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Engaging the iGeneration: A survey of elementary school teachers' perceptions on effective instructional practices and their abilities to use technology as an instructional tool in the mathematics classroom

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The purpose of this study was to describe 3rd through 5th grade mathematics teachers' demographic information and investigate their perceptions regarding effective instructional practices and their abilities to use technology as an instructional tool in the mathematics classroom. This information will give administrators a more detailed interpretation of what teaching strategies work best for engaging students in successfully learning mathematics. Additionally, the researcher investigated if there was a statistically significant difference in teachers' perceptions of select demographic variables and high-performance elementary schools and low-performance elementary schools.

To accomplish the purpose of this study, an online survey developed by the researcher was used to obtain information from participants via SurveyMonkey. The participants consisted of 135 3rd through 5th grade mathematics teachers. The data were analyzed using descriptive statistics, t-tests, and ANOVA.

The findings in the study revealed third through fifth-grade mathematics teachers had positive perceptions about effective instructional practices and their abilities to use technology as an instructional tool in the mathematics classroom. Additionally, there were statistically

significant differences found among demographic variables based on the teachers' responses to certain statements from the online survey. Statistically significant differences were found in the demographic variables of educational background, teaching experience, and years of experience with using various forms of technology in the classroom regarding teachers' perceptions of effective instructional practices. Also, there were statistically significant differences found in the demographic variables of age range and educational background regarding teachers' perceptions of using technology as an instructional tool in the mathematics classroom.

The conclusions and recommendations based on the findings in this study provided information for administrators in one central Mississippi school district to increase student engagement and improve statewide test scores in mathematics. It was recommended that comparative studies be conducted to further investigate if these findings are consistent with the perceptions of the remaining population of teachers whose students are mandated to take statewide exams about mathematics.

DEDICATION

I dedicate this dissertation to my entire family, who have supported me at every twist and turn of my life. My parents always believed and planted in me seeds that will last a lifetime. They constantly pushed me to greatness and encouraged me to be whatever in life I wanted to become; the sky is the limit. My father, Claude L. McInnis, was not able to physically be here to see me complete this journey, but he was the motivation to finish this endeavor because I promised him I would. I DID IT, DADDY! This is for my mama, Hattie L. Frazier, who never let me down and always is in my corner. You are my greatest inspiration and without you, I would have never been able to do anything progressive in this life. My aunts and uncles who are the closest people to me next to my parents: Wallene, Rufus, Eula, Roosevelt, Ruben, Earnest, Dorothy (Lit), Fred, Joyce, Willie, Martha, JoBennie, Nelson, Ruth, Alva, Greta, Jackie, Deedee, Bob, and Larry, you all constantly checked on me, fed me, and "anonymously" financially supported me. For that, you all live in my heart for eternity. I owe you my life!

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Lastly, to all my babies I want you to know and understand, you can become anything you every wish and hope to be in this life. This doctorate is for all of us! God makes everything possible!

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Completing this journey would have never been possible without the undying support of my committee members. You all ensured my study continued to progress until completion. Dr. Linda Cornelious, my major professor, you have been an amazing blessing to me from the first day I arrived on MSU's campus. Your example of a truly dedicated and devoted professor made me want to give that same effort to my students. Dr. Wayne Yu, your expertise and willingness to assist in my writing process can never be repaid. You strengthened my skills as a researcher. Dr. Debra Prince, thanks a million for helping me with my writing for many hours of your time. Your efforts developed my skills in writing and were the major catalyst for me finishing this process. Dr. Jessica Murphy, you started my journey into this doctoral process and your efforts to encourage my progress as a student will never be forgotten. I am forever grateful for everything you have done to assist me in accomplishing all my goals. You all have truly gone above and beyond to ensure that I complete this research for my doctoral degree. I love each of you for your unconditional support! God bless you.

TABLE OF CONTENTS

LIST OF TABLES

CHAPTER I

INTRODUCTION

The educational system is constantly in a state of evolution because a new generation of learners is endlessly on the horizon (Okogbaa, 2018). The iGeneration student is the most recent generation of students matriculating through the American educational system (Sellar, 2013). Despite the many efforts contributing to the educational success of these modern students, the iGeneration students continue to disengage from the learning process and produce low achievement scores (Mutlu, 2019). Disengagement from the learning process and producing low achievement scores is evident in the subject of mathematics (Barnes, Clemens, Fall, Roberts, & Klein, 2019). One of the efforts to improve the educational success of these students included recognizing the characteristic needs of the iGeneration to implement diverse instructional practices and to utilize technology as an instructional tool to promote engagement and raise scores in mathematics (Sendurur, Erosy, & Cetin, 2018).

Although these strategies have been implemented into the learning process, iGeneration students are not fully engaging in that process (Hill, Sessions, Doyle, Jackson, & Kocsis, 2017). Teachers are the true motivators of student engagement and improved test scores in mathematics. This knowledge is imperative because teachers must develop instructional practices that integrate technology into the curriculum (DeMonbrun et al., 2017). Teachers' perceived effective instructional practices and their ability to use technology as an instructional tool in the mathematics classroom increases student engagement, raise interest, and test scores, if executed correctly (Allen, Webb, & Matthews, 2016).

The demand is to develop global learners who can function at high levels of intellect to meet benchmarks set forth by educational governing institutions in each state of America to assure educational accountability (Stotsky, 2016). As school personnel focuses on educational accountability, which increases the academic achievement of today's students, they are ever mindful of the need to actively engage students in their learning. Howard, Corso, Bundick, Quagua, and Haywood (2013) have studied the effects of engaging students in the learning process. In fact, according to Corso et al. (2013), "The more students are engaged in their schoolwork, the more likely they are to perform well academically, obtaining higher grades in their classes and higher scores on standardized tests" (p. 50). Murray (2018) defined engagement as a function of an individual's time and effort devoted to study. However, for students to perform well in academics, the definition of academic engagement must include more than the measurement of time on task.

In more recent research, Finn, Faith, and Seo (2018) defined academic engagement as "the intensity and emotional quality of children's involvement in initiating and carrying out learning activities" (p. 98). Gebre, Saroyan, and Bracewell (2014) defined student academic engagement as "the quality of effort students themselves devote to educationally purposeful activities that contribute directly to desired outcomes" (p. 84). Both definitions place the responsibility of the actions on the students. However, they neglect to mention the precursors of these student behaviors.

According to the results of the National Survey of Student Engagement (NSSE), there are five benchmark standards that constitute the types of effective educational practices that lead to active student engagement (Fang, 2016). Those benchmarks are levels of academic challenge, active and collaborative learning, student-teacher interaction, enriching educational experiences, and supportive educational environments. (NSSE, 2019).

It appears that what drives student engagement with learning activities are the actual learning environments and how teachers develop and maintain those environments, which is influenced by teachers' perceptions and orientations regarding effective teaching (Sellingo, 2018). Therefore, before considering the quality of effort exhibited by students in their pursuit of engaged learning, it is imperative that administrators not only encourage meaningful student-teacher interactions but also develop and maintain educational environments, strategies, and attitudes that support student engagement (Svecova, 2017).

In terms of developing educational environments that support high levels of student engagement, one of the most valuable tools educators have at their disposal are instructional technologies. According to Patterson (2019), technology treated as an instructional tool can be used to accomplish complex tasks that engage students in extended and cooperative learning experiences that incorporate multiple disciplines. Moreover, according to Neutzling, Pratt, and Parker (2019), the notion of student engagement is rooted in the constructivist theory of learning, where learners actively construct knowledge through both authentic and collaborative learning experiences. Computer-related tools, such as educational software, have been shown to facilitate not only constructivist learning but also constructivist-oriented teaching. However, the authors noted and cautioned the readers that the outcomes of using instructional technologies were dependent on how that technology was being used (Davis, 2011).

Consistent with the word of caution provided by Meg (2019) in a study examining computer use in teaching and learning. The findings revealed that students' performance scores were significantly higher when computers were used as cognitive tools than they were when computers were used as presentation tools. The authors also found a negative correlation between the number of different computer application tools used and student performance. Therefore, while using computers as a cognitive tool had a positive impact on student learning, the practice of using multiple different computer application tools had a negative impact on student learning. Consequently, the authors noted that the benefits of using computers as a learning tool are only achieved when students are engaged with the tool in ways that assist them in learning specific objectives. (Valdez, 2018).

Additionally, the importance of the actual learning environment in engaging students in their learning is the importance of the perceptions and orientations of the teachers who facilitate the learning environment. Gage, Adamson, MacSuga-Gage, and Lewis (2017) have suggested that teachers are the most influential variable in terms of student achievement. Other researchers have also noted that the strategies and approaches that teachers use are greatly influenced by their perceptions of effective teaching, which in turn influences the environments they structure for their students, the types of technologies they use for educational purposes, and how they use those technologies (Williams, Trader, Boone, & Kimble, 2013).

According to Gebre et al. (2014), teachers' perceptions of effective teaching and their role in the process of effective teaching tend to fall into one of three broad categories: a) transmitting knowledge to students, b) engaging students, and c) developing learning independence/self-reliance in students. Ramezanzadeh, Zareian, Reza, and Ramezanzadeh (2017) found that teachers who perceived their role as developing learning independence and self-reliance also perceived that computer-related tools were essential to their course and student learning. At the other end of the spectrum, the authors found that teachers who perceived their role in effective teaching as transmitters of knowledge tended to rely on computer-related tools as a means of personal convenience. This group of teachers most often used computers to display and access prepared materials. Together, these findings reinforce the notion that the benefits of using computers as tools in the educational process is not automatic and depends on how educational technologies are used.

Researchers, such as Sendurur, et al. (2018), Machaba(2019), and Patterson (2019) have examined, thus far, that there are connections among student engagement, technology in teaching and learning, teachers' perceptions of effective teaching, and how each of these variables impacts student learning and achievement. Also, important to these connections and relationships are the salient attributes that today's learners bring to the classroom (Murillo-Zamorano, Lopez Sanchez, & Godoy-Caballero, 2019). Many labels have been attached to the students who occupy the classrooms today. The generation after the Millennials is often referred to as either Generation Z, the Net Generation, or the iGeneration. Nevertheless, regardless of the label attached, they all have one thing in common. Children born after 1997 have never lived during a time when computer technologies were not a significant part of their everyday lives (Vercelletto, 2019). The generation of students in our classrooms today have become accustomed to relying on technology for most aspects of their lives.

According to Boakes and Juliani (2012), the iGeneration label came about because of the new technologies with the "i" attached – iPods, iPhones, iPads. Shaped by the generation in which they were born, today's students continually immerse themselves in the world of technology to expand their knowledge. They have grown up attached to mobile phones and tablets and they figured out, at an early age, that many answers or lessons they need to learn, whether it's about makeup tips or calculus equations, can be found on a YouTube video (Fister, 2015).

According to Shatto (2017), the children in 2017-2018 classrooms were born into a world where technology was and is their major source of getting information very quickly. The world is equipped with the ever-evolving forms of technology that are integral to the lives of even our elementary school students. Therefore, the tools of technology become more fully integrated into the school curriculum. According to Bell, Morrison-Love, Wooff, and McLain (2018), educators must use 21st-Century tools to engage and challenge students to help them develop critical thinking skills that can be used to solve problems and make informed decisions.

Consequently, educational accountability, as it should, has forced educational establishments to critically analyze not only their results but also the vehicles to those results (Gottlieb & Schneider, 2018). Through this analysis, three streams of literature seem important. The first stream is the importance of actively engaging students in their learning. Secondly, in engaging students into their learning, one must first consider who the students are, and which educational strategies are most likely to result in their engagement (Sellingo, 2018). As a part of who the students are, research has highlighted one very significant attribute that the students in today's classrooms share and that is their familiarity and use of various forms of technological tools. The final stream is related to the response from the educational professionals, the teachers.

Teachers' perceptions of effective teaching influences not only the educational environments they create for their students, but also the classroom strategies that they use with their students and the opportunities they provide for them (Gill, 2018). Another segment of knowing who students are is finding that mathematics is a subject area where many students face challenges in understanding the content (Benson, 2016). With remarkable consistency over the decades, the mathematics achievement of American students has been a cause of concern both nationally and internationally. For example, the overall results of the most recent National Assessment of Educational Progress (NAEP) indicated that only 40% of the nation's fourth-grade students and 33% of the nation's eighth-grade students scored proficient or above on the exam (NAEP, 2018). When proficiency levels were examined by select subgroups, proficiency percentages were even lower. The 2015 results of the Programme for International Student Assessment (PISA) report revealed that out of 71 countries, the United States ranked 38th in mathematics (PISA, 2015). More must be done to support and enhance student learning in mathematics to increase achievement in the United States (Outhwaite, Gulliford, & Pitchford, 2019).

The state of Mississippi students' academic scores is lower than the national average in many content areas, including the content area of mathematics (NAEP, 2018). According to the Trends in International Math and Science Study (TIMSS), Mississippi students continue to score at the lowest levels than other states (National Center for Education Statistics, 2018). The 2015 PISA report concurred that Mississippi students are far below the national standards in mathematics. Additionally, Better Policies Better Lives (2018) agreed that low mathematics achievement is plaguing the state of Mississippi: 30% of students score below the basic level in mathematics compared to a national average of 19% of students scoring below basic.

In one central Mississippi school district, 60% of the elementary schools within this district are graded as a D- or an F- school, which suggests these are low-performing schools or schools that are failing to reach the goals mandated by the Mississippi Department of Education (MDE; 2018) for the school district. The students' test scores are compared to five levels of measurement which are Level 1 minimal, Level 2 basic, Level 3 average, Level 4 proficient, and

Level 5 advanced in the subject area of mathematics. The major goal of this district is to ensure students score average and above to achieve the state's goal of a successfully thriving academic level school. The results of the Mississippi Academic Assessment Program (MAAP) in mathematics for the 2017-2018 school year for this one central Mississippi school district revealed the largest percentage of fourth through fifth-grade elementary students scored on the basic level with 38% of third-graders, 38% of fourth-graders, and a little over 31% of fifth-graders scoring on the same level (MDE, 2017). Ideally, MDE requires administrators to focus on increasing the number of elementary students scoring average and above.

Statement of the Problem

According to Kolb (2019), much is known regarding many of the attributes of today's learners and the benefits of actively engaging them in their learning. The iGeneration student relies on various forms of technology to promote excitement in getting to know the world they inhabit. Therefore, traditional instructional practices such as demonstrations on the board and reading from a mathematics textbook may appear monotonous. These traditional approaches, then, continue to result in decreased attention spans and low scores in the mathematics classroom (Shatto, 2017). This is evident in one central Mississippi school district that has received a grade of F on the Annual Report Card for the past three years. According to the latest results from the 2018 – 2019 school year, over half of the students failed to demonstrate proficiency and only 30% of third through fifth-grade students scored basic or higher on the state's mathematics assessment (MDE, 2018). Furthermore, as measured by the annual assessment, there has been very little academic growth from 2016 - 2018 in elementary students' mathematics scores (MDE, 2018). Out of the 36 elementary schools in this district, only two schools showed exceptional academic growth (MDE, 2018).

While the literature has ample research, which indicates the use of technological tools that can support learning and improve academic achievement in the content area of mathematics, the low measures of mathematics achievement in this one central Mississippi school district persist. Moreover, there has been very little academic growth over the past few years (MDE, 2012). The specific problem that guides this proposed study is the absence of a meaningful explanation for the continued measures of low mathematics achievement and the absence of academic growth in this low performing school district in light of what is unknown about elementary school mathematics teachers' perceptions regarding effective instructional practices and their abilities to use technology as an instructional tool for increasing student engagement.

