TEACHER-EFFICACY WITH STANDARDS-BASED EDUCATION FOR EIGHTH-GRADE MATHEMATICS IN A 21st-CENTURY-SKILL FRAMEWORK: A CASE STUDY

by

Jemmeta DeMay Nesbeth

A Dissertation Presented in Partial Fulfillment

Of the Requirements for the Degree

Doctor of Education

Liberty University, Lynchburg, VA

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APPROVED BY:

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ABSTRACT

The purpose of this case study was to describe eighth-grade mathematics teachers' perception of teacher-efficacy and standards-based education within a 21st-century framework at a large suburban school district in North Carolina. Rotter's locus of control theory and Bandura's self-efficacy theory provide the guiding theoretical frameworks for this study. Both theories explain the personal characteristics of teacher qualities related to learning outcomes. This study addressed the following central research question: What is the perceived self-efficacy of eighth-grade mathematics teachers and standards-based education? I applied the extreme case sampling method to select the 12 unique participants and provide different perspectives. I collected data from documents, journal prompts, and interviews. Strategies for the data analysis consisted of confidential monitoring of the obtained data, memoing the key formulated ideas, codifying and identifying emerging themes. The study confirmed that districts must train teachers to develop high levels of teacher-efficacy as they research and use evidence-based instructional strategies to improve student performance.

Keywords: Teacher-efficacy, standards-based education, reform, technology, professional development, self-efficacy

Copyright Page

Dedication

I want to dedicate this dissertation to the Nesbeth clan, my husband, Edward, and my children, Edward, and Nicola, and to the memory of my son Daniel, who was the epitome of perseverance. They have provided me with support and encouragement throughout this process. They have sacrificed family time so that I could concentrate on assignments and the research. Without a healthy family and support group, none of this would be possible.

Acknowledgments

First and foremost, I acknowledge God the Father for His steadfast love toward me and His strong arms that have pointed me in the right direction on my educational journey. I have learned to rely on Him for perseverance and not in my own strength. This journey has been a part of His divine plan for my life, and I am thankful for the people he has placed in my life for such a time as this. God provided the necessary resources and tools that assisted me along the journey. Additionally, He has blessed me with a supportive husband and family, who have supported me throughout this journey.

I express profound gratitude to my husband Eddie for your continued patience and support during the countless hours of studying and preparing for this day. I am very blessed and honored to be your wife. To my son Ejay, your support has been invaluable, and your consistent words of encouragement kept me going.

To my Dissertation Chair, Dr. Susan Quindag, thank you for your enthusiastic support and prompt feedback. Dr. Quindag, your consistent guidance, and expert wisdom made my journey rewarding. You have inspired me to view other perspectives through your encouraging words and positive and excellent suggestions. Thank you so much, Dr. Quindag!

To my dissertation committee member, Dr. Christopher Clark, thank you. He has always given great feedback on my work and provided quick turnaround times upon my submissions. Thank you, Dr. Clark!

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List of Abbreviation

American Association of School Administration (AASA)

American Federation of Teachers (AFT)

Institutional Review Board (IRB)

Lake Middle School (LMS)

National Association of State Boards of Education (NASBE)

National Assessment of Educational Progress (NAEP)

National Board-Certified Teacher (NBCT)

National Center for Education Statistics (NCES)

National Council of Teachers of Mathematics (NCTM)

National Education Association (NEA)

National School Boards Association (NSB)

No Child Left Behind Act (NCLB)

Rosedale Middle School (RMS)

Sharon Middle School (SMS)

Standards-Based Education (SBE)

Sunshine County Schools (SCS)

CHAPTER ONE: INTRODUCTION

Overview

Reports of students under-performing in the United States during the 1980s alarmed policymakers and other stakeholders in education (Krupa & Confrey, 2017). According to reports from *A Nation at Risk* (National Commission on Excellence in Education, 1983), nearly 50% of United States high school graduates were underprepared for the 21st-century workplace (Hoel & Mason, 2018; P21, 2006). Furthermore, reports from the National Assessment of Educational Progress (2019) (NAEP) indicated that American schools under-perform in mathematics at the middle school level compared to other developed nations. Policymakers and other stakeholders viewed the dilemma as an opportunity for education reform. As a result, an intense national and local debate ensued over the direction of education reform and adopted standards-based education (SBE) (Greer 2018; Young, 2017).

Although teachers change instruction to comply with ongoing initiatives, students' mathematics performance at the eighth-grade level is affected by personal teaching-efficacy and outcome expectancy (Tassell et al., 2019). Consequently, there is a need to investigate teacher-efficacy concerning SBE and eighth-grade mathematics performance within a 21st-century framework. This chapter outlines the background, history, social context, theoretical framework of the study, the problem and purpose statements, the study's significance, the research questions, the definitions of key terms, and a summary of chapter one.

