect. Ours is not as perfect... They’re relying on things that are already done instead of them getting a piece of paper and drawing something themselves or creating something themselves” (p. 2).

The 3rd grade teachers stated that when the students come to them they have a hard time operating the desktop computer and Chromebooks. The students are used to working on touch screen phones and tablets, so they have trouble working a mouse and they pluck at the keys rather than correctly placing their hands on the keyboard. They both stated that they have to take a lot of extra time explaining how to use the technology and giving directions for online assignments, which ends up taking instructional time away from her class. 3rd grade teacher stated (2017), “If a text box isn’t moving or something pops up, if I’m teaching a small group I have to deal with a lot of interruptions.” A challenge they and the 4th grade math teacher both had was the low

supply of technology in their classrooms. They cannot use the technology as frequently as they would like because of the low supply.

Discussion and Implications

Through interviewing current in-service teachers, the researcher found that most teachers feel that technology can be very beneficial in STEM subject classrooms, with the exception of one outlier. The researcher believes that most teachers are comfortable with using technologies in their classrooms because of their familiarity with the devices based on information gathered in both the literature review (Ottenbreit-Leftwich, 2010) and in personal interviews. The STEM teacher uses technology almost everyday in her lessons, therefore she is comfortable with using the technology. The 3rd grade teachers are very young. They have only been out of college for three to six years, so they are comfortable using technology in their lessons. One of the 3rd grade teachers hopes that one day her county will have enough technology tools for each student to use in her classroom. When the 5th grade science teacher was asked about his comfort level of using technology in his class he stated (2017), “A lot of them are pretty self-explanatory and easy to use” (p. 3). On the other hand, the 4th grade science teacher stated (2017), “I am not educated in using technology so I have to seek out how to use it” (p. 1). The researcher believes that the usage of technology in the classroom directly correlates with teachers’ comfort levels of technology which has been found in Lee, Lin, Lin’s study (2015).

The main outlier, the 4th grade science teacher, is in her late 60s. Although she has taught for 33 years, she took 12 years off from work to raise her children. During that time, the implementation of technology was occurring in most schools. She missed the big change from paper-pencil teaching to more modern computer driven education.

By missing this important gap, the researcher feels that this could be why she is not as educated in using technology and becomes overwhelmed at the thought of using much technology in her class. When discussing how she uses the Smart board in her classroom, she stated (2017) “We’ve been using it [Smart board] as a projector, as a sound machine, whatever” (p. 5). She uses technology to the bare minimum in her lessons because she is more comfortable sticking with what she knows best.

As stated in the literature review, teachers’ beliefs tend to influence their instructional and technology integration practices in their classrooms (Ottenbreit-Leftwich, 2015). After conducting the research, the researcher found many connections from the literature reviewed on teachers’ beliefs in Ottenbreit-Leftwich’s study (2015) such as that the STEM lab and 3rd grade teachers too feel a need to equip their students with technology skills for their future. All the teachers feel that when technology is implemented in the classroom, it can engage and motivate students. They feel that technology can bring beneficial features to their classrooms. When reviewing teachers’ knowledge of technology, there are many factors to consider such as age, education, experience, gender, and work location. Understanding that the teachers interviewed are located in southeast rural Georgia, have different levels of experience and vary among age can help the researcher understand why or why not teachers use technology in their classrooms. In the teachers’ knowledge section of the literature review, the article discussed that “paranoids” of technology tend to show more optimism, lower innovativeness, and relatively high insecurity and discomfort at the thought of using technology in their classrooms.

Technology's influence on student engagement was a theme in the research. All teachers felt that technology engaged students when not overused in the classroom. The researcher found a direct connection in technology usage from an article used in the Literature Review with the 5th grade math teacher. Jerry Sun's (2014) study used polling technologies like the remotes/clickers used in the 5th grade math class. The devices are small and record student responses immediately to questions. The professor/teacher receives instant feedback to help them determine if their students are understanding the material. The study showed that students in the group that used familiar technology showed reduced levels of anxiety. The 4th grade math teacher and 3rd grade teachers stated that they felt that their students were more comfortable working with technology, therefore they produced better work. They felt that their students were probably relaxed with the idea of using a familiar device in class.

Wan Ng (2008) researched how technologies allowed the students to self-direct their own learning. The 5th grade science teacher stated that he felt technology is beneficial in his classroom when completing research projects because (2017), "to just find the information themselves they seem to like looking for the information as opposed to me just force feeding it to them, allowing them to take a scenario and run with it." Throughout Ng's study the students were working independently on the computers, but the teacher did not feel that the computers were sufficient. Like the 4th grade science teacher, the teacher in the study felt that the students' engagement was high but their understanding was low. When discussing learning topics with the 4th grade science teacher, she felt that science learning should be hands on. She stated (2017), "I think simple machines really need to be all hands on. I think you could draw a prototype and

then use it as a plan, but as far as creating something online, and I think they still need to get the hands on activity.”

The researcher feels that future research should focus on methods of incorporating technology into classrooms because it can play an important role in developing elementary students’ awareness and curiosity in STEM. A study by Habashi, Graziano, Evangelou, and Ngambeki (2008) found that teachers who were effective at directing elementary students’ interests in STEM subjects were shown to be a motivational influence for students engaging in STEM activities. As researched through personal interviews, students’ engagement can increase when technology is used in these subjects. Future research could uncover why there are such limited supplies of technology in rural schools and also note the change to the usage of wireless devices in schools.

This study questioned 3rd-5th grade STEM teachers’ perceptions of technology and student achievement and the challenges associated with technology usage in the classroom. Overall, the teachers interviewed felt that technology led to an increase in student engagement which in turn sometimes resulted in better work produced by the students. There was one outlier who felt that technology could sometimes engage the students if not overused but felt that hands on experiences are more authentic. The main challenge associated with using technology in the classroom for the teachers interviewed was the reliability of the technology. If the internet is down or the technology is not working properly can be a stressor for teachers who are relying on technology for their lesson. Other than reliability, the teachers felt that technology was an asset to their classrooms and students’ achievement.

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