Purpose of the Study

The purpose of this study was to examine the perceptions of third- through fifth-grade mathematics teachers in one central Mississippi school district as they relate to effective instructional practices and their abilities to use technology as an instructional tool in the mathematics classroom. A secondary purpose of this study was to determine if third- through fifth-grade mathematics teachers' perceptions are related to specific demographic variables.

Research Questions

The following questions were developed to guide the study:

1. What are the perceptions of elementary school mathematics teachers regarding effective instructional practices?
2. What are the perceptions of elementary school mathematics teachers regarding their abilities to use technology as an instructional tool in the mathematics classroom?

3. Are there statistically significant differences in elementary school mathematics teachers' perceptions regarding effective instructional practices by select demographic variables (i.e. gender, ethnicity, age range, educational background, teaching experience [veteran teachers and new teachers], and years of experience with various forms of technology)?
4. Are there statistically significant differences in elementary school mathematics teachers' perceptions regarding their abilities to use technology as an instructional tool in the mathematics classroom by select demographic variables (i.e. gender, ethnicity, age range, educational background, teaching experience [veteran teachers and new teachers], and years of experience with various forms of technology)?
5. Is there a statistically significant difference in elementary school mathematics teachers' perceptions regarding their effective instructional practices based on school performance?
6. Is there a statistically significant difference in elementary school mathematics teachers' perceptions regarding their abilities to use technology as an instructional tool in the mathematics classroom based on school performance?

Justification of the Study

The emphasis on developing high achieving school districts is the main goal of every state in America, especially if that school district is located in a capital city (Stotsky & Holzman, 2015). In recent years, the capital and largest city of Mississippi has failed to meet the benchmarks of high achievement mandated by the MDE on statewide exams administered in grades 3 through 8 (MDE, 2018). Year after year, students in this one central Mississippi school district continue to produce low scores on statewide exams (MDE, 2012). This failure is most noted in the area of mathematics. Mathematics performance in the state is measured on five levels ranging from minimal to advanced. Most students in Mississippi score on the proficient or advanced levels, which are the highest levels of achievement on the performance scale (NAEP, 2018). However, students in the capital city score on the minimal or basic levels located at the bottom of the scale (National Center for Education Statistics, 2018).

The primary purpose of this study was to identify effective instructional practices with the integration of technology to promote student engagement in mathematics that leads to higher test scores. Mathematics teachers should be focused on ensuring that they are preparing students to successfully score high on statewide exams (Saka, 2016). Moreover, teachers must be concerned with helping students retain pertinent information for academic success throughout the school year. Yet, teachers may not be able to offer individual instruction to every student in the classroom to ensure students are comprehending concepts (Tolle, 2015). Subsequently, teachers should be able to modify their instructional practices to successfully educate a generation of students sitting in the modern classroom (Rathburn, 2017). Teachers must also recognize and understand the unique characteristics students sitting in the classroom, who have been identified as the iGeneration.

Despite the large body of research on the iGeneration's technological characteristics, there are only a few studies, Little (2017), Hoge (2016), Carney (2016), Schillinger (2016), Spurlock (2016), and Tatum (2013) which focus exclusively on teachers' effective instructional practices and their abilities to use technology as an instructional tool to promote student engagement. Furthermore, few studies have measured elementary teachers' perceptions of effective instructional practices and their abilities to use technology as an instructional tool in the mathematics classroom to increase student engagement concurrently (Carver 2016; Turner 2018; Dyer, Larson, Steele, & Holbeck 2015; Karatas, Tunc, Yilmaz, and Karachi 2017; Lysenko, Rosenfield, Dedic, Savard, Abrami, Wade, & Naffi 2016).

The purpose of this study was to investigate the perceptions of third- through fifth-grade mathematics teachers' effective instructional practices and their abilities to use technology as an instructional tool in the classroom to engage students in the learning process.

Attard and Orlando (2014) detailed how teachers must be willing to explore effective instructional practices to engage the students in learning. Some teachers are not incorporating enough technology into their instructional practices because they are not properly trained or have the ability to use various forms of technology. Hee-Chan and Seo-Young (2014) suggested that teachers fail to incorporate more technology into the classroom because they are not receiving professional development training on including technology into their classroom lectures. Therefore, teachers are not gaining new insights on increasing student engagement and raising scores in mathematics, while students continue to perform poorly on statewide exams.

This lack of adequate preparedness on the part of the teachers to utilize technology, coupled with the lack of student engagement has led to iGeneration students becoming bored and uninterested in the learning process leading to low scores in mathematics (Sheldrake & Watkin, 2013). A better understanding of teachers' perceptions of effective instructional practices and abilities to use technology as an instructional tool in the mathematics classroom will facilitate the development of professional development opportunities that may be used to improve or enhance the instructional practices of teachers. Lee, Longhurst, and Campbell (2017) suggested that improvements in instructional practices and technology integration will increase student engagement and student achievement which will result in higher performance ratings for low performing schools.

Furthermore, it is recognized that the use of technology alone cannot create an effective improvement in the learning of students (Karatas et al., 2017). However, more technology integration can enhance the learning experience by simply questioning iGeneration teachers about which instructional practices they perceive will be the best option to engage and excite students about learning different concepts of mathematics while using technology as an instructional tool in the classroom.

Teachers can use various technical strategies to heighten students' interest in mathematics. Bulik (2011) contended, "One of the iGeneration's key categories of influence is technology. This generation is not just comfortable with technology, they're uncomfortable without technology" (p. 17). Since technology encompasses students' everyday life, it would benefit teachers to become knowledgeable about developing a student-centered educational system in which they are constantly engaged in the learning process.

Ultimately, the findings in this study are important to teachers and administrators. Identifying effective instructional practices and ensuring teachers can use technology as an instructional tool may positively impact test scores and increase interest in mathematics. The study was designed to obtain the perceptions of third- through fifth-grade mathematics teachers' perception of effective instructional practices and their abilities to use technology as an instructional tool in the mathematics classroom. Results from the study may guide this one central Mississippi school district in developing a program that provides teachers with effective instructional strategies to implement in each elementary school. The program could ensure every student is receiving the same caliber of education to enhance learning.

Likewise, administrators can discover what abilities third- through fifth-grade mathematics teachers have about using technology as an instructional tool in the mathematics classroom. Administrators might offer professional development opportunities to cultivate and strengthen elementary teachers' abilities to use technology as an instructional tool in mathematics based on the results of the study. The study could lead to implementing a program in one central Mississippi school district that provides every teacher with the same effective instructional practices and enriches their ability to use technology as an instructional tool to promote student engagement and raise test scores in mathematics for this one central Mississippi school district.

Delimitations of the Study

This study was delimited to third- through fifth-grade mathematics teachers in one central Mississippi school district who responded to the survey instrument used in this study. The study did not include perceptions of any other administrators. The study was delimited to the measures of perceptions of third- through fifth-grade mathematics teachers using the instrument developed by the researcher.

Limitations of the Study

Third- through fifth-grade mathematics teachers' perceptions could be influenced by the resources which are available in each of their classrooms. This study should not be generalized beyond the population of this study.

Definition of Terms

The following definitions were used for this study:

1. iGeneration – The iGeneration, Generation Z, Internet Generation, Digital Natives, or Net Generation consists of those children born after the Millennials (Finitsis, 2012).
2. Instructional practice – The methods and platforms by which educators provide information to learners. Various combinations of course design and modality exist. Examples include traditional face-to-face classroom instruction, flipped classrooms in which online course

content presented outside of class is paired with practice and application activities during the in-class time, and hybrid or blended learning in which face-to-face class time is paired with online work (Hill, 2012).

3. Instructional tool – Materials the teacher uses to help facilitate learning (District Adminstration, 2018).
4. School performance – The A-F grading scale is a way to identify how well students are performing in school, especially on tests and assignments. For school or district grades, it is important to understand that several factors are taken into consideration. Mississippi's school grading system considers several indicators, including how well students perform on state tests, whether students are showing improvement on those tests from year to year and whether students are graduating within four years. The system also factors in how well schools are helping their lowest-achieving students make progress toward proficiency (MDE, 2012).
5. Teacher perceptions – Teachers' mental processes by which intellectual, sensory, and emotional beliefs, insights, and understandings about educational practices are logically or meaningfully organized (The Colorado Education Initiative, 2019).
6. Technology – Any innovation including computer equipment, software, and other electronic devices in action that involves the production of knowledge and processes, which create systems to solve problems and expand human capabilities. For this study, the researcher is primarily interested in digital technologies (e.g., computers, laptops, mobile devices, and interactive whiteboards) that would be used in a classroom setting by a teacher or student (Shameem, 2016).

7. Technology as an instructional tool - Teachers plan and prepare lessons that integrate technological supports with process-oriented approaches and product outcomes (Goldenberg, Meade, Midouhas, & Cooperman, 2011).
8. Veteran teacher – A tenured teacher with at least six or more years of teaching experience. At the six-year mark, teachers have passed the point where they would have been statistically more likely to leave the profession (Yonezawa, Jones, & Singer, 2011).

CHAPTER II

REVIEW OF THE RELATED LITERATURE

This study examined the perceptions of third- through fifth-grade mathematics teachers on effective instructional practices and their abilities to use technology as an instructional tool in the mathematics classroom. This chapter begins with a review of the related literature regarding strategies used to engage the iGeneration student into learning to promote academic success. Section two and three of this chapter provide an overview of the instructional practices which increase student engagement and describes the need of diverse instructional practices in the mathematics classroom.

Sections four and five of this chapter explained why teachers must have the ability to incorporate technology and describes the importance of using technology as an instructional tool in the mathematics classroom. The final section of this chapter describes the select demographic variables which may influence teachers' perceptions of effective instructional practices and their abilities to use technology as an instructional tool in the mathematics classroom.

Engaging the iGeneration Student

The iGeneration, Generation Z, Internet Generation, Digital Natives, or Net Generation consists of those children born in 1990 and beyond (Williams, Trader, Boone, & Kimble, 2013). The focus of students in this era was obtaining technology-based information. These young people are unique because their birth coincides with the introduction of the graphical web that resembles the Internet of today (CStore Decisions, 2016). These individuals have become accustomed to life with the Internet. They thrive on fast access to information and using cell phones for more than mere conversations. Cell phones have become mobile technology for the iGeneration. They no longer should sit in front of a computer. Handheld devices perform just as well or, in some cases, even better than a personal computer. For instance, they develop most relationships through instant messaging, text messaging, and synchronized online conversations (Garcia-Galera, Del-Hoyo-Hurtado, & Fernandez-Munoz, 2014).

Elementary students, now part of the iGeneration, constantly face decreasing math grades and statewide testing scores, particularly in the United States (The Economist Group, 2019). Most students are severely disengaged from the concept of learning challenging aspects of mathematics because they perceive it as boring or difficult (Brunye, Mahoney, Giles, Rapp, & Taylor, 2013). Subsequently, students' motivations to excel in math are at the bottom of the list when comparing to other tasks they must complete. For example, the students would rather do any other tasks, including eating vegetables, cleaning their rooms, and going to the dentist, than do math (Henrich, Sloughter, & Anderson, 2016). Negative perceptions of math are major indicators of how elementary school students detest the thought of completing math concepts and becoming successful in the area (Nunez-Pena, Bono, & Suarez-Pellicioni, 2015). Negative perceptions about mathematics lead to students becoming frustrated and academically underachieving in the subject (Wake, 2019).

Reducing the negative perceptions of mathematics for students brings another challenge that teachers must conquer. The challenge is targeting and understanding which concepts are causing students the most problems and developing instructional practices that help iGeneration students comprehend mathematical objectives (Kapur, 2014). Roman (2014) has discovered that identifying instructional practices that engage students in the learning process helps develop a positive attitude towards mathematics. Teachers are instrumental in creating an environment where students can engage in learning mathematics effectively (Clements, Baroody, & Sarama, 2016). Developing an effective learning environment involves teachers targeting which concepts students are having the most difficulty mastering. Tsai and Li (2017) affirmed, the importance of mathematical learning, coupled with the difficulties students have with the subject, has prompted researchers to focus on the area of mathematics.

Consequentially, negative perceptions in mathematics lead to low confidence in students and they are more prone to failing mathematics due to their inability to fully understand the mathematical concept (Everingham, Gyuris, & Connolly, 2017). Students are unable to recover from the failure of never quite grasping the concept of difficult mathematical problems. Rodrigues, Dyson, Hansen, and Jordan (2016) confirmed: “Students who may have received several years of traditional classroom lecture still have a weak foundation for understanding math” (p. 135). Thus, teachers are essential in lowering the barriers of negative perceptions of mathematics for students by using technology as an instructional tool in classroom lectures (Dostal & Robinson, 2018).

Instructional Practices for Student Engagement

Students are motivated to perform better when educators promote diverse instructional practices (Tolle, 2015). Merrill contended teachers who adapt their instructional practices to include students’ learning styles should come close to providing an optimal learning environment for most students in a class (Craig & Merrill, 2012). Students become excited when allowed to experience more than traditional classroom lecturing in mathematics creating an optimal learning experience.

McGah (2019) found that students became excited about the learning environment when teachers' instructional practices included discussions on various classroom topics, application to real-world situations, application to students' own life, cooperative learning, and identifying similarities and differences. While teachers aim to ensure every student is excited about the learning process, it can become overwhelming to utilize every single effective instructional practice in each mathematics classroom setting to create excitement (Martin, Way, Bobis, & Anderson, 2015). Consequently, teachers are often stretched too thin and lack classroom time to explore various instructional practices equally well for all students (Chung & Ackerman, 2015).

This lack of time is a major reason teachers cannot implement more individualized learning (Swanson, Solis, Ciullo, & McKenna, 2012). Whetstone, Clark, and Flake (2014) affirmed, "Classroom teachers are challenged with meeting the needs of diverse learners who demonstrate differing degrees of readiness for the rigors of the Common Core State Standards" (p. 79). Unfortunately, some students develop a sense of hopelessness because they are unable to master pertinent objectives in mathematics. Teachers must be willing to diversify their instructional practice strategies to ensure students are engaging in learning various objectives successfully (Star, 2016).

Once students lose interest in learning objectives, it is difficult for them to maintain the normal pace of the classwork (Vandercruysse, Vrugte, Jong, Wouters, & Oostendorp, 2017). Fifth-grade mathematics teacher Bornstein (2011) asserted, "Mathematics is like a ladder. If you miss a step, sometimes you can't go on. And then you start losing your confidence and then the hierarchies develop" (Bornstein, 2011, p. 2). No amount of encouragement can refocus their attention to the learning objectives. At this critical point, iGeneration students must be given other diverse instructional practices to assist in meeting their individual needs (Sendurur et al., 2018).

Instructional practices of teachers in the mathematics classroom are essential in the development of critical thinking skills in elementary school students (Cooper, Hirn, & Scott, 2015). Little (2016) agreed, “Instructors are tasked with finding ways to keep students engaged and motivated to complete their courses” (p. 8). Cooper et al. (2015) suggested, instructors of students must implement instructional practices that promote student success. Goals for student success in mathematics should focus on conceptual understanding and mathematical instructional practices (Clements, Baroody, & Sarama, 2016).

Teachers’ Instructional Practices

Society demands a greater need for an understanding of mathematics (Williams, Burt, & Hilton, 2016). Mathematics must be viewed in a positive light to increase scores and interest. Hence, teachers must reevaluate instructional practices that often do not match students’ technological savviness and skills needed in the 21st-century society (Bottia, Moller, Mickelson, & Stearns, 2014). Lessons must be presented in a variety of instructional practices (Paiva & Ferreira, 2017). For instance, a new concept can be taught through role-play, cooperative groups, visual aids, hands-on activities, and technology (Reid & Reid, 2017). As a result, once children see math as fun, they will enjoy it, and the joy of mathematics could remain with them throughout the rest of their lives (Roman, 2014). Combining Skagerlund, Rickard, Traff, & Vastfjall’s (2019) study further indicated that thousands of elementary school students are failing math due to mundane instructional practices and not because of their intellectual level.