Background

During the 1980s, threats from low students' academic performance, global inferiority, and political changes fueled the need for education reform. Initiatives such as the No Child Left

Behind ACT (NCLB) and the U.S. Elementary and Secondary Education Act (ESEA) revealed flaws in the education system. They propelled the nation to adopt the national standards coalition. As a result, of the national standards coalition, Standards-Based Education (SBE) was introduced and adapted in 1983. SBE is a system of instruction, assessment, grading, and reporting based on students' mastery of the knowledge and skills they are expected to learn on a given standard (Bonner et al., 2018). Policymakers viewed SBE as the most promising option for reforming the education system (Bonner et al., 2018; Young, 2018). Research indicated that SBE offered the solution of raising students' scores across the country and provided a viable alternative for a structured approach for accountability and for reporting student competencies globally (Edwards, 2015; Garner & Ilana, 2017; Greer, 2018; Wasserberg & Rottman, 2016; Young, 2018). This initiative intended to transform teaching culture and practices; however, the approach's primary focus was on improving learning for all students.

Several studies suggested that SBE provides rigor and solid rationales that guide curriculum development and subsequent instruction (Ronan 2018; Schultz-Jones et al.,2018; Troia et al., 2018). Toia et al. (2018) further asserted that SBE supports instructional practices geared towards diversity and technology integration. SBE intends to allow teachers to establish instructional priorities and goals and provide clear expectations for student achievement at each grade (Barlow et al., 2018). Supporters of SBE argued that the approach could generate higher scores in core subjects such as mathematics and science and provide a successful pathway for the United States to regain education prominence globally (Petrilli, 2020). Proponents further claimed that SBE fosters accountability for the overall improvement in the teaching and learning experiences and provides teachers with directions for meeting students' learning needs (Bonner et al., 2018; Cox et al., 2018). According to SBE supporters, based on the trajectory of SBE, the

future holds the promise of increasing the number of high school graduates ready for college (Turner, 2019).

In the mid-1980s, experts argued that it was important for educators to integrate technology with SBE since it aligns with developing cross-curricular skills in students (Tarbutton, 2018; Tondeur et al., 2017). Proponents further claimed that aligning technology with SBE is a practical and dual solution for increasing students' learning and equipping them with 21st-century-skills (Chaaban, & Ellili-Cherif, 2017). According to these experts, technology would enhance the mission of SBE since technology is an integral part of subject area content. Munzur (2015) argued that technology is a significant asset for the 21st-century teaching-learning process since it fosters up-to-date technology skills. Proponents for technology integration with SBE argued that changing the curriculum and instructional strategies without including a mandatory technology component will not adequately prepare the digital natives.

Research also found that successful schools utilize available technology to enhance learning (Radović & Passey, 2016). However, critics of SBE have expanded their objections to the reform, citing several notable inadequacies that include integrating a flawless technology curricula program in the mathematics classroom (Shinas, & Steckel, 2017). Research collectively suggests that teachers must be better equipped to master the integration of 21st-century-skills in the mathematics classroom (Butler et al.,018; Li & Schoenfeld, 2019). Therefore, further studies are needed to describe teachers' experiences with technology integration in the eighth-grade mathematics classroom. For this study, technology integration will be defined as a pedagogical approach that evolves from SBE to prepare students for college and career readiness. Based on the assumption that students should be prepared for functioning in the 21st-century global world, the pedagogy must be a priority rather than an isolated variable.

Historical Context

Technology was introduced into the U.S. education system in the early 1950s for the dual purpose of preparing for an increasingly digital future and preparing for its Cold War-era competition (Buss et al., 2018). The integration of technology in mathematics and science classrooms became an essential component of education reform after the progress that the Soviet Union made with the launch of the first satellite Sputnik in 1957 (Radović & Passey, 2016). As in the 1960s, advocates for technology-based learning advocated using computers to boost students' achievement through drills and practice using computer programs (Skinner, 1960). However, educators' idea of technology literacy was not well received since they regarded technology integration as an isolated innovation to classroom practices (Papert, 1978).

In 1963, schools benefitted from technology funds by The Vocational Education Act. As a result, basic computers and calculators became more available in classrooms, and students began learning computer jargon. The progression of technology integration has advanced from simple computers and calculators in the classrooms during the 1980s to sophisticated hardware devices such as graphing calculators, Pods, smart technologies such as interactive white boards, and software programs such as Google Classroom and Study Island (Buss et al., 2018; Ronan, 2018). Buss et al. (2018) stated that technology had improved the classroom environment resulting in increased student achievement over the past two decades. However, as technology integration became a part of instructional practices, there were also observable challenges such as teachers' resistance to change, inadequate hardware and software platforms for some schools, and insufficient technology support for teachers (Shinas, & Steckel, 2017).

In 1983 *A Nation at Risk* report advocated for the launching of the Excellence Reform Movement in response to prompting concerns about low-performing schools across the United

States (National Commission on Excellence in Education, 1983). The report further claimed that other first-world nations were matching and surpassing the United States' educational attainment (Bonner et al., 2018). The *Nation at Risk* report garnered support from other interested parties such as politicians and started the intense debate centered around educational reform. In the late 1990s, educational stakeholders designed K−12 students' standards (National Education Technology Standards for Students (NETS−S). Additionally, NETS–S standards encouraged and described the technical skills such as critical thinking, communication, collaboration, and creativity that students needed to master. According to Bakir (2016), "The International Society for Technology in Education (ISTE), a non-profit organization, was the first organization to recognize the emerging needs of technology and teacher education in 1998" (p.24).