Schillinger (2016) conducted a qualitative study about mathematical instructional practices and the self-efficacy of kindergarten teachers, observing the instructional practices for teaching mathematics. While Schillinger concluded that there is a relationship between professional development and self-efficacy in teaching mathematics, except it lacks full disclosure of what works best to increase scores and engagement in mathematics. Schillinger's study failed to describe the actual instructional teachers utilized in the mathematics classroom. It does not give details about the best strategies to increase scores in mathematics. Schillinger's qualitative study mainly described how teachers performed in the classroom and did not gain any insight into their perceptions of effective instructional practices in mathematics classes. It does, however, prove that when teachers believe in themselves and are willing to get proper training in effective instructional strategies, they can teach mathematics confidently to early learners (Hirn & Scott, 2014).

In a study by Hoge (2016), the author focused on the teachers' relationship between instructional practices, professional development, and students' achievement on state assessment exams. Hoge investigated which instructional practices increased scores in mathematics for elementary students but it lacked in describing, in detail, the instructional practices which may increase test scores. Third- through sixth-grade teachers were given a questionnaire based on their perceptions on instructional practices and professional development as it relates to teaching mathematics.

Additionally, their students' scores were observed to investigate if there was a relationship with teachers' perceptions of professional development. There was no relationship found in the study to be significant involving professional development. Hoge did not include an extensive questionnaire on instructional practices. This leaves the reader with no factual information to determine if these sets of teachers' instructional practices helped to increase scores in mathematics. A gap is left in the research because there is no description of instructional practices that other teachers could use to help their mathematics students (Yarbro, McKnight, Elliott, Kurz, & Wardlow, 2016). Teachers have the most influence on students succeeding in mathematics (Lewis & Bond, 2018). However, teachers must be able to pinpoint effective instructional strategies to ensure their students are performing well in the area of mathematics on statewide exams (Khumalo, 2018).

Carney (2016) conducted a non-experimental survey design of 140 fourth through eighth-grade mathematics teachers to investigate if relationships existed among teacher and school variables and mathematics instructional practices. Teachers took a professional development course on instructional practices and applied that knowledge to classroom management to increase mathematics scores on standardized exams. A relationship was found among teacher-centered instructional practices and the standardized test results. This supports the idea that when teachers instruct from their theories of teaching then students score higher on exams (Jacobi-Vessels, Todd, & Molfese, 2016).

Carney's study did not yield any results of the activities included in teachers' daily instructional practices. There were no details on exactly how their daily instructional routines influenced higher scores in mathematics. Carney's study investigated the daily instructional practices teachers used in the classroom to motivate students to effectively learn mathematics and increase statewide test scores, but targeted instructional practices were identified in the research findings.

Spurlock (2016) suggested that instructional practices should be used as an intervention to prepare high school students for college. He tested three instructional practices, which consisted of face to face lectures, digital learning, and blended learning tutoring, against the completion of transitional courses. His focus was not to rely solely on teacher interaction but to discover which methods worked best for these underprepared students. Spurlock wanted to ensure that students were well prepared to attend college based on these instructional practices and determine whether a relationship exists with transitional courses.

The results of Spurlock's research indicated that blended learning tutoring was the most successful instructional practice. Teachers who used a combination of instructional practices had more students score higher on statewide exams. Spurlock failed to explain the extent to which instructional practices were effective for optimal learning nor did he describe teachers' perceptions of using these instructional practices in daily classroom activities. Teachers' instructional practices shape the opportunities students must have to engage in the learning process, therefore, leading to higher scores in mathematics (Yu & Singh, 2018).

Little (2017) conducted a qualitative study in 2017 with community college faculty on their instructional practices for developmental mathematics students. Little's study concentrated on the idea that these faculty members must develop creative, effective instructional practices to increase scores in developmental mathematics students. The concept was to promote success in their mathematics courses. Yet, this research lacked detailed instructional practices because it did not include strategies these instructors used to encourage academic success for students.

Also, Little's study targeted developmental mathematics students who had mastered basic mathematics, despite the fact they are enrolled in college courses. Little's study investigated effective instructional practices with instructional technology to promote a solid foundation for elementary students. Little's study is different from the current study because the rationale is to recognize instructional practices that promote academic success in elementary students to avoid low achievement in mathematics throughout their journeys to higher grade levels. Ideally, elementary students should develop a successful learning experience in mathematics to minimize the risk of failure or remedial assistance (Wright & Gotwals, 2017).

Teachers' Abilities to Use Technology

Teachers play a large role in implementing technology in the classroom setting to raise interest in math (Murphy, 2016). Yet, many teachers have failed to make math interesting to students. Unfortunately, many teachers do not present mathematics in ways that are meaningful to students (Reid & Reid, 2017). The best strategy to make math interesting to students is the teacher's pedagogy of delivering important concepts (Star, 2016). It is the teachers' enthusiasm about the topic which motivates the students to learn effectively (Chung & Ackerman, 2015). If the teacher allows students to express learning new math concepts in various ways, then, hopefully, they will become excited about the objectives in the classroom (Lazarides, Viljaranta, Aunola, & Nurmi, 2018). The key is getting them involved in the lesson by incorporating meaningful mathematical activities. For example, in dealing with the iGeneration, the teacher can create video games for a particular lesson. The video game could entail concepts with which the students may have difficulty mastering (Machaba, 2019). Consequently, successfully student engagement depends on the teacher's ability to make learning fun while integrating technology (Bissett, 2019).

The major issue of technology integration is not with the students but with their teachers (Mears, 2012). The training and ability to use technology allow instructors to decide how technology will be used in theory within the classrooms (Badia & Iglesias, 2019). Many current teachers, especially those that have been teaching for fifteen or more years, are often averse to the idea of integrating technology into their teaching. Bolandifar (2015) contended, "Negative attitudes of teachers lead to negative effects on the implementation of technology in classrooms"

(p. 364). This aversion places students and teachers on opposite sides of the technology discussion, negatively impacting the students (Gill, 2018). However, despite many older teachers rejecting the incorporation of technology into the classroom, mathematics has been saturated with various forms of technology to assist students in retaining skills for the academic year. “Technology is available and accessible in many mathematics classrooms” (Ball & Pierce, 2013, p. 300).

According to Fital-Akelbek and Akelbek (2012), “Technology can be integrated into mathematics classes in such a way that students are better engaged and are connecting the material to real-world applications.” (p. 67). Technology has become one of the major factors influencing most mathematics educational designs. Gorhan, Oncu, and Senturk (2014) suggested, “The use of computers and technological devices in mathematics education has gradually become more and more widespread” (p. 2263).

Accordingly, teachers are attending professional development courses that allow them to learn how to incorporate more technology into their lectures (Saclarides & Lubienski, 2018). Moreover, “many of the larger companies that have a presence in the K12 educational technology field, such as Thinkfinity, Discovery Education, Google, and Adobe, have train-the-trainer programs for districts using their products” (Schrock, 2012, p. 59). Most school districts have placed computers or other forms of technology in teachers’ classrooms (United States Department of Education, 2011). This access allows teachers to use technology to enhance a lesson or give students opportunities to use the equipment, which they may not have access to at home. Students become excited about new concepts the mathematics teacher has shown them in class, and this may motivate them to learn difficult mathematical concepts (Gill, 2018).

Technology can be a motivation for learning mathematics (Byun & Joung, 2018). Barreto, Vasconcelos, and Orey (2017) have found students enjoy learning and practicing using various forms of technology. It gives them a sense of understanding the topic on their terms. In some cases, the teacher may not be able to convey the lesson in a manner which the students comprehend, but if they solve problems using their favorite computer game, then they can learn while they play (Barreto et al., 2017). “A mathematics teacher can teach students how to use coefficients properly, but a technology teacher can make students understand [how to implement the coefficient in real-life situations] as they calculate the lift coefficient of a wing in flight” (Dettelis, 2011, p. 37). Real-life simulations provide a vivid example of how a mathematics concept works beyond the classroom, which functions to increase the interests of the students as they realize how mathematics is significant to their daily lives (Saunders, Spooner, & Davis, 2018).

Technology integration also gives students the confidence to apply the concepts or methods they learned in mathematics class to other classes and aspects of life (Al-Hilli, 2019). Thus, teachers are highly interested in adding technology as an instructional tool in their classrooms. “Teachers say one of the biggest benefits they’ve seen from the use of technology is that students’ confidence levels and their ability to truly understand and explain the mathematics they’re doing has risen” (Davis, 2011, p. 39). The integration of technology-enhanced instruction allows students to challenge themselves and progress at an individualized rate (Whetstone, Clark, & Flake, 2014). When teachers incorporate technology into instructional practices, it emboldens students to try even more activities as they now have the language to vocalize other goals and desires (Clements & Sarama, 2016).

Teachers Incorporating Technology

In general, various forms of technology have been incorporated into classroom learning for many decades throughout countless school districts (Scallise, 2016). In today's world, technology has become an important part of teachers' knowledge base (Karatas, Tunc, Yilmaz, & Karaci, 2017). In Karatas, Tunc, Yilmaz, and Karaci's (2017) study they investigated the perceptions of pre-service teachers on the topic of instructional technology in the mathematics classroom. The major focus was to discover if college students were prepared to teach math based on their self-confidence, content knowledge, and perceptions of technology. Their findings revealed these new teachers had low confidence about incorporating technology into their math lesson plans. Future teachers that have low confidence or doubt about their ability to use technology as an instructional tool in the classroom may fail to effectively instruct students in the area of mathematics.

Other studies have suggested students performed best when technology use blended with regular classroom instruction or as part of a more comprehensive program (Lysenko et al., 2016). Lysenko et al. (2016) conducted a study using interactive software to teach foundational mathematical skills to elementary students. The researchers were seeking to understand if by using interactive computer software within classroom instruction would yield higher mathematics achievement and positive dispositions towards mathematics. Twelve teachers were chosen and 186 students granted permission to become a part of the study. Twelve classes were included in the study and half of those classes were identified as the control classrooms.

The experimental group was allowed to use interactive software with the instruction of mathematical concepts for about seven weeks. The data were measured by comparing pre- and post-test scores of the control and experimental group. The findings were that the experimental group had higher mathematics achievement and a more positive disposition for mathematics. Teachers who used interactive technology in their daily instruction increased student math abilities and reduced mathematics anxiety and boredom.

Turner (2018) suggested the shift of blended learning into the traditional classroom, and greater acceptance and availability of online courses, has allowed for the best approach to combining the two modes. Turner's study further suggested that technology use is gaining momentum in public schools across the country at a rapid pace, highlighting the need for more research on understanding learning in K-12 education. In the study, Turner considered the need to investigate blended learning and sought to determine teachers' perceptions of the benefit and appropriateness of blended learning. The study assessed 460 teachers' perceptions of blended learning among elementary, middle, and high school levels by administering a survey. There were no statistically significant differences found in teachers' perceptions of blended learning, but the more positive the teacher's responses were about blended learning, the more likely they were to incorporate technology into classroom instruction.

Carver (2016) explored K-12 teachers' perception of the benefits and barriers to educational technology when used by teachers or students in K-12 instruction. The results indicated that first-order barriers such as technology availability, are still major concerns that impact both student and teacher use. Equipment availability, more than any other factor, seemed to have the greatest impact on whether the technology was incorporated into classroom instruction. Teachers in this study more frequently viewed technology as a tool for increasing student engagement and understanding, rather than for higher-order skills of research and evaluation.

Dyer et al. (2015) believed instructors in online classes should lead the charge of innovation and integration of technology into the online classroom to ensure that students achieve the best learning outcomes. In their study, they investigated if faculty members were able to improve student outcomes by integrating technology into classroom content areas. The findings were supported with positive student feedback showing that by targeting the low achievement areas with integrated technology the instructors were able to enhance the classroom. The students were more engaged and motivated to successfully complete assignments.

Teachers' Perceptions

Several factors have been considered to potentially influence teacher's perceptions of effective instructional practices and their ability to use technology as an instructional tool in the mathematics classroom. Most research about teachers' perceptions regarding effective instructional practices and their ability to use technology as an instructional tool is limited. However, certain characteristics have been examined to determine if they influence teachers' perceptions of instructional practices and the use of technology as an instructional tool.

Yurdakal and Kirmizi (2019) conducted a study investigating teachers' views on instructional practices used for diminished reading difficulty at primary schools. The only characteristics which played a role in teachers' perceptions were gender and the educational experiences of teachers (Yurdakal & Kirmizi, 2019). Another study by Park, Gunderson, Tsukayama, and Beilock (2016) studied young children's motivational frameworks and mathematics achievement concerning teacher-reported instructional practices. The findings were teachers' instructional practices differed by educational experience. The longer teachers taught the better they were at using instructional practices which assisted in student learning (Park et al., 2016).

Additionally, various forms of technology were used throughout institutions of learning (Black & Lassmanni, 2016), but little was known about the factors that influence the teachers' perceptions of their abilities to use technology as an instructional tool in mathematics class. Tondeur, Braak, Ertmer, and Ottenbreit-Leftwich (2017) suggested technology integration is still a complex educational change, thus, the use of technology in schools is still extremely varied and limited. Furthermore, the technology available to teachers was a factor as proven by a 2016 report which discovered that technological resources varied from school to school (Simba Information, 2016). The inconsistencies in the results found that teachers reported numerous forms of technology in the classroom although many other teachers had no technological resources. Additionally, in other related studies, the instructor's gender is a factor regarding teachers' perceptions to integrate technology into classroom instruction. Turner (2018) and Karatas et al. (2017) found that male teachers had higher confidence and used technology more often in the classroom than female teachers.

Summary of the Review of Related Literature

Research indicated that teachers of the iGeneration student must implement instructional practices that promote student success (Cooper, Hirn, & Scott, 2015) along with the integration of technology (Byun & Joung, 2018). Oddly, few studies addressed the issues of teachers' being unprepared to effectively incorporate technology into their instructional practices. Little (2017) discovered instructional practices used by instructors who were not considered effective do not promote academic success and need to be changed but teachers failed to recognize which strategies would improve student success.

Schillinger's (2016) investigation was slightly different because this study questioned teachers' perception of their self-efficacy in classroom instruction while using technology.

Schillinger found that teachers who were confident in the classroom and comfortable teaching with technology better prepared their students to enter higher education. Several other studies and articles emphasized the need to identify effective instructional practices of teachers and ensuring they are using technology to engage the iGeneration student into learning mathematics (Cooper et al. 2015; Foegen et al., 2016; Hoge, 2016; Shatto, 2017).

In conclusion, much research has been done on the iGeneration student (Finitsis, 2012), but there is minimal research being conducted on teachers' perceptions of effective instructional practices and their abilities to use technology as an instructional tool in the classroom. It is evident from the aforementioned research that iGeneration students thrive on technology in every aspect of life. Teachers must prepare instructional practices that are beneficial to student learning but also incorporate technology as an instructional tool to increase engagement in mathematics class (Keating & Mells, 2017). Additionally, Investigating teachers' perceptions regarding effective instructional practices and their ability to use technology within classroom lectures could lead to higher test scores and interest in mathematics (Lazarides et al., 2018).

CHAPTER III

METHODOLOGY

The purpose of this study was to examine the perceptions of elementary school mathematics teachers in one central Mississippi school district as they relate to effective instructional practices and their abilities to use technology as an instructional tool in the mathematics classroom. A secondary purpose of this study was to determine if the teachers' perceptions were related to specific demographic variables. This chapter, within which the researcher described the methods of this study, is divided into the following sections: (a) research design, (b) population, (c) instrumentation, (d) data collection, and (e) data analysis.

Research Design

The quantitative research designs in this study utilized descriptive and causal-comparative research methods. According to Fraenkel, Hyun and Wallen (2018), descriptive methods are useful for describing populations, acquiring data from groups of individuals about a given topic, and establishing relationships among variables. The Center for Innovation in Research and Teaching (2018) suggested descriptive research is used extensively in social science, psychology, and educational research. This research method can provide a rich data set that often brings to light new knowledge or awareness that may have otherwise gone unnoticed or encountered (Center for Innovation in Research and Teaching, 2018). It attempts to gather quantifiable information that can be used to statistically analyze a target audience or a particular subject. Descriptive research methods were appropriate for this study because it described third-through fifth-grade mathematics teachers' perceptions of effective instructional practices and their abilities to use technology as an instructional tool in the mathematics classroom.

The second form of research that was used is causal-comparative research. Causal-comparative research is used to identify cause-effect relationships or to examine the consequences of differences that already exist between two groups. Causal-comparative research is also sometimes referred to as "ex-post-facto" research because the researcher is attempting to determine the cause or reason for differences that already exist among groups of individuals. In other words, the effect and the alleged cause have already occurred and are being studied "after the fact" (Center for Innovation in Research and Teaching, 2018). This method was appropriate for this study because it determined the significant differences between groups. Specifically, the relationships in the demographic groups which were the independent variables and the elementary school mathematics teachers' perceptions which were the dependent variables.

Population

The participants of this study consisted of 135 third- through fifth-grade mathematics teachers from one central Mississippi school district. The district serves approximately 26,000 students, representing more than 80% of school-aged children in the only urban municipality in the state. There are seven high schools, 12 middle schools, 33 elementary schools, and two alternative schools comprising the district's 54 school sites. Student demographic data for this district indicated that more than 95% of the student population is African American. The school district's achievement level during the 2017-2018 academic year was an accountability label of F which signifies failing to reach benchmark scores on statewide exams.

Instrumentation

In this study, an online survey (Appendix A) developed by the researcher was emailed to participants via SurveyMonkey. SurveyMonkey is an online hosting site that enables a person to develop a survey for use over the internet (Waclawski, 2012). It is used in higher education research to collect participants' information. Online survey usage increases response rates by providing the option of followup emails. Other benefits of this instrument were cost-effectiveness and a user-friendly interface for participants. Additionally, the online survey provides quick selection processes with clicking options and increases completion by urging participants to advance to the next section of the online survey by clicking the forward arrow option (Kunsoon, Park, Heo, & Gustafson, 2019).

The online survey was used to examine third- through fifth-grade mathematics teachers' perceptions regarding effective instructional practices and their abilities to use technology as an instructional tool in the mathematics classroom. The online survey consisted of three sections which were Section I – demographic information, Section II – teachers' perceptions of effective instructional practices, and Section III – teachers' perceptions of their abilities to use technology as an instructional tool in the mathematics classroom. Section I of the survey obtained demographic information and consisted of eight questions. Instructions can be found on the survey administered to the participants. The demographic variables were (a) gender, (b) ethnicity, (c) age range, (d) highest level of education completed, (e) teaching experiences, (f) school accountability performance level, (g) technology classroom experience, and (h) forms of technology available in the classroom.

Section II of the survey consisted of 20 statements, which were related to third- through fifth-grade mathematics teachers' perceptions regarding effective instructional practices in the mathematics classroom. The participants were asked to rate their perceptions of Effective Instruction as “Not Important for Effective Instruction,” “Inhibits Effective Instruction,” “Neutral,” “Somewhat Important for Effective Instruction,” or “Essential for Effective Instruction.”

Section III of the survey used two Yes-No questions to ask teachers their opinions regarding using technology in the mathematics classroom. Additionally, Section III included 20 statements that were related to third- through fifth-grade mathematics teachers’ perceptions regarding their ability to use technology as an instructional tool in the mathematics classroom. The participants were asked to choose which option best reflected how strongly they perceived their abilities to be while using technology as an instructional tool in the mathematics classroom. Thus, participants were required to respond to 20 statements by selecting from the provided Likert scale items by clicking in the corresponding circle which consisted of degrees from “strongly disagree” to “strongly agree.”

Validity and Reliability of the Instrument

Validity refers to the instrument and the ability of the instrument to measure what it is supposed to measure (Green, 2018). To determine content validity, the survey was reviewed by a panel of four experts in the field of education (Appendix B). In the review of content, experts were asked to examine the instrument for relevancy to the research purpose and clarity. The panel consisted of one elementary mathematics teacher, one mathematics lead teacher from Curriculum and Instruction, and the chief academic officer of elementary schools, all from the same school district as well as one professor of mathematics education from a local university.

After the review process was completed, the researcher received positive feedback from each expert. However, there were two suggestions provided that would improve the survey. One suggestion was to add “Specialist Degree” to the educational background list and the other suggestion was to add “to” to one of the statements in Section II. The researcher made the corrections and emailed the changes to the panel of experts for their final review. The final review resulted in each expert indicating that the instrument had good content validity.

According to Mills and Gay (2016) reliability refers to the degree of consistency based on scores or answers from one administration of an instrument to another and from one set of items to another. SPSS software was used to estimate the reliability of Sections II and III of the online survey instrument based on the data obtained from a sample of the participants’ responses using Cronbach’s Alpha. A common rule for describing internal consistency using Cronbach’s Alpha has many levels. The most acceptable level $\alpha \geq 0.90$ indicates excellent internal consistency; $0.70 \leq \alpha < 0.90$ indicates good internal consistency; $0.60 \leq \alpha < 0.70$ indicates acceptable internal consistency; $0.50 \leq \alpha < 0.60$ indicates poor internal consistency; and $\alpha < 0.50$ indicates unacceptable internal consistency (Mills & Gay, 2016). The results of the reliability test yielded Cronbach’s Alpha to be .942, indicating excellent internal consistency.

Data Collection and Procedures

The researcher contacted the school district’s central office located in central Mississippi to gather information on the proper protocol to collect data from the district’s classroom teachers. The central office administrators directed the researcher to contact the Office of Accountability and Research to speak with the executive director. The researcher visited the office and met with the executive director’s secretary and was given the guidelines to gain permission from the district to conduct research. The guidelines included a very detailed letter of request describing the study and a hardcopy of the online survey.

The researcher prepared a letter of request which contained the complete details of the study and a hardcopy of the online survey. The letter of request and hardcopy of the online survey were delivered to the office of the executive director of Accountability and Research for the school district (Appendix C). A few days later the secretary of the executive director called and informed the researcher that the study was approved, and a follow-up email would be sent the next day containing the approval letter. A letter of approval was emailed to the researcher on October 16, 2018, granting permission to conduct research in the school district (Appendix D).

Once permission was gained from JPS, the researcher submitted a completed application with the approval letter attached to the Mississippi State University Institutional Review Board (IRB) to obtain permission to conduct the study from MSU. Permission was granted from the MSU IRB on October 25, 2018, to conduct the study. An approval letter was sent to the researcher via email (Appendix E). After both entities granted permission to conduct the study the researcher obtained the professional email addresses of all third- through fifth-grade mathematics teachers from the school district.

The researcher met with the Executive Director of Accountability and Research to ask for assistance in delivering the information about the study to other administrators in the district. He emailed all Assistant Superintendents and Principals that their third- through fifth-grade mathematics teachers would be receiving an email concerned with anonymously volunteering to be included in the study through their school district’s emailing system. The researcher emailed a short description of the study and the link to the online survey to third- through fifth-grade mathematics teachers.

The third- through fifth-grade mathematics teachers who volunteered to participate in the study were asked to complete and submit the survey through an online survey service, SurveyMonkey. A hyperlink to the online survey along with a short description of the study was emailed to each participant. A reminder email was sent to participants who did not respond each week after the initial email had been sent on November 4, 2018. Participants were also emailed a reminder if they exited out of the online survey before they reached the “Successfully Completed the Survey” message.

After one week of collecting the online surveys and only receiving a few responses, the researcher was encouraged by the Executive Director to try and meet with the principals who had not confirmed they received the email or informed their third- through fifth-grade mathematics teachers about the study. The researcher visited each elementary school to meet with the principals who had not confirmed they had informed their third- through fifth-grade mathematics teachers about the study.

The researcher had to provide the approval letters from JPS and MSU IRB to meet with each principal and was then allowed to enter the school (See appendixes for all references to letters and surveys). Once the researcher met with the principals and thoroughly explained the study, then they provided each school’s website address where third- through fifth-grade mathematics teachers’ professional email addresses were listed in case the researcher had not received the correct information the first time. The principals instructed the researcher to email them the description of the study containing the online survey link and they then forwarded that email message to the third- through fifth-grade mathematics teachers to ensure only their third- through fifth-grade mathematics teachers were receiving the email for the study.

A total of 208 third- through fifth-grade mathematics teachers were invited to take the online survey. These were 135 third- through fifth-grade mathematics teachers who responded to the online survey. The participants’ submission of the completed surveys resulted in a response rate of 65%. Once the participants submitted the online survey, consent was granted, and confidentiality was secured because all identifiers were removed by the online survey service. All surveys were submitted by December 21, 2018.

Data Analysis

Data analysis included in this study were descriptive and inferential statistics. Inferential statistics used were an analysis of variance (ANOVA) and t-tests. The probability level for all the statistical analyses was set at $p < 0.05$ to test for statistically significant differences among the groups. Generally, researchers set a predetermined level for significance in educational research (Mills & Gay, 2016).

After all the data were collected through the online survey, the researcher exported the responses of 135 participating third- through fifth-grade mathematics teachers' perceptions to IBM Statistical Package for the Social Sciences (SPSS) 26.0 (2017), a computer program for statistical analysis. Demographic information was analyzed by collecting data from Section I of the online survey. The analyses used were descriptive statistics which calculated the frequency, percentages, mean, and standard deviation of the independent variables of gender, ethnicity, age range, educational background, teaching experience, school accountability performance level, technology experience, and forms of technology available in the classroom.

The following paragraphs discussed the statistical analysis used to answer each research question based on the online survey instrument.

Research Questions One and Two

Research Question 1 asked, "What are the perceptions of elementary school mathematics teachers regarding their effective instructional practices in the mathematics classroom?" To answer Question 1 Section II of the online survey consisted of 20 statements pertaining to instructional practices in the mathematics classroom in a five-point Likert Scale format, with "5" being "Essential for effective instruction," "4" being "Somewhat important for effective instruction," "3" being "Neutral," "2" being "Inhibits effective instruction," and "1" being "Not important for effective instruction," were used to describe how effective teachers perceived each statement to be for instructional practices in their mathematics classroom to promote student engagement and raise scores in mathematics.

Descriptive statistics (mean scores and standard deviations) were used to analyze third- through fifth-grade mathematics teachers' perceptions of effective instructional practices in the mathematics classroom by using a range. As shown in Table 1, a mean score that ranged from 1.00-.149 indicated a poor perception of the statement, 1.50-2.49 indicated a fair perception of the statement, 2.50-3.49 indicated the teacher had no perception of the statement, 3.50-4.49 good perception of the statement, and 4.50-5.00 indicated an excellent perception of the statement with the importance of the standard.

Table 1

Mean Interpretation Table for Teachers' Perceptions Regarding Instructional Practices

Rating	***Description***
1.00-1.49	Not Important for Effective Instruction
1.50-2.49	Inhibits Effective Instruction
2.50-3.49	Neutral
3.50-4.49	Somewhat Important for Effective Instruction
4.50-5.00	Essential for Effective Instruction

Research Question 2 asked, "What are the perceptions of elementary school mathematics teachers regarding their abilities to use technology as an instructional tool in the mathematics classroom?" To answer Research Question 2, Section III of the online survey begins by asking two Yes-No questions. Questions one and two of Section III were analyzed by calculating the percentages and frequencies based on teachers' responses regarding using technology in the mathematics classroom.

The remaining part of Section III included 20 statements about teachers' perceptions regarding their abilities to use technology as an instructional tool in the mathematics classroom. The teachers' responses were rated in a five-point Likert Scale format, with "5" being "Strongly Agree," "4" being "Agree," "3" being "Neither Agree/Disagree," "2" being "Disagree," and "1" being "Strongly Disagree," were used to describe how teachers' perceived their abilities to use technology as an instructional tool in the mathematics classroom for each statement to promote student engagement and raise scores in mathematics.

Descriptive statistics (mean scores and standard deviations) were used to analyze third- through fifth-grade mathematics teachers' perceptions of their abilities to use technology as an instructional tool in the mathematics classroom by using a range. As shown in Table 2, a mean score that ranged from 1.00-.149 indicated a poor perception of the statement, 1.50-2.49 indicated a fair perception of the statement, 2.50-3.49 indicated the teacher had no perception of the statement, 3.50-4.49 indicated a good perception of the statement, and 4.50-5.00 indicated an excellent perception of the statement with the importance of the standard.

Table 2

Mean Interpretation Table for Teachers' Perceptions Regarding Abilities to Use Technology

Rating	***Description***
1.00-1.49	Strongly Disagree
1.50-2.49	Disagree
2.50-3.49	Neither Agree/Disagree
3.50-4.49	Agree
4.50-5.00	Strongly Agree

Research Questions Three and Four

Research Question 3 asked, “Is there a statistically significant difference in elementary school mathematics teachers’ perceptions regarding their effective instructional practices by select demographic variables (i.e. gender, ethnicity, age range, educational background, teaching experience [veteran teachers and new teachers], and years of experience with various forms of technology)?” Research Question 4 asked, “Is there a statistically significant difference in elementary school mathematics teachers’ perceptions regarding their abilities to use technology as an instructional tool in the mathematics classroom by select demographic variables (i.e. gender, ethnicity, age range, educational background, teaching experience [veteran teachers and new teachers], and years of experience with various forms of technology)?”

To answer Questions 3 and 4, inferential statistics were used to analyze the data, and independent t-tests were used to compare teachers’ perceptions across the variables of gender and teaching experience. Additionally, ANOVA tests were used to compare mean perceptions across the independent variables of ethnicity, age range, educational background, and technology classroom experience. Both questions used inferential statistics to measure if there were any statistically significant differences among the demographic variables from the items on the online survey.

Research Questions Five and Six

Research Question 5 asked, “Is there a statistically significant difference in elementary school mathematics teachers’ perceptions regarding their effective instructional practices based on school performance?” Research Question 6 asked, “Is there a statistically significant difference in elementary school mathematics teachers’ perceptions regarding their abilities to use technology as an instructional tool in the mathematics classroom based on school performance?”

To answer Questions 5 and 6, inferential statistics were used to analyze the data. Independent t-tests were used to compare teachers' perceptions across the variables of gender and teaching experience. Additionally, ANOVA tests were used to compare mean perceptions across the independent variables of ethnicity, age range, educational background, and technology classroom experience. Both questions used inferential statistics to measure if there were any statistically significant differences among the demographic variables from the items on the online survey.

CHAPTER IV

RESULTS

This study was conducted to investigate the perceptions of third- through fifth-grade mathematics teachers in one central Mississippi school district as they related to effective instructional practices and their abilities to use technology as an instructional tool in the mathematics classroom. An online survey was utilized to collect teachers' responses. The online survey consisted of three sections. Section I, Demographic Information; Section II, Perceptions on Effective Instructional Practices; Section III, Perceptions on third- through fifth-grade mathematics teachers' abilities to use technology as an instructional tool in the mathematics classroom. This chapter is divided into the following sections: (a) Participants, (b) Demographic Information, (c) Research Questions, (d) Summary. The online survey responses were used to answer the following research questions:

1. What are the perceptions of elementary school mathematics teachers regarding their effective instructional practices?
2. What are the perceptions of elementary school mathematics teachers regarding their abilities to use technology as an instructional tool in the mathematics classroom?
3. Is there a statistically significant difference in elementary school mathematics teachers' perceptions regarding effective instructional practices by select demographic variables (i.e. gender, ethnicity, age range, educational background, teaching experience [veteran teachers and new teachers], and years of experience with various forms of technology)?