The need to prepare America's students for the global economy was a central contention source as stakeholders shared differing opinions (Young, 2018). The final consensus was the development of the Federal Goals 2000: Educate America Act. The Educate America Act was designed to provide a national framework for education reform. Hence, the development of many national standards, which include mathematics and technology. Subsequently, standards for educators and administrators were developed in 2000 and 2001 to address 21st-century learning goals in the education system. Administrators and teachers needed to acquire the requisite skills, knowledge, and practices to manage and support effective technology integration and proactively guard against disruption in classrooms (Howard & Thompson, 2016). Bakir (2016) asserted that the standards had been revised to accommodate technological changes and meet the changing goals and objectives of K-12 education. ISTE (2016) claimed that the development and release of Standards for Technological Literacy: Content for the Study of Technology (STL) in 2000

provided the content and direction for 21st-century learning. Critics such as Dugger et al. (2018) contradicted the claim and highlighted the need for a technology curriculum for K-12 education.

Experts in educational reform recognized the importance of integrating technology with instructional practices. For these experts, 21st-century learning promises to provide increased learning outcomes that will foster innovation and creativity (Dugger et al., 2018). The benefits derived from 21st-century learning would positively address the increasing threat of critical issues such as cybersecurity attacks (Love & Strimel, 2016). The United States Department of Education continues to advocate for technology integration in classrooms (Bakir, 2016; Ronan, 2018). However, teachers face many barriers to technology integration that impedes the successful implementation of 21st-century-skills, and successful pedagogical changes are dependent on teachers' confidence and perception (Bell et al., 2018; Ronan, 2018).

Social Context

Schools are increasingly diverse in students' populations and reflect the 21st-century work environment (Bell et al., 2018). However, educators must first acknowledge that there are differences in students and that one approach may not adequately satisfy all students' learning styles. Researchers found that technology can influence academic performance (Knifsend, 2018; Rojas et al., 2018). Thus, quality education depends on teachers' ability to use instructional strategies that empower students to demonstrate mastery of goals and objectives. Therefore, classroom instructions should reflect the expectations of the global workforce. Employers value the skills of workers who are flexible and are team players in a work environment (Hutton, 2019). Therefore, the challenge is for educators to incorporate 21st-century-skills into the teaching and learning process to improve students' learning.

Educators must continually respond to learning gaps created by a diverse student population such as English as second language underachievers, gifted students, students with disabilities, and culturally diverse students (Taliaferro, 2017). The challenge to teach to these diversities intensifies with the emphasis that SBE requires for students to attain academic goals and standards at the same time. Advocates of SBE argue in favor of increasing content knowledge for students: with disabilities, minority groups, and students from lower socioeconomic backgrounds (Ehler-Hansen, & O'Meara, 2019). The aim is for SBE to create a democratic community where students can learn from each other (Jefferson et al., 2018). Supporters of SBE further contend that the approach fosters structure and accountability and provides social equity for all learners, as is evident in measuring academic standards and rigor (Edwards, 2015; Garner & Ilana, 2017; O'Keeffe & Medina, 2016; Wasserberg & Rottman, 2016). The implication is that SBE allows all students to experience educational equity and uniformity in the classroom through rigor and technology integration that influences the development of critical thinking skills in students.

Critiques of SBE argued that the approach is insufficient in providing the quality education needed for America to regain global educational prominence (Georgii-Hemming, 2017). Research suggests that SBE is essentially a "quick- fix" geared towards teacher accountability rather than lifelong learning for students (ASCD, 2016; Bennett, 2016). With the introduction of SBE, teachers of mathematics face increasing pressure to ensure students' mastery (Castro Superfine et al., Feldman et al., 2020; Litster et al., 2020; Polly et al., 2017). Although many mathematics teachers have completed professional development and training to improve students' quality of education, it is not uncommon for students at the eighth-grade level to struggle with mathematics. Students generally attribute a lack of mastery in mathematics as

the reason for failure in schools. Teachers, however, attribute low student performance in mathematics to two significant variables— short time allotment for instructional time, Lack of resources, and inconsistencies in the standards (Greer, 2018; Young, 2018). Students' poor performance indicates a crucial need for improvement in mathematics instructional practices. Further studies are needed to provide information on teacher-efficacy when implementing SBE in the mathematics classroom. Thus, the need exists to provide a voice for teachers and their perception of SBE (Frechette, 2017).

Globally, the public has adopted technology as a part of daily life to include essential activities such as communications and entertainment (Bell et al. 2018). Technology enhances the learning environment and has become increasingly intertwined with curriculum and pedagogy (Ronan, 2018; Verschaffel et al., 2019). Adopting technology in the classroom promotes mastery of 21st-century learning. Students' success in mathematics at the eighth-grade level has the potential to better prepare them for competitive careers in the STEM areas (Han, 2016). Classroom technology integration includes educational tools to improve curriculum standards within the classroom (De Koster et al., 2017). The prevalent available forms of classroom technology resources include, but are not limited to, computers, cell phones, interactive whiteboards, and document cameras. The implication is for educators to integrate technology into curricula practices seamlessly. However, despite the increased dependency on technology, teachers fail to integrate technology into instructional practices for various reasons (Ronan, 2018).

Graziano (2018) commented that technology integration has the potential to maximize learning. However, to some extent, the successful adoption of 21st-century-skills and technology in the classroom is dependent on teachers' belief systems. Graziano (2018) asserted that high

levels of teacher-efficacy are a prerequisite for 21st-century learning. Teacher-efficacy in mathematics may be viewed as a factor that either impedes or promotes technology integration. Ronan (2018) stated that educators who feel uncomfortable using technology are unlikely to make it an integral part of instructional practices. Ronan (2018) further attributed teachers' underutilization of technology to fear, lack of resources, and inadequate training. Paradigm shifts such as these outlined by Ronan (2018) must be examined to increase student achievement. Consequently, this study has provided a medium for eighth-grade mathematics teachers to voice their perceptions of teacher-efficacy when implementing SBE within a 21st-century framework.

Theoretical Context

This study was grounded in Rotter's (1966) locus of control theory and Bandura's (1977) theory of self-efficacy. Rotter's (1966) locus of control theory will also provide a supporting framework for this study. Rotter's (1966) locus of control theory is a related theory of the social-cognitive framework. The theory assumes personal belief control over life events. The theory further posited that locus of control is established internally and externally. Based on the locus of control theory, individuals who are internally driven attribute events to personal actions. Thus, these individuals believe that intrinsic potentials encourage change.

Conversely, individuals driven by an external locus of control believe outcomes of events result from external factors (Rotter 1966). These individuals believe they have no control over outcomes and blame other factors for failures. They place minimal value in personal efforts and are satisfied with the marginal performance (Senler, 2016). For purposes of this study, teacher locus of control is defined as teachers-efficacy as it relates to student performance (Snyder, & Fisk, 2016). The theory behind teacher-efficacy is appropriate for this study as teachers prepare

to meet the challenges of SBE and technology integration (Açikgül, & Aslaner, 2019; Fredrick 2017; Srisupawong et al., 2018).

Bandura's social cognitive theory posited that personal beliefs indicate capabilities and have the power to impact individual motivation depending on the system of reward or consequence (Wang et al., 2018). The implication is that teachers experience success or failure depending on personal efficacy. Thus, the perceived sense of self-efficacy influences instructional practices. According to Bandura (1977), success results in increased levels of a teachers'-efficacy. The impact of self-efficacy is twofold as self-efficacy leads to success, and success leads to teacher-efficacy. Teachers who have experienced past achievements are more likely to become efficacious in their teaching ability within that subject and display an increase in students' improvement expectancy. Conversely, unsuccessful outcomes may cause low self-efficacy in teachers and contribute to unsatisfactory student performance (Ümmet, 2017). This study offers the possibility of providing information that will benefit training and curricular planning for teachers in mathematics instruction aligned with SBE and technology at the eighth-grade level to improve learning outcomes.

Situation to Self

My enthusiasm for leading this qualitative case study stems from the desire to explore the perceptions and experiences of eighth-grade mathematics teachers. I am currently employed at a small private school where I am the curriculum and instruction specialist and an eighth-grade mathematics teacher. My philosophy, every child can learn when exposed to the right learning environment has fueled my decision to select this topic. This topic is of deep concern to me as I recognize the need to effect change and improve the quality of education for 21st-century

learners. My perspective is that the continued low performance of students in the mathematics content area indicates a disconnect between instructional practices and learning outcomes.

My goal in conducting this study is to give a voice to eighth-grade mathematics teachers to improve students' performance in mathematics. I believe that quality education can be of significant benefit to humanity in a technologically driven society. I firmly believe that educators should be provided with the tools needed to equip students with practical strategies to help them function efficiently in the 21st-century. A part of my job description includes assessing the quality of instructional interaction in the teaching and learning process and making recommendations to the administration on ways to encourage academic growth in students and help develop and maintain high self-efficacy in teachers. This study will provide me with materials that I can use in professional development courses to encourage high teacher-efficacy levels.

I developed three philosophical assumptions within the qualitative design — epistemological, axiological, and ontological. Epistemological assumptions consider what counts as knowledge, how this knowledge is justified, and establish what relationship exists between the researcher and the phenomenon (Creswell & Poth, 2018). My epistemological assumption is that I believe in developing meaningful interactions with the 12 participants to know and understand their perspectives. In my experience and role as a mathematics teacher, I am concerned about future students' academic outcomes and the quality of content they receive. Through documents, interviews, and journal prompts. My plan was to enter the schools where the research is being conducted and spend time building professional relationships with each participant. However, I was only able to visit two of the three schools because of the covid 19 pandemic. Most of the interaction between participants and myself took place virtual or electronically.

My axiological assumption is that I value mathematics and the 21st-century style of learning. As a mathematics teacher, I know that there is value in integrating mathematics with 21st-century-skills to make the teaching and learning process engaging, relevant, and rigorous in preparing students for the global community. As a teacher, I know that there are values in relating the perceptions and passions of other mathematics teachers. The experiences of other teachers will broaden my instructional strategies.