4. Is there a statistically significant difference in elementary school mathematics teachers' perceptions regarding their abilities to use technology as an instructional tool in the mathematics classroom by select demographic variables (i.e. gender, ethnicity, age range, educational background, teaching experience [veteran teachers and new teachers], and years of experience with various forms of technology)?
5. Is there a statistically significant difference in elementary school mathematics teachers' perceptions regarding effective instructional practices based on school performance?
6. Is there a statistically significant difference in elementary school mathematics teachers' perceptions regarding their abilities to use technology as an instructional tool in the mathematics classroom based on school performance?

Demographics

The participants of this study were third- through fifth-grade mathematics teachers from one central Mississippi school district. There were 135 online surveys submitted which is 65% of the total population surveyed, $N = 208$. The demographic information described the characteristics of the participants through their responses from Section I of the online survey from eight questions. Online survey questions included in this section focused on the respondents' (a) gender, (b) ethnicity, (c) age range, (d) educational background, (e) teaching experience, (f) school performance level, (g) technology classroom experience, and (h) forms of technology available in the classroom.

Gender, Ethnicity, and Age

The first three questions in Section I of the online survey inquired about gender, ethnicity, and age range. The gender question offered two options to select for a response which was male or female. The ethnicity question offered the choices of Asian or Pacific Islander, Black or African American, Hispanic or Latino, White/Caucasian, or Other with a provided text box to enter a response to the ethnicity question. The age range question provided a range of choices divided into four groups: 21 to 25, 26 to 35, 36 to 50 and 51 or older. The data were examined by calculating the percentages and the number of responses for the first three questions. Table 3 shows the results of Section I: Demographics from the online survey for gender, ethnicity, and age range. Most (89.6%) of the participants were female, most (74%) of the participants were African American, and 61 out of 134 participants (45.2%) were 36-50 years of the age range.

Table 3

Gender, Ethnicity, and Age

Demographic Variables		N	%
Gender	Female	121	89.6
	Male	13	9.6
	Not Reported	1	0.8
	Total	135	100
Ethnicity	African American	100	74
	White / Caucasian	31	23
	Other	4	3
	Total	135	100
Age	21 - 25	13	9.6
	26 - 35	34	25.2
	36 - 50	61	45.2
	51 or older	26	19.3
	Not Reporting	1	0.7
	Total	135	100

Educational Background and Years of Teaching Experience

The next set of questions, four and five, in Section I of the online survey inquired about the highest level of education completed by the participants or educational background and the number of years participants had been teaching or years of teaching experience. The educational background question offered four response options from which to select. The options were Bachelor's degree, Master's degree, Specialist degree, and Doctorate degree. The years of teaching experience question provided a range of choices divided into two groups: 0 – 5 years or 6 or more. The data were examined by calculating the percentages and the number of responses for Questions four and five. Table 4 shows the results of Section I: Demographics from the online survey for educational background and years of teaching experience. A slightly higher percentage (39.3%) of the participants earned a Bachelor's degree over all other degrees and most (72.6%) of the participants had taught for six or more years.

Table 4

Educational Background and Years of Teaching Experience

Characteristics		n	%
Educational Background	Bachelor's Degree	53	39.3
	Master's Degree	47	34.8
	Specialist Degree	24	17.8
	Doctorate Degree	11	8.1
	Total	135	100
Years of Experience	6 or more	98	72.6
	0 – 5	37	27.4
	Total	135	100

Accountability Performance Level

The next question, six, in Section I of the online survey inquired about the accountability performance level of the schools where the participants taught. The accountability performance level question offered two options to select for a response which was high-performance (A-C) or low-performance (D-F). The participants selected which school accountability performance level their school was labeled as by MDE. The data were examined by calculating the percentages and the number of responses for Question 6. Table 5 shows the results of Section I: Demographics from the online survey for the accountability performance level. More than half (56.3%) of the participants taught in low-performance level elementary schools.

Table 5

Accountability Performance Level

Characteristics		n	%
Accountability Performance Level	High-performance Level (A-C)	54	40
	Low-performance Level (D-F)	76	56.3
	Not Reporting	5	3.7
	Total	135	100

Years of Technology Usage in the Classroom

The next question, #7, in Section I of the online survey inquired about the number of years participants had been using technology in the classroom. The years of technology usage in the classroom question provided five choices to select for a response which were less than one year, at least three years but less than five years, at least five years but less than ten years, at least one year but less than three years, and ten years or more. The data were examined by calculating the percentages and the number of responses for Question7. Table 6 shows the results of Section I: Demographics from the online survey for years of technology usage in the classroom. The largest percentage (41.5%) of participants had used technology in the classroom for 10 or more years.

Table 6

Years of Technology Usage in the Classroom

Characteristics		n	%
Technology Usage	10 or more years	56	41.5
	At least 5 years but less than 10	35	25.9
	At least 1 year but less than 3 years	10	7.4
	At least 3 years but less than 5 years	25	18.5
	Less than 1 year	9	6.7
	Total	135	100

Technology Devices Available in the Classroom

The next question, #8, in Section I of the online survey inquired about which forms of technology were available to be used in the classroom or technology devices available in the classroom along with learning mathematics. The forms of technology available in the classroom question offered a checklist to select all options which applied to the participants and a provided textbox to enter other forms of technology that they used in the classroom but were not listed in the checklist. The forms of technology available in the classroom question provided eight checkboxes to click to place a checkmark for all options that applied to their classroom settings.

The checkbox options included computers, mobile devices, handheld devices, interactive whiteboards, educational software, calculators, the internet, and others. The data were examined by calculating the percentages of which forms of technology were available to use in the classroom and the number of responses for Question 8. Table 7 shows the results of Section I: Demographics from the online survey for forms of technology available in the classroom. A majority (94.8%) of teachers indicated they had computers in their classrooms.

Table 7

Forms of Technology Available in the Classroom

Characteristics		n	Not reporting	Total	%	% Not Reporting	% Total
Forms of Technology Available in the Classroom	Computers	128	7	135	94.8	5.2	100
	Mobile Devices	78	57	135	57.8	42.2	100
	Handheld Devices	13	122	135	9.6	90.4	100
	Interactive Whiteboards	106	29	135	78.5	21.5	100
	Educational Software	49	86	135	36.3	63.7	100
	Calculators	41	94	135	30.4	69.6	100
	The Internet	107	28	135	79.3	20.7	100
	Other (please specify)	5	130	135	3.7	96.3	100

Research Question 1 Perceptions of 3rd-5th Grade Mathematics Teachers Regarding Effective Instructional Practices

Research Question 1 asked what are the perceptions of elementary school mathematics teachers regarding effective instructional practices? To answer Research Question 1, participants were asked their opinions based on 20 statements about teachers' perceptions regarding effective instructional practices in the mathematics classroom. The teachers were offered five options to click to respond to each statement. The options were "Not Important for Effective Instruction," "Inhibits Effective Instruction," "Neutral," "Somewhat Important for Effective Instruction," and "Essential for Effective Instruction." The data were examined by calculating the mean and standard deviation for each statement using descriptive statistics.

The overall responses indicated the participants perceived most of the statements to be "Somewhat Important for Effective Instruction" to promote student engagement and increase scores in mathematics. The instructional practices teachers perceived as "Essential for Effective Instruction" to promote student engagement and increase mathematics scores included requiring students to memorize basic number facts, requiring students to respond orally to open-ended questions, requiring students to participate in cooperative learning activities, requiring students to explain how the mathematical concepts they are learning relate to the real world and requiring students to explain their reasoning when giving an answer.

The instructional practice teachers perceived as "Neutral" was requiring students to use calculators for learning or practicing skills ($M = 3.38$, $SD = 1.16$, $n = 135$). This statement scored the lowest on the scale. Table 8 displays the results from the online survey Section II: Teachers' Perceptions on Effective Instructional Practices which include mean scores and results from third- through fifth-grade mathematics teachers' perceptions regarding effective instructional practices in the mathematics classroom.

Table 8

Teachers' Perceptions of Effective Instructional Practices

Statement	***n***	***M***	***SD***
1. Requiring students to memorize basic number facts	126	4.54	.82
2. Requiring students to memorize formulae	126	4.11	.88
3. Requiring students to generate original examples of mathematics concepts	124	4.48	.69
4. Requiring students to explain to the whole class solutions to problems developed individually	126	4.23	.95
5. Requiring students to evaluate other students' work	126	3.82	1.03
6. Requiring students to respond orally to open-ended questions	126	4.56	.79

Table 8 (continued)

Statement	*n*	*M*	*SD*
7. Requiring students to respond orally to questions testing recall	125	4.16	.94
8. Requiring students to participate in cooperative learning activities	125	4.52	.80
9. Requiring students to explain how the mathematical concepts they are learning relate to the real world	126	4.54	.76
10. Requiring students to work independently on worksheets and workbooks	125	3.82	1.17
11. Requiring students to participate in peer-to-peer tutoring	125	4.16	.83
12. Requiring students to complete a mathematics reflective journal	125	3.76	1.03
13. Requiring students to take notes during a mathematics lecture	125	4.14	.96
14. Requiring students to practice taking standardized tests	126	4.19	.97
15. Requiring students to explain their reasoning when giving an answer	125	4.68	.65
16. Requiring students to use calculators for learning or practicing skills	126	3.38	1.16
17. Requiring students to use calculators to develop conceptual understanding	125	3.56	1.11
18. Requiring students to complete daily homework	125	4.06	1.02
19. Requiring students to work in small groups	124	4.25	.94
20. Requiring students to practice on drill and computational skills	125	4.43	.82
Not Reporting	10		

Research Question 2 Perceptions of 3rd-5th Grade Mathematics Teachers Regarding Their Abilities to Use Technology as an Instructional

Research Question 2 asked what are the perceptions of elementary school mathematics teachers regarding their abilities to use technology as an instructional tool in the mathematics classroom? Questions One and Two of Section III were closed-ended and inquired about teachers' perceptions regarding using technology as an instructional tool to promote student engagement and increase scores in mathematics. The participants were given the option of responding by choosing yes or no. Percentages were calculated to explain the results of the two closed-ended questions for Section III. The results for Question 1 of Section III were 84.4% of participants answered yes, 6.7% answered no, and 8.9% did not respond to the question. The results for question two of Section III were 74.8% of participants answered yes, 17% answered no, and 8.1% did not respond to the question.

The remaining part of Section III used statements to answer Research Question 2. Teachers were asked how strongly they felt about the remaining statements based on teachers' perceptions regarding their abilities to use technology as an instructional tool in the mathematics classroom. The teachers were offered five options to click to respond to each statement. The options were "Strongly Disagree," "Disagree," "Neither Agree/Disagree," "Agree," and "Strongly Agree." The data were examined by calculating the mean and standard deviation for each statement using descriptive statistics.

The overall mean of 4.02 with a standard deviation of 0.64 indicated the teachers' perceptions were they "agreed" in having the ability to use technology as an instructional tool in the mathematics classroom. The results of the teachers' perceptions varied from the highest positive perceptions on Statement 4 ($M = 4.43$, $SD = .86$, $n = 123$) which indicated teachers "Strongly Agreed" they could learn technology to the lowest positive perception on Statement 21 ($M = 3.29$, $SD = 1.17$, $n = 124$) that showed teachers' "neither agree/disagree" that they can use social media to enhance students' engagement in learning mathematics (Facebook, Instagram, Twitter, etc.). Table 9 displays Statements 3 – 22 and the descriptive statistics for the online survey Section III: Teachers' Perceptions Regarding their abilities to use technology as an instructional tool which include mean scores and results from 3rd - 5th grade mathematics teachers' perceptions regarding their abilities to use technology as an instructional tool in the mathematics classroom.

Table 9

Teachers' Perceptions of their Abilities to Use Technology

Statement	***n***	***M***	***SD***
3. I believe I know how to solve my own technical problems.	123	3.54	1.13
4. I can learn technology.	123	4.43	.86
5. I believe I keep up with important new technologies.	124	4.08	.93
6. I frequently play around with the technology.	124	4.16	.88
7. I can use a lot of different technologies while teaching math.	124	4.00	.97
8. I believe I have the technical skills I need to use technology.	123	4.12	.86
9. I believe I have had sufficient opportunities to work with different technologies.	124	3.61	1.16
10. I can adapt my teaching based upon what students currently understand or do not understand using various forms of technology.	123	4.05	.89
11. I can use a wide range of teaching approaches in a classroom setting.	124	4.24	.83
12. I can select effective teaching approaches to guide student thinking and learning in mathematics.	123	4.22	.81
13. I can choose technologies that enhance the teaching approaches for a lesson.	124	4.10	.95
14. I can adapt to the use of the technologies that I have learned about in different teaching activities.	123	4.17	.86
15. I can select technologies to use in my classroom that enhance what I teach, how I teach, and what students learn.	124	4.04	.91
16. I can provide leadership in helping others to coordinate the use of content, technologies, and teaching approaches at my school and/or district.	124	3.75	1.07

Table 9 (continued)

Statement	*n*	*M*	*SD*
17. I can choose technologies that enhance the content for a lesson.	123	4.12	.89
18. I can select technologies to use in my classroom that enhance what I teach, how I teach, and what students learn.	124	4.04	.91
19. I can provide leadership in helping others to coordinate the use of content, technologies, and teaching approaches at my school and/or district.	124	3.75	1.07
20. I can choose technologies that enhance the content for a lesson.	123	4.12	.89
21. I can use social media to enhance students' engagement in learning mathematics (Facebook, Instagram, Twitter, etc.).	124	3.29	1.17
22. I can use educational videos to enhance students' engagement in learning mathematics (YouTube, Khan Academy, etc.)	124	4.33	.81
Not Reporting	11		

Research Question 3 Demographic Variables that May Influence 3rd-5th grade Mathematics Teachers' Perceptions Regarding Effective Instructional Practices

Research Question 3 asked are there statistically significant differences in elementary school mathematics teachers' perceptions regarding effective instructional practices by select demographic variables (i.e. gender, ethnicity, age range, educational background, teaching experience [veteran teachers and new teachers], and years of experience with various forms of technology)? A series of ANOVAs and t-tests were used to examine if there were any statistically significant differences among select demographic variables. There were statistically significant differences found in the demographics of educational background, teaching experience, and years of experience using various forms of technology in the classroom. There were no statistically significant differences found in age range, gender, and ethnicity.

There was a statistically significant difference at the .05 alpha level of the teachers' perceptions regarding effective instructional practices by educational background. The analysis was significant for Statement 4, "requiring students to explain to the whole class solutions to problems developed individually," $F(3, 122) = 3.13$, $p = 0.02$. Table 10 displays the results of the one-way ANOVA which was conducted for the teachers' perceptions regarding effective instructional practices based on educational background.

Table 10

ANOVA Results on Educational Background for Statement 4

Statement		***Sum of Squares***	***df***	***Mean Square***	***F***	***Sig.***
4. Requiring students to explain to the whole class solutions to problems developed individually.	Between Groups	8.08	3	2.69	3.13	0.02
	Within Groups	104.78	122	.859		

An *LSD Post Hoc* test was used to identify where the statistically significant differences were found in the ANOVA results. The *LSD Post Hoc* test further revealed there were statistically significant differences ($p = 0.02$) between teachers' who have a Bachelor's degree and Master's degree and teachers who have a Bachelor's degree and Doctorate. This indicated that teachers who have Bachelor's degrees ($M = 4.48$, $SD = .544$) have a more favorable perception of instructional practices for Statement 4 than teacher's who have Master's degrees ($M = 4.05$, $SD = 1.06$). Additionally, it also indicated that teachers who have Bachelor's degrees

(M = 4.48, SD = .544) have a more favorable perception of instructional practices for Statement 4 than teachers who have Doctorate degrees (M = 3.90, SD = 1.19).

Teaching Experience

An independent-samples t-test was conducted to identify if there were statistically significant differences found in the responses of the teachers' perceptions regarding effective instructional practices based on teaching experience. The t-test between new and veteran teachers revealed there was a statistically significant difference (t (124) = -1.22, p = 0.005) at the .05 alpha level in the teachers' perceptions regarding effective instructional practices by teaching experience. This analysis was significant for Statement 16, "Requiring students to use calculators for learning or practicing skills," new teachers (M = 3.14, SD = 1.43) had less favorable perceptions of requiring students to use calculators for learning or practicing skills than veteran teachers (MD = 3.47, SD = 1.04) who perceived that it was somewhat important for effective instructional practices. Table 11 displays the results of an independent-samples t-test which was calculated for the teachers' perceptions regarding effective instructional practices based on teaching experience. Table 11 displays the results of the t-test which was used to measure for statistical differences in teachers' perceptions regarding effective instructional practices based on teaching experience for Statement 16.

Table 11

T-test Results for Teaching Experience for Statement 16

Statement	***T***	***p***
16. Requiring students to use calculators for learning or practicing skills.	-1.22	0.005

*p<.05

An independent-samples t-test was conducted to identify if there were statistically significant differences found in the responses of teachers' perceptions regarding effective instructional practices based on teaching experience. The t-test between new and veteran teachers revealed there was a statistically significant difference (t (124) = -1.29, p = 0.003) at the .05 alpha level in the teachers' perceptions regarding effective instructional practices by teaching experience. This analysis was significant for Statement 17, "Requiring students to use calculators to develop conceptual understanding," new teachers (M = 3.32, SD = 1.38) had less favorable perceptions of requiring students to use calculators to develop conceptual understanding than veteran teachers (MD = 3.65, SD = 0.99) who perceived that it was somewhat important for effective instructional practices. Table 12 displays the results of the t-test was conducted to measure statistical differences in teachers' perceptions regarding effective instructional practices based on teaching experience for Statement 17.

Table 12

T-test Results for Teaching Experience for Statement 17

Statement	***T***	***p***
17. Requiring students to use calculators to develop conceptual understanding.	-1.29	0.003

*p<.05

Technology Classroom Experience and Perceptions

A one-way ANOVA was conducted to identify if there were statistically significant differences found in the responses for teachers' perceptions regarding effective instructional practices based on the number of years teachers had with using technology in the classroom. There was a statistically significant difference at the .05 alpha level of the teachers' perceptions regarding effective instructional practices based on the number of years teachers had with using technology in the classroom. The analysis was significant for Statement 14, "Requiring students to practice taking standardized tests," *F*(4, 121) = 2.383, p = 0.03). Table 13 displays the results of the one-way ANOVA which was conducted for the teachers' perceptions regarding effective instructional practices based on the number of years teachers had with using technology in the classroom.

Table 13

ANOVA Results on Experience with Teaching Technology for Statement 14

Statement		*Sum of Squares*	*df*	*Mean Square*	*F*	*Sig.*
14. Requiring students to practice taking standardized tests.	Between Groups	9.53	4	2.383	2.66	0.03
	Within Groups	121	.897			

An *LSD Post Hoc* test was used to identify where the statistically significant differences were found in the ANOVA results. The *LSD Post Hoc* test further revealed there were statistically significant differences (p = .004) between teachers who had been using technology for at least 5 years but less than 10 years and teachers who had been using technology for at least 3 years but less than 5 years. This indicated teachers who had been using technology for at least 3 years but less than 5 years (M = 4.50, SD = .932) have a more favorable perception of instructional practices for Statement 14 than who had been using technology for at least 5 years but less than 10 years (M = 3.76, SD = .923).

Additionally, it also revealed there were statistically significant differences (p = .008) between teachers who had been using technology for at least 5 years but less than 10 years and teachers who had been using technology for 10 years or more. This indicated teachers who had been using technology for at least 5 years but less than 10 years (M = 3.76, SD = .923) have a less favorable perception of instructional practices for Statement 14 than who had been using technology for 10 years or more (M = 4.33, SD = .909).

A one-way ANOVA was conducted to identify if there were statistically significant differences found in the responses of the teachers' perceptions regarding effective instructional practices based on the number of years teachers had with using technology in the classroom. There was a statistically significant difference at the .05 alpha level of the teachers' perceptions regarding effective instructional practices by the technology classroom experience. The analysis was significant for Statement 18, "Requiring students to complete daily homework," $F(4, 120) = 3.21$, $p = 0.01$). Table 14 displays the results of the one-way ANOVA which was conducted for the teachers' perceptions regarding effective instructional practices based on the number of years teachers had with using technology in the classroom.

Table 14

ANOVA Results on Technology Classroom Experience for Statement 18

Statement		***Sum of Squares***	***df***	***Mean Square***	***F***	***Sig.***
18. Requiring students to complete daily homework.	Between Groups	12.524	4	3.131	3.21	0.01
	Within Groups	116.96	120	.975		

An *LSD Post Hoc* test was used to identify where the statistically significant differences were found in the ANOVA results. The *LSD Post Hoc* test further revealed there were statistically significant differences (p = .006) between teachers who had been using technology for at least 5 years but less than 10 years and teachers who had been using technology for at least 3 years but less than 5 years. This indicated teachers who had been using technology for at least 3 years but less than 5 years (M = 4.30, SD = 1.07) have a more favorable perception of instructional practices for Statement 18 than who had been using technology for at least 5 years but less than 10 years (M = 3.55, SD = 1.18).

Perceptions of Age, Ethnicity, and Gender

A one-way ANOVA was conducted for teachers' perceptions regarding effective instructional practices based on age range, ethnicity, and gender. There were no statistically significant differences at the .05 alpha level of the teachers' perceptions regarding effective instructional practices for age range, ethnicity, and gender.

Research Question 4 Demographic Variables that May Influence the Perceptions of 3rd-5th Grade Teachers' Abilities to use Technology as an Instructional Tool

Research Question 4 asked if there were statistically significant differences in elementary school mathematics teachers' perceptions regarding their abilities to use technology as an instructional tool in the mathematics classroom by select demographic variables (i.e. gender, ethnicity, age range, educational background, teaching experience [veteran teachers and new teachers], and years of experience with various forms of technology). A series of ANOVAs and t-tests were used to examine if there were any statistically significant differences among select demographic variables. There were statistically significant differences found in the demographic variables of age range and educational background. No statistically significant relationships were found in the demographic variables of ethnicity, gender, educational experience, and technology use experience in the classroom.

Age and Perceptions Regarding Teachers' Abilities to Use Technology

A one-way ANOVA was conducted for the teachers' perceptions regarding effective instructional practices based on age range. There was a statistically significant difference at the .05 alpha level of the teachers' perceptions regarding effective instructional practices by age range. The analysis was significant for Statement 3, "I believe I know how to solve my own technical problems," F(3, 118) = 4.41, p = 0.006. Table 15 displays the results of the one-way ANOVA conducted for teachers' perceptions regarding effective instructional practices based on age range.

Table 15

ANOVA Results for Age for Statement 3

Statement		***Sum of Squares***	***df***	***Mean Square***	***F***	***Sig.***
3. I believe I know how to solve my own technical problems.	Between Groups	15.97	3	5.32	4.41	0.006
	Within Groups	142.226	118	1.20		

An *LSD Post Hoc* test was used to identify where the statistically significant differences were found in the ANOVA results. The *LSD Post Hoc* test further revealed that there were statistically significant differences between teachers who were 21 to 25 years old and teachers who were 26-35 years old, 36-50 years old and 51 or older on the statement "I believe I know how to solve my own technical problems." This indicated that teachers who were 21 to 25 (M = 4.00, SD = .63) have a more favorable perception of their abilities to use technology in the mathematics classroom than teachers that were 51 or older (M = 2.87, SD = 1.15) as indicated in

Statement 3. Teachers who were 26 to 35 (M = 3.84, SD = 1.22) have a more favorable perception of their abilities to use technology in the mathematics classroom for Statement 3 than teachers that were 51 or older (M = 2.87, SD = 1.15). Teachers who were 36 to 50 (M = 3.58, SD = 1.06) have a more favorable perception of their abilities to use technology in the mathematics classroom for Statement 3 than teachers that were 51 or older (M = 2.87, SD = 1.15).

A one-way ANOVA was conducted to identify if there were statistically significant differences for teachers' perceptions of effective instructional practices based on age range. There was a statistically significant difference at the .05 alpha level of the teachers' perceptions regarding effective instructional practices by educational background. The analysis was significant for Statement 5, "I believe I keep up with important new technologies," $F(3, 119)$ = 6.40, p = 0.00. Table 17 displays the results of the one-way ANOVA which was conducted for the teachers' perceptions regarding effective instructional practices based on age.

Table 16

ANOVA Results of Age for Statement 5

Statement		***Sum of Squares***	***df***	***Mean Square***	***F***	***Sig.***
5. I believe I keep up with important new technologies.	Between Groups	14.89	3	4.96	6.40	0.000
	Within Groups	92.293	119	.77		

An *LSD Post Hoc* test was used to identify where the statistically significant differences were found in the ANOVA results. The *LSD Post Hoc* test further revealed that there were statistically significant differences between teachers who were 21 to 25 years old and teachers who were 51 or older, ages 26-35 and 51 or older, and ages 36-50 and 51 or older on the statement “I believe I keep up with important technologies.” This indicated that teachers who were 21 to 25 (M = 4.50, SD = .68) have a more favorable perception of their abilities to use technology in the mathematics classroom in Statement 5 than teachers that were 51 or older (M = 3.41, SD = 1.17).

Teachers who were 26 to 35 (M = 4.31, SD = 0.82) have a more favorable perception of their abilities to use technology in the mathematics classroom according to Statement 5 than teachers who were 51 or older (M = 3.41, SD = 1.17). Teachers who were 36 to 50 (M = 4.14, SD = 0.79) have a more favorable perception of their abilities to use technology in the mathematics classroom in Statement 5 than teachers who were 51 or older (M = 3.41, SD = 1.17).

A one-way ANOVA was calculated for the teachers’ perceptions regarding effective instructional practices based on age range. There was a statistically significant difference at the .05 alpha level of the teachers’ perceptions regarding effective instructional practices by educational background. The analysis was significant for Statement 6, “I frequently play around with the technology,” $F(3, 119) = 4.14$, $p = 0.008$. Table 17 displays the results of the one-way ANOVA which was conducted for the teachers’ perceptions regarding effective instructional practices based on age range.

Table 17

ANOVA Results of Age for Statement 6

Statement		***Sum of Squares***	***df***	***Mean Square***	***F***	***Sig.***
6. I frequently play around with the technology.	Between Groups	9.16	3	3.054	6.40	0.008
	Within Groups	87.58	119	.73		

An *LSD Post Hoc* test was used to identify where the statistically significant differences were found in the ANOVA results. The *LSD Post Hoc* test further revealed that there were statistically significant differences between teachers who were 26 to 35 years old and teachers who were 51 or older (p = .012), and ages 36-50 and 51 or older (p = .001) on the statement "I frequently play around with the technology." This indicated that teachers who were 26 to 35 years old (M = 4.21, SD = .87) have a more favorable perception of their abilities to use technology in the mathematics classroom for Statement 6 than teachers who were 51 or older (M = 3.62, SD = 1.17). Teachers who were 36 to 50 years old (M = 4.35, SD = 0.69) have a more favorable perception of their abilities to use technology in the mathematics classroom for Statement 6 than teachers that were 51 or older (M = 3.62, SD = 1.17).

A one-way ANOVA was conducted to identify if there were statistically significant differences found for teachers' perceptions of effective instructional practices based on age range. There was a statistically significant difference at the .05 alpha level of the teachers' perceptions regarding their abilities to use technology as an instructional tool in the mathematics classroom by educational background. The analysis was significant for Statement 7, "I can use a lot of different technologies while teaching mathematics," $F(3, 119) = 3.08$, p = 0.03. Table 18 displays the results of the one-way ANOVA conducted for the teachers' perceptions regarding effective instructional practices based on age range.

Table 18

ANOVA Results of Age for Statement 7

Statement		***Sum of Squares***	***df***	***Mean Square***	***F***	***Sig.***
7. I can use a lot of different technologies while teaching mathematics.	Between Groups	8.35	3	2.78	6.40	0.030
	Within Groups	107.61	119	.904		

An *LSD Post Hoc* test was used to identify where the statistically significant differences were found in the ANOVA results. The *LSD Post Hoc* test further revealed that there were statistically significant differences between teachers who were 21 to 25 years old and teachers who were 51 or older (p = .028), ages 26-35 and 51 or older (p = .030), and ages 36-50 and 51 or older (p = .005) on the statement "I can use a lot of different technologies while teaching mathematics." This indicated that teachers who were 21 to 25 (M = 4.27, SD = .78) have a more favorable perception of their abilities to use technology in the mathematics classroom for Statement 7 than teachers who were 51 or older (M = 3.50, SD = 1.10). Teachers who were 26 to 35 (M = 3.06, SD = .94) have a more favorable perception of their abilities to use technology in the mathematics classroom in Statement 7 than teachers who were 51 or older (M = 3.50, SD 1.10). Teachers who were 36 to 50 (M = 4.16, SD = .91) have a more favorable perception of their abilities to use technology in the mathematics classroom for Statement 7 than teachers who were 51 or older (M = 3.50, SD = 1.10).

A one-way ANOVA was calculated for the teachers' perceptions of effective instructional practices based on age range. There was a statistically significant difference at the

.05 alpha level of the teachers' perceptions regarding their abilities to use technology as an instructional tool in the mathematics classroom by age range. The analysis was significant for Statement 8, "I believe I have the technical skills I need to use technology," $F(3, 119) = 3.08$, p = 0.03. Table 19 displays the results of the one-way ANOVA which was conducted for the teachers' perceptions regarding effective instructional practices based on the age range for Statement 8.

Table 19

ANOVA Results of Age for Statement 8

Statement		*Sum of Squares*	*df*	*Mean Square*	*F*	*Sig.*
8. I believe I have the technical skills I need to use technology.	Between Groups	9.45	3	3.15	4.55	0.03
	Within Groups	81.70	119	.692		

An *LSD Post Hoc* test was used to identify where the statistically significant differences were found in the ANOVA results. The *LSD Post Hoc* test further revealed that there were statistically significant differences between teachers who were 21 to 25 years old and teachers' who were 51 or older (p = .011), ages 26-35 and 51 or older (p = .017), and ages 36-50 and 51 or older (p = .001) on the statement "I believe I have the technical skills I need to use technology." This indicated that teachers who were 21 to 25 (M = 4.36, SD = .50), 26 to 35 (M = 4.12, SD = .76), and 36 to 50 (M = 4.30, SD = .71) all had a more favorable perception of their abilities to use technology in the mathematics classroom according to Statement 8 than teachers that were 51 or older (M = 3.50, SD = 1.21).

Educational Background and Perceptions Regarding Teachers' Abilities to Use Technology

A one-way ANOVA was conducted to identify if there were statistically significant differences found in the responses for teachers' perceptions regarding their abilities to use technology in the mathematics classroom based on educational background. There was a statistically significant difference at the .05 alpha level of the teachers' perceptions regarding their abilities to use technology in the mathematics classroom by educational background. The analysis was significant for Statement 7, "I can use a lot of different technologies while teaching mathematics," $F(3, 120) = 2.92$, $p = 0.03$. Table 20 displays the results of the one-way ANOVA which was conducted for the teachers' perceptions regarding their abilities to use technology in the mathematics classroom Statement 7.