Ontological assumption addresses realities of the same phenomenon (Creswell & Poth, 2018). My previous and current teaching experiences have allowed me to understand the benefits and challenges of instructional practices in the mathematics classroom. Therefore, my ontological assumption is that although eighth-grade mathematics teachers work with SBE, the reality in their instructional approaches are different. Additionally, teachers exhibit varying levels of teacher-efficacy related to their job performance (Zee & Koomen, 2016). Individual teacher experiences related to mastery and non-mastery of mathematical concepts and 21st-century connectedness make up the rich details of the research.

My paradigm is from the perspective of social constructivism. Social constructivism allows individuals to explore and construct knowledge by social interaction within their world (Jung, 2019). The social constructivism paradigm provided an interpretative framework. It was used as a guide for the various perceptions reported as the patterns and themes emerged from the collected data (Creswell & Poth 2018). The social constructivism perspective guided my efforts to understand the world in which I work and rely on participants' views and experiences in developing teaching -efficacy while implementing SBE in teaching eighth-grade mathematics in a 21st -century framework (Creswell & Poth, 2018).

Problem Statement

According to James et al. (2016), mathematics is a core area that annually comes under intense scrutiny because U.S. students generally perform poorly. The most recent statistical report indicates that only 34% of eighth graders scoring at or above proficiency (NAEP, 2019). The information has been used to justify stakeholders' concerns, especially compared to other first-world nations. Reports from the Program for International Student Assessment Results from the (PISA, 2019) suggested a trend in the underperformance of eighth-grade mathematics students. Stakeholders attribute the low student mathematics performance in part to U.S. policies and practices surrounding teacher and instructional quality (Young, 2018). Studies suggested that US mathematics teachers are not adequately equipped in the content area (Croft et al., 2016; Jeynes, 2015). In comparing first-world instructional practices, studies imply that the United States focuses on routine procedures rather than conceptual understandings (Hill et al., 2019).

Researchers have found mixed results related to SBE and eighth-grade mathematics teaching within a 21st-century framework (Howard & Miller, 2016). Given what is known about self-efficacy and its potential to predict behavior, it is helpful to examine teachers' perspectives on teacher-efficacy levels in instructional practices and technology integration in the eighth-grade mathematics class (Choi et al., 2019; Shi, 2016). The use of technology integration in eighth-grade mathematics class provides an advantage since today's students are considered digital natives (Butler et al., 2018; Li & Schoenfeld, 2019). However, despite the excellent advantage and the global trend of technology dependency, many teachers still report that they lack the necessary confidence to integrate the available technology into instructional practices (King, 2016). Factors influencing teachers' technology efficacy have not been specifically identified in the literature. Research is needed to provide a synchronized understanding of how to

address the role of mathematics teacher-efficacy within SBE and a 21st-century framework. Previous research on SBE implementation in mathematics focuses on teachers at the elementary level or points to mathematics teachers' struggles to use appropriate pedagogical strategies to support SBE and foster critical thinking (Ellingsen, & Clinton, 2017; Howard & Miller, 2016; Matthee & Turpin, 2019).

The problem is that there is a low level of teacher-efficacy related to implementing the SBE eighth grade mathematics curriculum within a 21st-century-skill framework (Greer, 2018; Kitchen & Berk, 2016; Polly et al., 2017). Failure to increase the level of mathematics teachers' efficacy may result in ineffective instructional methods that support minimal mathematical, conceptual development (Cannon, 2020). However, if teacher-efficacy can be addressed in this era of SBE, research will perhaps provide viable solutions that support instructional practices aligned with mathematics standards (Hayward, 2018).

Purpose Statement

The purpose of this case study was to describe eighth-grade mathematics teachers' perception of teacher-efficacy and SBE within a 21st-century framework at a large suburban school district in North Carolina. At this stage in the research, teacher-efficacy will be generally defined as a personal belief in affecting change. The theories guiding this study are Bandura's (1977) theory of self-efficacy and Rotter's (1966) locus of control theory. The concept of teacher-efficacy is grounded in Bandura's (1977) social cognitive theory and Rotter's 1966 locus of control theory. Rotter (1966) posited that learning is an integral part of one's environment. Rotter further assumed that personality and behavior are didactic and develop in response to experiences. The study will examine the individual perceptions of eighth-grade mathematics teachers related to teacher-efficacy in implementing SBE in the 21st-century framework. The

research will provide valuable insight into mathematics teaching at the eighth-grade level and be used for future professional development.

Significance of the Study

Theoretical Significance

While studies have been completed regarding teacher-efficacy and SBE in mathematics at the elementary level, there is a lack of research that focuses on teacher-efficacy and SBE at the eighth-grade level (Lee et al., 2017; Tassel et al., 2018). Research suggests that both theories of self-efficacy and locus of control profoundly affect teachers' instructional practice (Donohoo, 2018). These theories apply both to this study and teachers' instructional practice in general because they support the idea that positive instructional experiences while implementing SBE can increase student achievement (Nowikowski, 2017). It is, therefore, vital to identify the origin of teacher-efficacy. Teacher-efficacy is grounded in Bandura's (1977) self-efficacy theory and Rotter's (1966) locus of control theory. Self-efficacy comprises two components: efficacy expectation and outcome expectation (Bandura, 1977). Rotter's (1966) locus of control theory states that teacher-efficacy refers to the extent to which teachers believed that they could control the outcome of their actions. Both approaches provide relevance for exploring teacher-efficacy and implementing SBE because teachers' personal belief in cognitive abilities and skills increases students' learning outcomes (Donohoo,2018). Ekawati and Kohar (2016) further contended that teachers play a significant role in student's academic success; the study suggested that high teacher-efficacy influences positive students' learning outcomes. Tassel et al. (2019) stated that "Those with high self-efficacy succeed well beyond their capacities, while people with low self-efficacy might underperform due to inaccurate view of their abilities" (p. 2). An

efficacy expectation is a belief that a person has in their abilities to successfully perform the necessary actions to produce a particular outcome (Bandura, 1977).

Empirical Significance

The empirical significance of the study was to add to the current body of literature in mathematics (Bonner et al., 2018; Polly et al., 2018; Smith, 2017; Van Boxtel, 2017). Teachers must understand the dynamics of SBE to improve students' learning in mathematics (Moloi et al., 2019). There have been several studies that examined mathematics and SBE for a defined population. For example, Barlow et al. (2018) sought to understand how SBE influences accountability in schools. Young et al. (2017) examined the impact of the social relationship on mathematics achievement for African American girls. Douglas and Salman (2020) explored the effect of college mathematics coursework and its relation to gender and significant studies. Moloi et al. (2019) researched SBE on teacher education in preparation for teaching elementary education. Hudson (2018) also examined the quality of mathematics instruction at the elementary level. Hudson (2018) further stated that the mathematics curriculum should clearly define the relevance and scope of students' knowledge. There is a lack of research that examined SBE in mathematics at the eighth-grade level (Lee et al., 2017; Tassel et al., 2018). According to (Yin, 2018) empirical research advanced the knowledge base of a phenomenon. Therefore, this study is essential since it will add to the limited body of knowledge for the eighth-grade mathematics teacher.

This case study provided a multi-faceted practical significance. Professional training is used to support teachers' practices (Tassell et al., 2019). After professional training, teachers should be expected to incorporate strategies learned to improve teacher-efficacy in implementing SBE in mathematics within the framework of a 21st-century learning environment. Ekawati and

Kohar (2016) contended that "teachers need to coordinate the knowledge gained from teacher professional development programs to transform classroom practices" (p. 2). Understanding the perception of eighth-grade mathematics teachers related to teacher-efficacy and SBE mathematics instruction in a 21st-century environment will allow K-12 mathematics educators and administrators to develop content, pedagogy, and technology integration strategies (Açikgül, & Aslaner, 2019). Zimmerman (2018) asserted that in SBE, "students are expected to develop an understanding of specific knowledge and mastery of particular skills (p.109); therefore, teachers must have professional development training in areas that will strengthen teacher-efficacy.

Practical Significance

Practically, stakeholders can benefit from the findings of this study. School administrators will gain information about the strengths and weaknesses in their policies and procedures related to standards-based education in the content area of mathematics. Teachers will benefit from increased knowledge about collaborating with their peers to develop and maintain high teacher-efficacy as they adopt reformed instructional practices in the eighth-grade mathematics classroom. Providing training and support in technology integration while implementing SBE will increase teacher-efficacy in the eighth-grade mathematics teacher. High-teacher-efficacy will ultimately influence positive academic behaviors and achievement in eighth-grade mathematics (Letwinsky, 2017). Teachers with high levels of teacher-efficacy will rise above encountered challenges and meet eight-grade mathematics students' learning needs by immersing them in a technology-rich environment. Research shows that technology is a needed component for preparing students to function in the global society (Ekawati & Kohar 2016) adequately.

This study has illuminated the significance of high levels of teacher-efficacy in instructional practices and improve marginal areas. Marginal areas such as technology integration and support prevent the successful implementation process of SBE. Zimmerman (2018) argued that teachers are professionally obligated to use instructional strategies to ensure students' mastery of the standards. Thus, with the information gleaned from this study, curriculum planners and administrators will create opportunities for teachers to develop effective instructional strategies to improve teacher-efficacy and, ultimately, students' learning.

Research Questions

The following four questions were used to guide this study:

CQ: What is the perceived self-efficacy of eighth-grade mathematics teachers and standards-based education?

Bandura (1977) attributed self-efficacy to the expectation of an individual to "successfully execute the behavior required to produce outcomes" (p. 193). Teacher -efficacy is the extent to which teachers believed that they could control the reinforcement of their actions; the control is dependent on whether or not the support lies within themselves or in the environment" (Tschannen-Moran et al. 1998, p. 202). Hence, teacher-efficacy refers to teachers' beliefs about their instructional abilities to motivate students learning. As part of the mathematics education reform, policy teachers must implement an SBE approach to meet students' learning needs (National Council for Teachers of Mathematics 2014; Papadakis et al. 2016; U.S. Department of Education 2008). Emerging research indicates that teachers consistently encounter many difficulties in interpreting and implementing the standards in their classrooms (Drew et al., .2018). Previous research claimed that teacher-efficacy influences instructional practices and beliefs that impact students' achievement. (Donohoo, 2018; Hattie, 2016). Donohoo

(2018) further argued that teachers who demonstrate efficacious high levels about themselves would be more apt to model academic optimism while implementing the standards. Emerging literature points to positive students' learning outcomes for teachers with high teacher-efficacy (Mahler et al., 2018; Zee & Koomen, 2016). Research by nationally led initiatives such as the Call to Action and P21's Framework for 21st-century Learning recommended that technology should be used to develop the required critical thinking skills for living in the 21st-century (P21 Partnership for 21st-century Learning 2009). Li et al. (2019) further argued that teachers are essential in transforming instructional practices that include technology's integral use.