Table 20

ANOVA Results of Educational Background for Statement 7

Statement		***Sum of Squares***	***df***	***Mean Square***	***F***	***Sig.***
7. I can use a lot of different technologies while teaching mathematics.	Between Groups	7.96	3	2.65	2.92	0.03
	Within Groups	109.03	120	.909		

An *LSD Post Hoc* test was used to identify where the statistically significant differences were found in the ANOVA results. The *LSD Post Hoc* test further revealed that there were statistically significant differences ($p = 0.01$) between teachers who have a Bachelor's degree and Master's degree and teachers who have a Bachelor's degree and Doctorate ($p = .02$). This indicated that teachers who have Bachelor's degrees ($M = 4.34$, $SD = 0.93$) have a more favorable perception of their abilities to use technology as an instructional tool in the mathematics classroom within Statement 7 than teachers who have Master's degrees (M = 3.82, SD = 1.03). Additionally, it also indicated that teachers who have Bachelor's degrees (M = 4.34, SD = .93) have more favorable perceptions on their abilities to use technology as an instructional tool in the mathematics classroom for Statement 7 than teachers who have Doctorate degrees (M = 3.60, SD = 1.17).

Ethnicity, Gender, Teaching Experience, and Technology Usage Experience

A one-way ANOVA was calculated for the teachers' perceptions regarding their abilities to use technology as an instructional tool in the mathematics classroom for ethnicity, gender, educational experience, and technology use experience in the classroom. There were no statistically significant differences at the .05 alpha level of the teachers' perceptions regarding their abilities to use technology as an instructional tool in the mathematics classroom based on the other demographic variables such as ethnicity, gender, educational experience, and years of technology use in the classroom.

Research Question 5 Perceptions of 3rd-5th Grade Teachers Regarding Effective Instructional Practices Based on School Performance

Research Question 5 asked, "Is there a statistically significant difference in elementary school mathematics teachers' perceptions regarding their effective instructional practices based on school performance?" To answer Question 5, a t-test was conducted for the perceptions of third- through fifth-grade mathematics teachers regarding effective instructional practices based on school performance levels.

An independent-samples t-test was conducted for teachers' perceptions of effective instructional practices based on school performance. The t-test between high and low-performance level schoolteachers' perceptions revealed there was a statistically significant difference (t (118) = 1.56, p = 0.02) at the .05 alpha level in teachers' perceptions regarding effective instructional practices based on school performance. This analysis was significant for Statement 9, requiring students to explain how the mathematical concepts they are learning to relate to the real world; low-performance school teachers (M = 4.45, SD = 0.83) had less favorable perceptions of requiring students to explain how the mathematical concepts they are learning to relate to the real world than high-performance school teachers (MD = 4.68, SD = 0.65) who perceived that it was essential for effective instructional practices. Table 21 displays the results of an independent-samples t-test which was conducted for the teachers' perceptions regarding their perceptions of effective instructional practices based on school performance for Statement 9.

Table 21

T-test Results of Instruction based on School Performance for Statement 9

Statement	***t***	***p***
9. Requiring students to explain how the mathematical concepts they are learning relate to the real world.	1.64	0.02

*p<.05

An independent-samples t-test was conducted for teachers' perceptions of effective instructional practices based on school performance. The t-test between high and low-performance level school teachers' perceptions revealed there was a statistically significant difference (t (88) = -1.04, p = 0.02) at the .05 alpha level in the teachers' perceptions regarding effective instructional practices based on school performance. This analysis was significant for Statement 16, requiring students to use calculators for learning or practicing skills, as low-performance school teachers (M = 3.48, SD = 1.04) had more favorable perceptions of requiring students to use calculators for learning or practicing skills than high-performance school teachers (MD = 3.26, SD = 1.33). Table 22 displays the results of an independent-samples t-test which was conducted for teachers' perceptions regarding effective instructional practices based on school performance for Statement 16.

Table 22

T-test Results of Instruction based on School Performance for Statement 16

Statement	***t***	***p***
16. Requiring students to use calculators for learning or practicing skills.	-1.00	0.02

$*p<.05$

Research Question 6 Perceptions of 3rd-5th Grade Teachers Regarding their Abilities to use Technology as an Instructional Tool Based on School Performance

Research Question 6 asked, is there a statistically significant difference in elementary school mathematics teachers' perceptions regarding their abilities to use technology as an instructional tool in the mathematics classroom based on school performance? To answer Question 6, a t-test was conducted for the perceptions of third- through fifth-grade mathematics teachers regarding their abilities to use technology as an instructional tool in the mathematics classroom.

An independent-samples t-test was conducted to identify statistically significant differences in teachers' perceptions of their abilities to use technology as an instructional tool in the mathematics classroom based on school performance. The t-test between high and low-performance level school teachers' perceptions revealed there was a statistically significant difference ($t(93) = -1.58$, $p = 0.01$) at the .05 alpha level in the teachers' perceptions regarding their abilities to use technology as an instructional tool in the mathematics classroom. This analysis was significant for Statement 9, I believe I have had sufficient opportunities to work with different technologies. Low-performance school teachers (M = 3.42, SD = 1.25) had less favorable perceptions than high-performance school teachers (MD = 3.77, SD = 1.09) who agreed to the statement. Table 23 displays the results of an independent-samples t-test which was conducted for the teachers' perceptions regarding their abilities to use technology as an instructional tool in the mathematics classroom based on school performance for Statement 9.

Table 23

T-test Results of Abilities based on School Performance for Statement 9

Statement	*t*	*p*
9. I believe I have had sufficient opportunities to work with different technologies.	-1.58	0.01

*p<.05

An independent-samples t-test was conducted for teachers' perceptions of their abilities to use technology as an instructional tool in the mathematics classroom based on school performance. The t-test between high and low-performance level school teachers' perceptions revealed there was a statistically significant difference (t (78) = -1.50, p = 0.04) at the .05 alpha level in the teachers' perceptions regarding their abilities to use technology in the mathematics classroom. This analysis was significant for Statement 17, I can teach lessons that appropriately combine mathematics, technologies, and teaching approaches. Low-performance school teachers (M = 3.35, SD = 1.25) had less favorable perceptions than high-performance school teachers (MD = 4.53, SD = 0.51) who strongly agreed to the statement. Table 24 displays the results of an independent-samples t-test which was calculated for the teachers' perceptions regarding their abilities to use technology as an instructional tool in the mathematics classroom based on school performance Statement 17.

Table 24

T-test Results of Abilities based on School Performance for Statement 17

Statement	***t***	***p***
17. I can teach lessons that appropriately combine mathematics, technologies, and teaching approaches.	-1.50	0.04

*p<.05

Summary

Six research questions were developed in this research to determine the perceptions of third- through fifth-grade mathematics teachers' effective instructional practices and their abilities to use technology as an instructional tool in the mathematics classroom and demographic variables that may affect the perceptions. Based on the research findings and the significance of all statistical tests being at the .05 alpha level, elementary school mathematics teachers perceived statements about effective instructional practices to be "somewhat important for effective instruction" and "agreed" they had the abilities to use technology as an instructional tool in the mathematics classroom.

Statistically significant differences were found between the teachers' perceptions based on certain demographic variables among the statements. There were statistically significant differences found among teachers' perceptions of effective instructional practices based on the demographic variables of educational background, teaching experience, and years of experience with technology usage in the classroom based on teachers' perceptions. Also, there were statistically significant differences found among teachers' perceptions of their abilities to use technology as an instructional tool in the mathematics classroom based on the demographic variables of age range and educational background. Lastly, there were statistically significant differences found in certain statements among teacher's perceptions based on school performance for effective instructional practices and their abilities to use technology as an instructional tool in the mathematics classroom.

CHAPTER V

SUMMARY, CONCLUSIONS, AND RECOMMENDATIONS

Summary of the Study

The purpose of this study was to examine the perceptions of elementary school mathematics teachers in one central Mississippi school district as they relate to effective instructional practices and their abilities to use technology as an instructional tool in the mathematics classroom. A secondary purpose of this study was to determine if the teachers' perceptions are related to specific demographic variables. The researcher investigated third- through fifth-grade mathematics teachers' perceptions regarding effective instructional practices and their abilities to use technology as an instructional tool in the mathematics classroom.

The following research questions were developed to guide this study:

1. What are the perceptions of elementary school mathematics teachers regarding effective instructional practices?
2. What are the perceptions of elementary school mathematics teachers regarding their abilities to use technology as an instructional tool in the mathematics classroom?
3. Are there statistically significant differences in elementary school mathematics teachers' perceptions regarding effective instructional practices by select demographic variables (i.e. gender, ethnicity, age range, educational background, teaching experience [veteran teachers and new teachers], and years of experience with various forms of technology)?

4. Are there statistically significant differences in elementary school mathematics teachers' perceptions regarding their abilities to use technology as an instructional tool in the mathematics classroom by select demographic variables (i.e. gender, ethnicity, age range, educational background, teaching experience [veteran teachers and new teachers], school performance level [high-performance or low-performance], and years of experience with various forms of technology)?
5. Is there a statistically significant difference in elementary school mathematics teachers' perceptions regarding their effective instructional practices based on school performance?
6. Is there a statistically significant difference in elementary school mathematics teachers' perceptions of their abilities to use technology as an instructional tool in the mathematics classroom based on school performance?

Data were collected from the online survey created by the researcher. A total of 208 third- through fifth-grade mathematics teachers were invited to take the online survey. Subsequently, 135 third- through fifth-grade mathematics teachers responded to the online survey, resulting in a response rate of 65%. Once the participants submitted the online survey, this meant they consented to become a part of the study. All identifiers were removed by the online survey service to ensure confidentiality. The submitted online surveys were analyzed using the SPSS statistical program. Statistics used in analyzing the data were descriptive, ANOVA and independent sample t-tests.

Discussion

Research Question One examined the perceptions of elementary school mathematics teachers regarding effective instructional practices. The researcher found teachers' overall perceptions were positive. This means teachers perceived that overall each statement was somewhat important for effective instruction. These findings were similar to Carney's (2016) study because teachers perceived using effective instructional practices in the classroom to be positive for student learning. Moreover, teachers did identify five statements to be essential for effective instruction to promote student engagement and raise scores in mathematics. These statements were related to the findings of Park et al. (2016) which identified certain instructional practices used by teachers in the mathematics classroom increased academic achievement.

Research Question Two examined the perceptions of elementary school mathematics teachers regarding their abilities to use technology as an instructional tool in the mathematics classroom. The researcher found teachers' overall perceptions about their abilities to use technology as an instructional tool were positive. Teachers agreed to most statements about their abilities to use technology as an instructional tool. Teachers felt on average they had the ability to use technology as an instructional tool in the mathematics classroom. These findings coincide with those of Carver (2016), teachers' perceptions were positive about incorporating technology into their classroom instructions.

Research Question Three explored statistically significant differences in elementary school mathematics teachers' perceptions regarding effective instructional practices by select demographic variables (i.e. gender, ethnicity, age range, educational background, teaching experience [veteran teachers and new teachers], and years of experience with various forms of technology). After conducting a series of ANOVA and t-tests, the researcher concluded there were statistically significant differences found in the demographics of educational background (Sig. = 0.02, $p<.05$), teaching experience (Sig. = 0.005, $p<.05$), and years of experience using various forms of technology (Sig. = 0.03, $p<.05$) in the classroom based on certain statements.

The results for educational background revealed teachers with Bachelor's degrees perceived requiring students to explain to the whole class solutions to problems developed individually to be somewhat important effective for instructional practices in the mathematics classroom. Teachers with Master's and Doctorate degrees held perceptions that were less positive than teachers with Bachelor's degrees. The results for teaching experience revealed new teachers had less favorable perceptions for requiring students to use calculators for learning and understanding than veteran teachers. Additionally, the results for years of experience with various forms of technology revealed teachers using technology for 10 or more years were less favorable for requiring students to take standardized tests and complete daily homework than teachers who used technology for three to five years in the mathematics classroom.

However, these results contradicted another researcher's findings. Tatum (2013) found no statistically significant differences in teachers' perceptions of best instructional practices based on educational background, teaching experience, or the number of years they had experienced using technology. Those variables were not influential when compared to teachers' perceptions of the best instructional practices in the classroom. Consequently, the researcher's and Tatum's findings were the same for teachers' perceptions of effective instructional practices based on age range, ethnicity, and gender because they found no statistically significant differences in those demographic variables.

Research Question Four explored statistically significant differences in elementary school mathematics teachers' perceptions regarding their abilities to use technology as an instructional tool in the mathematics classroom. After a series of ANOVAs and t-tests were conducted, the researcher found there were statistically significant differences found in the demographic variables of the age range (Sig. = 0.006, $p<.05$) and educational background (Sig. = 0.03, $p<.05$).

The teachers who were in the 51 or older age had the lowest perceptions of their abilities to use technology as an instructional tool in the mathematics classroom. While teachers who identified themselves to be in the 21- 25, 26-35, and 36-50 age ranges, all believed they had the ability to solve their own technical problems, keep up with new technologies, frequently play around with technology, and use a lot of different technologies while teaching mathematics.

The perceptions of teachers with Bachelor's degrees demonstrated that all believed they had the ability to use different technologies while teaching mathematics, while teachers with Master's and Doctorate degrees were neutral about their perceptions. These conclusions support the findings of other researchers. Lysenko et al. (2016) and Turner (2018) found that younger teachers with Bachelor's degrees were more likely to incorporate technology into classroom instruction. There were statistically significant differences in teachers' perceptions of their abilities to use technology in the mathematics classroom based on ethnicity, gender, teaching experience, or years of experience using technology which coincides with Turner's (2018) findings but the gender variable contradicts the research of Karatas et al. (2017) because those findings revealed male teachers were more inclined to use technology in the classroom than female teachers.

Research Question Five explored statistically significant differences in elementary school mathematics teachers' perceptions regarding effective instructional practices based on school performance. After a series of t-tests were conducted, the researcher found there were statistically significant differences based on school performance (Sig. = 0.02, $p<.05$). Teachers who taught at high-performance schools perceived requiring students to explain how mathematical concepts they are learning relate to the real world, as being essential for effective instructional practices. While teachers who taught at low-performance schools perceived that it was somewhat important for effective instructional practices.

Additionally, the researcher found teachers who taught at low-performance schools perceived requiring students to use calculators for learning or practice was somewhat important for effective instructional practices, while teachers who taught at high-performance schools were neutral about that instructional practice. Another researcher found that teachers' perceptions were statistically different based on school accountability. Pope (2018) found that teachers' perceptions who taught at high-performance schools were more positive than teachers' perceptions who taught at low-performance schools pertaining to the topic of educational strategies in the classroom.

Research Question Six explored statistically significant differences in elementary school mathematics teachers' perceptions regarding their abilities to use technology as an instructional tool based on school performance. After a series of t-tests were conducted, the researcher found there were statistically significant differences based on school performance (Sig. = 0.01, $p<.05$). The researcher found teachers who taught at high-performance schools agreed they had sufficient opportunities to work with different technologies, while teachers who taught at low-performance schools neither agreed nor disagreed with the statement.

Additionally, teachers who taught at high-performance schools strongly agreed they could teach lessons that appropriately combine mathematics, technologies, and teaching approaches, while low-performance teachers agreed to the statement. These conclusions support Carver's (2016) and Turner's (2018) findings which revealed teachers who taught at high-performance levels schools have more access to technology in the classroom rather than teachers who taught at low-performing schools.