SQ1: What role does professional development play in fostering teacher-efficacy in Standards-Based Education within a 21st-century learning environment?

Pharis et al. (2019) contended that professional development is used to support educational programs' quality. According to Pharis et al. (2019), professional development should not only provide training for curricula programs. Still, it should also facilitate "supportive and constructive feedback that can be used to improve practice" (p. 41). Mahler et al. (2017) claimed that professional development positively impacts teacher-efficacy and enthusiasm towards instructional practice. According to Bandura (1977), the social cognitive framework teacher-efficacy is enhanced by beliefs, mastery, and experience. Professional development offers teachers the opportunities to develop confidence as they experience learning to master the mathematical standards (Mahler et al., .2017; Morris et al., .2017). Research indicates that teachers with high teacher-efficacy levels will seek professional development opportunities to broaden their technology knowledge (Li et al., 2019).

SQ2: What role does teacher-efficacy play in using technology to implement SBE within a 21st-century framework?

Many available technology tools can be used to integrate mathematical concepts (Er & Kim, 2017). However, emerging research indicates that teachers are often reluctant to incorporate technology in their teaching, "despite the increased availability of technology in schools" (Bulman & Fairlie 2016, p.502). Tondeur et al. (2017) claimed that teachers' reluctance to use technology in the classroom depends on their level of confidence and self-Efficacy. Li et al. (2019) further suggested that teachers with higher self-efficacy levels are typically more apt to use technology as a tool for engaging learners. In contrast, teachers with low levels of teacher-efficacy are generally reluctant to use technology tools because they do not feel comfortable using them based on the perceived lack of technological knowledge. Other studies found that high teacher-efficacy and knowledge of 21st-century-skills are integral parts of technology integration (Callaghan et al., 2017; Joo et al., 2018).

SQ3: How do teachers perceive the role of teacher-efficacy with encountered difficulties while implementing SBE within a 21st-century framework?

Implementing new policies and curricular programs generally rests on the teacher as a professional (Campbell & Lawson 2018). Teachers with high teacher -efficacy will use their voice and proactive attitudes to overcome constraints that mitigate the teaching-learning process (Priestley et al. 2016). The implementation of SBE within a 21st-century framework requires teachers to establish an environment that supports a collaborative work culture before and during the implementation of the process (Lawson et al., 2017; Zuckerman et al., 2018). Emerging research indicates that teachers require crucial support and collaboration with colleagues to implement them (Stosich, 2016). Furthermore, Stosich (2016) claimed that teachers rely on each other for professional support during the implementation process.

Further research indicates that teachers with high levels of teacher-efficacy will accept the challenge of becoming informal leaders to ensure curricular programs (Zuckerman et al., 2018). The fluid nature of the mathematical standards and high teacher-efficacy allows teachers to collaborate and use professional obligations to tailor standards to their students' learning needs (Priestley et al., 2016). The concept of Self-efficacy is grounded in Bandura's (1977) self-efficacy theory and Rotter's (1966) locus of control theory. Zee & Koomen (2016) asserted that a teacher's self-efficacy is established on personal beliefs, experiences, and professional competency. Teacher-efficacy will be manifested in the emotional resilience and approach that a teacher exhibits towards establishing the standards that prepare students for 21st-century learning (Sun et al. 2016). Research indicates that many mathematics teachers are unclear about the standards' objectives since they give vague outlines on adaptations and implementation policies (Campbell et al., 2018; Coburn et al., 2016). Hence, teachers spend a lot of time unpacking and collaborating to interpret the standards. McDuffie et al. (2018) contended that standards do not align with curriculum resources and activities.

Definitions

1. *Instructional practices* – Instructional practices include activities that a teacher employs to develop a conceptual understanding of curriculum standards for student learning (Vyn et al., 2019).
2. *Self-efficacy* – Personal beliefs in capabilities of succeeding in specific situations (Kose & Uzun, 2018).
3. *Standards-Based Education* - A system of instruction and academic reporting based on students demonstrating mastery of the knowledge and skills they are expected to learn at different grade levels (Young, 2018).

4. *Teacher self-efficacy* – "the teacher's belief in his or her capability to organize and execute courses of action required to accomplish a specific teaching task in a particular context" (Abedini et al., 2018).
5. *Teaching outcome expectancy*: Teaching outcome expectancy is the belief in the ability of an effective teacher to have a significant, positive effect on student learning (Bandura, 1977).
6. *Technology integration* - Technology integration uses technology in a teacher's regular teaching and curricular plans (Açikgül, & Aslaner, 2019).
7. *Technology teacher-efficacy* - Technology teacher-efficacy is a teachers' belief in successfully performing the technological task (Abedini et al., 2018).
8. *21st-century learning* - core competencies in life and career skills, Innovation collaboration, communication, critical thinking, and creativity (Tarbutton, 2018).