Conclusions

One central Mississippi school district's elementary students continue to perform poorly on statewide exams in mathematics. This poor performance has resulted in a failing school accountability grade declared by MDE for several years (MDE, 2018). To remedy this problem, teachers must seek to create a student-centered learning environment and understand the iGeneration student, which inhabit their classrooms (Coogen, 2016). These elementary school students thrive on a constant need to use technology to swiftly gain knowledge and engage them in actively learning. Thus, teachers must discover effective instructional practices and rely on their abilities to use technology as an instructional tool in the mathematics classroom to get and keep students engaged in the learning process (Fister, 2015). This study reinforces the need to continue to explore teachers' perceptions regarding effective instructional practices and their abilities to use technology as an instructional tool in the mathematics classroom to help promote student engagement and raise scores in mathematics across this one central Mississippi school district.

According to this study, teachers perceived most statements to be somewhat effective for instruction and agreed they had the ability to perform the technological actions described in each statement. Educational background, teaching experience, and years of using various forms of technology significantly impacted teachers' perceptions of effective instructional practices. Additionally, the age range and educational background significantly impacted teachers' perceptions of their abilities to use technology as an instructional tool in the mathematics classroom. Lastly, school performance significantly impacted teachers' perceptions of effective instructional practices and their abilities to use technology as an instructional tool in the mathematics classroom. To that end, the need emerges for administrators to support further research regarding teachers' perceptions of effective instructional practices and their abilities to use technology as an instructional tool in the mathematics classroom.

Recommendations

Based on the results of this study, several areas are suggested for future research. These recommendations are as follows:

1. The results of this study indicated teachers perceived most instructional practice statements to be effective in the mathematics classroom. Therefore, it is recommended that the study is replicated using the entire teacher population of schools mandated to take statewide exams on the subject of mathematics in this one central Mississippi school district.

2. The results of this study indicated teachers perceived they had the abilities to use technology as an instructional tool based on most statements. Therefore, it is recommended that the study is replicated using the entire teacher population of this one central Mississippi school district mandated to take statewide exams on the subject of mathematics to investigate if there is a trend in teachers' abilities to use technology or if their perceived abilities are exclusive to their grade levels.

3. The results of this study revealed there were no statistically significant differences found in teachers' perceptions regarding effective instructional practices based on age range, ethnicity, and gender. Therefore, it is recommended a comparative study be conducted with the entire teacher population of this one central Mississippi school district mandated to take statewide exams on the subject of mathematics to determine if the same results will be observed.

4. The results of this study revealed there were no statistically significant differences found in teachers' perceptions regarding their abilities to use technology as an instructional tool in the mathematics classroom based on ethnicity, gender, teaching experience, and years of

technology use in the classroom. Therefore, it is recommended a comparative study be conducted with the entire teacher population of this one central Mississippi school district mandated to take statewide exams on the subject of mathematics to determine if the same results will be observed.

5. The results of this study revealed there were two statements where teachers' perceptions were found to be statistically significant regarding effective instructional practices based on school performance. Therefore, it is recommended a comparative study be conducted with the entire teacher population of this one central Mississippi school district mandated to take statewide exams on the subject of mathematics to determine if the same results will be observed.

6. The results of this study revealed there were two statements where teachers' perceptions were found to be statistically significant regarding their abilities to use technology as an instructional tool in the mathematics classroom. Therefore, it is recommended a comparative study be conducted with the entire teacher population of this one central Mississippi school district mandated to take statewide exams on the subject of mathematics to determine if the same results will be observed.

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APPENDIX A

RECRUITMENT LETTER

Elizabeth McInnis
525 Wyatt Circle
Jackson, MS 39206

September 1, 2018

Dr. Jason Sargent, Executive Director
Jackson Public School District
624 South President Street
Jackson, MS 39201

Dr. Sargent:

My name is Elizabeth McInnis. I am a doctoral student from Mississippi State University. I am writing to ask permission to conduct my research in the Jackson Public School District, during the 2018-2019 school year, in order to complete my degree. The title of my project is, "Engaging the iGeneration: a survey of elementary school teachers' perceptions on effective instructional practices and using technology as an instructional tool in the mathematics classroom." It is a quantitative study on how 3^{rd} – 5^{th} grade elementary math teachers' perceptions on effective instructional practices and including more technology into their classroom. I will need a list of every teachers' email address to administer the online survey. It will not affect or interrupt their teaching schedules.

Any information that is obtained in connection with this study and that can be identified with the teacher's personal information will remain confidential. His or her responses will not be linked to his or her name in any written or verbal report of this research project.

If you have any questions or concerns, please do not hesitate to give me a call at 601-331-5699 or my advisors, Dr. Debra Prince or Dr. Wayne Yu at 662-325-2280. Attached is an example of the survey I will email to the teachers. Thank you and have a wonderful day.

Sincerely,

Elizabeth McInnis

Enclosure

APPENDIX B

PANEL OF EXPERTS EMAIL

Dear Sir or Madam:

I am conducting a descriptive and casual-comparative research study. This study is my doctoral dissertation research and will employ an online survey to examine 3rd-5th grade elementary school teachers' perceptions regarding effective instructional practices and their abilities to use technology as an instructional tool in the mathematics classroom.

In order to further development this instrument, it needs to be reviewed by a panel of experts to strengthen its content and mechanics. I would greatly appreciate it if you would agree to be one of the members of the expert panel. Upon receiving the feedback from the panel, the instrument will be revised in an appropriate manner, then will be reviewed by the IRB prior to the data collection and statistical analyses of the actual study.

To facilitate the instrument review process, this instrument should include, please consider, the following criteria:

Validity

Is the instrument relevant to the research purpose? Does the number of items sufficiently cover each section? Are there more items needed for each section? Does each statement clearly communicate its meaning to the participants?

Thank you for your time and efforts!

APPENDIX C

SURVEY

Engaging the iGeneration: A survey of elementary school teachers' perceptions on effective instructional practices and their abilities to use technology as an instructional tool in the mathematics classroom

Section I: Demographics

1. What is your gender?

- ◯ Female
- ◯ Male

2. What is your ethnicity? (Please check all that apply.)

- ☐ Asian or Pacific Islander
- ☐ Hispanic or Latino
- ☐ Black or African American
- ☐ White / Caucasian
- ☐ Other (please specify)

3. What is your age?

- ◯ 21 to 25
- ◯ 26 to 35
- ◯ 36 to 50
- ◯ 51 or older

4. What is the highest level of education you have completed?

- ◯ Bachelor's degree (e.g. BA, BS)
- ◯ Master's degree (e.g. MA, MS, MEd)
- ◯ Specialist Degree (e.g. EdS, SpEd)
- ◯ Doctorate (e.g. PhD, EdD)

5. How many years have you been a teacher?

- ◯ 0 - 5
- ◯ 6 or more

1

6. What accountability performance level was your school labeled by the Mississippi Department of Education?

- ◯ High Performance (Grade A - C)
- ◯ Low Performance (Grade D - F)

7. About how many years have you been using technology in the classroom?

- ◯ Less than 1 year
- ◯ At least 3 years but less than 5 years
- ◯ At least 5 years but less than 10 years
- ◯ 10 years or more
- ◯ At least 1 year but less than 3 years

8. Which forms of technology are available in your classroom? (Check all that apply.)

- ☐ Computers
- ☐ Educational Software
- ☐ Mobile Devices (Smartphones, Laptops, Tablets, etc.)
- ☐ Calculators
- ☐ Handheld Devices (Clickers, Remote Response Systems, ect.)
- ☐ The Internet
- ☐ Interactive Whiteboards, Smartboards, & Promethean Boards
- ☐ Other (please specify)

Engaging the iGeneration: A survey of elementary school teachers' perceptions on effective instructional practices and their abilities to use technology as an instructional tool in the mathematics classroom

Section II: Teachers' Perceptions on Effective Instructional Practices

This section includes statements regarding your perceptions on effective instructional practices which could promote student engagement and increase scores in mathematics.

*** 9. What are your perceptions of effective instructional practices in the classroom?**

	Not important for effective instruction	Inhibits effective instruction	Neutral	Somewhat important for effective instruction	Essential for effective instruction
Requiring students to memorize basic number facts.	◯	◯	◯	◯	◯
Requiring students to memorize formulae.	◯	◯	◯	◯	◯
Requiring students to generate original examples of mathematics concepts.	◯	◯	◯	◯	◯
Requiring students to explain to the whole class solutions to problems developed individually.	◯	◯	◯	◯	◯
Requiring students to evaluate other students' work.	◯	◯	◯	◯	◯
Requiring students to respond orally to open-ended questions.	◯	◯	◯	◯	◯
Requiring students to respond orally to questions testing recall.	◯	◯	◯	◯	◯
Requiring students to participate in cooperative learning activities.	◯	◯	◯	◯	◯

	Not important for effective instruction	Inhibits effective instruction	Neutral	Somewhat important for effective instruction	Essential for effective instruction
Requiring students to explain how the mathematical concepts they are learning relate to the real world.	◯	◯	◯	◯	◯
Requiring students to work independently on worksheets and workbooks.	◯	◯	◯	◯	◯
Requiring students to participate in peer-to-peer tutoring.	◯	◯	◯	◯	◯
Requiring students to complete a mathematics reflective journal.	◯	◯	◯	◯	◯
Requiring students to take notes during a mathematics lecture.	◯	◯	◯	◯	◯
Requiring students to practice taking standardized tests.	◯	◯	◯	◯	◯
Requiring students to explain their reasoning when giving an answer.	◯	◯	◯	◯	◯
Requiring students to use calculators for learning or practicing skills.	◯	◯	◯	◯	◯
Requiring students to use calculators to develop conceptual understanding.	◯	◯	◯	◯	◯
Requiring students to complete daily homework.	◯	◯	◯	◯	◯
Requiring students to work in small groups.	◯	◯	◯	◯	◯

4

	Not important for effective instruction	Inhibits effective instruction	Neutral	Somewhat important for effective instruction	Essential for effective instruction
Requiring students to practice on drill and computational skills.	○	○	○	○	○

5

Engaging the iGeneration: A survey of elementary school teachers' perceptions on effective instructional practices and their abilities to use technology as an instructional tool in the mathematics classroom

Section III: Teachers' Perceptions on their abilities to use technology as an instructional tool.

This section includes statements regarding your abilities to use technology as instructional tool in classroom lectures which could promote student engagement and increase scores in mathematics.

10. Do you believe technology is essential to increasing student engagement in math class?

- ◯ Yes
- ◯ No

11. Do you believe technology is essential to increasing math scores?

- ◯ Yes
- ◯ No

12. Please select the best option which reflects your abilities to use technology as an instructional tool in the mathematics classroom.

	Strongly Disagree	Disagree	Neither Agree/Disagree	Agree	Strongly Agree
I believe I know how to solve my own technical problems.	◯	◯	◯	◯	◯
I can learn technology.	◯	◯	◯	◯	◯
I believe I keep up with important new technologies.	◯	◯	◯	◯	◯
I frequently play around with the technology.	◯	◯	◯	◯	◯
I can use a lot of different technologies while teaching math.	◯	◯	◯	◯	◯
I believe I have the technical skills I need to use technology.	◯	◯	◯	◯	◯
I believe I have had sufficient opportunities to work with different technologies.	◯	◯	◯	◯	◯

6

	Strongly Disagree	Disagree	Neither Agree/Disagree	Agree	Strongly Agree
I can adapt my teaching based upon what students currently understand or do not understand using various forms of technology.					
I can use a wide range of teaching approaches in a classroom setting.					
I can select effective teaching approaches to guide student thinking and learning in mathematics.					
I can choose technologies that enhance the teaching approaches for a lesson.					
I can choose technologies that enhance students' engagement in learning the lesson.					
I can think critically about how to use technology in my mathematics classroom.					
I can adapt the use of the technologies that I have learned about in different teaching activities.					
I can teach lessons that appropriately combine mathematics, technologies, and teaching approaches.					
I can select technologies to use in my classroom that enhance what I teach, how I teach, and what students learn.					

7

	Strongly Disagree	Disagree	Neither Agree/Disagree	Agree	Strongly Agree
I can provide leadership in helping others to coordinate the use of content, technologies, and teaching approaches at my school and/or district.	○	○	○	○	○
I can choose technologies that enhance the content for a lesson.	○	○	○	○	○
I can use social media to enhance students' engagement in learning mathematics (Facebook, Instagram, Twitter, etc).	○	○	○	○	○
I can use educational videos to enhance students' engagement in learning mathematics (YouTube, Khan Academy, etc.)	○	○	○	○	○

APPENDIX D

APPROVAL LETTER FROM SCHOOL DISTRICT

Jason Sargent, Ph.D.
Executive Director

Building Stronger Schools Together!

Phone 601-960-8850
Facsimile 601-973-8680
Email JaSargent@jackson.k12.ms.us
www.jackson.k12.ms.us

October 16, 2018

Dear Ms. Elizabeth Y. McInnis:

The Research Review Committee for the Jackson Public School District has approved your request to conduct research on the title, *"Engaging the iGeneration: A Survey of Elementary School Teachers' Perceptions on Effective Instructional Practices and their Abilities to use Technology as an Instructional Tool in the Mathematics Classroom."* Please ensure that all information used in research activities pertaining to individuals' identity and facilities remain anonymous.

Before beginning your research, you are required to present a copy of this letter along with your original IRB approval letter to specified district sites. This study is limited to 3rd – 5th grade elementary school teachers; failure to comply with these requests will automatically nullify your research approval status. Additionally, let it be noted that your approval status is valid for the 2018 – 2019 school year.

If further assistance is needed, you may contact our office via email at shollins@jackson.k12.ms.us, and in the subject heading, please include "***research***." Best wishes with your research activities!

Sincerely,

Jason Sargent, Ph.D.
Executive Director

624 South President Street
JACKSON PUBLIC SCHOOL DISTRICT
Post Office Box 2338
Jackson, Mississippi 39225-2338

APPENDIX E

APPROVAL LETTER FROM IRB

MISSISSIPPI STATE UNIVERSITY™

Office of Research Compliance

Institutional Review Board for the Protection of
Human Subjects in Research
P.O. Box 6223
53 Morgan Avenue
Mississippi State, MS 39762
P. 662.325.3294

www.orc.msstate.edu

October 25, 2018

Debra Prince, PhD, Counseling Ed Psyc & Foundations, Linda Cornelious;Wei-Chieh Yu

Engaging the iGeneration: a survey of 3rd-5th grade teachers' perceptions on effective instructional practices and their abilities to use technology as an instructional tool in the mathematics classroom.

IRB-18-471

Approval Date: October 25, 2018 Expiration Date: October 24, 2023

EXEMPTION DETERMINATION

The review of your research study referenced above has been completed. The HRPP had made an Exemption Determination as defined by 45 CFR 46.101(b)1. Based on this determination, and in accordance with Federal Regulations, your research does not require further oversight by the HRPP.

Employing best practices for Exempt studies are strongly encouraged such as adherence to the ethical principles articulated in the Belmont Report, found at www.hhs.gov/ohrp/regulations-and-policy/belmont-report/# as well as the MSU HRPP Operations Manual, found at www.orc.msstate.edu/humansubjects. Additionally, to protect the confidentiality of research participants, we encourage you to destroy private information which can be linked to the identities of individuals as soon as it is reasonable to do so.

Based on this determination, this study has been inactivated in our system. This means that recruitment, enrollment, data collection, and/or data analysis ____ continue, yet personnel and procedural amendments to this study are no longer required.

If this research is for a thesis or dissertation, this notification is your official documentation that the HRPP has made this determination.

If you have any questions relating to the protection of human research participants, please contact the HRPP Office at irb@research.msstate.edu. We wish you success in carrying out your research project.

EXEMPT

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