Summary

Stakeholders and policymakers agree that America's potential for achieving global effectiveness is dependent upon educational reform. Recent reports from NAEP (2019) indicated that eight-grade mathematics students are still performing below the proficiency level across the nation. Statistical reports state that approximately 40% of United States high school graduates are underprepared for the 21st-century workplace (Partnership for 21st-century-skills. (2006). Hence, the need exists for improving mathematics instruction and the preparation of 21st-century learning. Teachers' evaluation for effectiveness revolves around SBE and standardized test scores (Krise, 2016; Norris et al., 2017; Xu et al., 2016). As a result, teacher effectiveness and educational reform remained major academic concerns. The focus of this study was to gain a better understanding of eighth-grade mathematics teachers' perceptions and beliefs regarding

teacher-efficacy, SBE, and technology integration in the eighth-grade mathematics classroom. The assumption of teacher-efficacy is interrelated with outcome expectancy, the belief that actions directly influence results. The theory of self-efficacy is a construct of the social cognitive theory, with the premise that behaviors and beliefs determine confidence and persistence (Bandura, 1977). Furthermore, I sought to understand how individual teacher perceptions and implementation methods are established so future professional instruction can be designed to increase teacher-efficacy and improve eighth-grade mathematics students' performance.

CHAPTER TWO: LITERATURE

Overview

Chapter Two provided the theoretical framework for the study and a review of the relevant literature related to teacher-efficacy and eighth-grade mathematics standards-based learning within a 21st-century-skill framework. This study was grounded in Rotter's (1966) locus of control theory and Bandura's (1977) theory of self-efficacy. These theories were used to explain teachers' perceptions of how belief systems and behaviors can affect quality during the implementation of standards-based education in eighth-grade mathematics within a 21st-century framework.

Furthermore, the successful implementation of SBE is hindered by adaptive curricular challenges and inadequate resources (Koedel et al., 2017). The relevant literature addressed the issues relating to implementing SBE in mathematics and pedagogical practices that guide classroom instructions towards integrating 21st-century-skills. The role of teacher-efficacy towards the implementation of SBE mathematics curricula was addressed. Chapter two examined the role of professional development in increasing teacher-efficacy and attitudes related to eighth-grade mathematics standards-based learning within a 21st-century-skill framework.

Theoretical Framework

The theoretical framework for this study was provided by Rotter's (1966) locus of control theory and Bandura's (1977) self-efficacy theory. Both views are based on the social-cognitive idea and are integrally related to instructional practice, teacher persistence, and student achievement (Carleton et al., 2008). Rotter's (1966) locus of control theory asserts that people use locus of control to stimulate actions. According to (Rotter, 1966) the locus of control may be internal or external. Bandura's (1977) self-efficacy theory states that personal belief and self-

awareness directs individual initiatives. Furthermore, self-efficacy guides the development and organization of a required course of action. Both theoretical frames have combined to create the outgrowth of teacher-efficacy (Ross, 1992).

Rotter's (1966) locus of control theory is derived from the social learning theory and provides a link between behavioral and cognitive psychology (Pajares,1996). Rotter's (1966) locus of control theory argues that individual actions are guided by either an internal or external stimulant. Furthermore. Rotter (1966) assumes that individuals with an external locus of control are temperamental and rely on non-personal factors to determine outcomes. Rotter describes individuals with an internal locus of control as people who attribute outcomes to personal abilities. An individual's perceptions determine the locus of control. One's perception of past experiences determines decisions that result in outcomes based on internal or external control (Houts & Kassab, 1997).

Rotter (1966) further states that internal locus of control is applied whenever individuals use personal beliefs to assert actions. Individuals with an internal locus of control are generally more organized and thorough in their approach to academic endeavors and consequently tend to be more proficient in achieving positive learning outcomes than individuals with an external locus of control (Krause, 2007). Additionally, Krause (2007) argues that individuals with an internal locus of control recognize challenges as opportunities to demonstrate growth. Research suggests that a high internal locus of control has profound implications for advancing the teaching and learning process (Zimmerman, 2000). Students exhibiting the qualities of a high internal locus of control typically out-perform their peers with demonstrable low features of the internal locus (Zimmerman, 2002). Slavin (2009) agreed that locus of control is also an essential predictor of students' academic performance. Scheck & Rhodes (2001) found that teachers with a

high internal locus of control are more competent in performing instructions than teachers with a high external locus of control. Thus, these teachers are not afraid of changes and will take risks to overcome challenges that inhibit learning (Krause, 2007; Tschannen-Moran et al., 1998). (Koo 2016) states that teachers with an internal locus of control are confident in motivating and guiding students to learn. These teachers use failure as an opportunity to develop excellence; for example, if students experience difficulties in grasping conceptual knowledge, these teachers will use various pedagogical strategies to improve learning.

However, an individual with an external locus of control attributes outcomes to other factors like luck and fate (Rotter, 1966). Individuals who have the characteristic traits of external locus of control exhibit behaviors that align with low self-esteem, depression, and passivity. (Koo, 2016) argues that teachers with a high external locus of control may use factors such as students' background and parental influence as elements that impede their effort to improve students' learning. Additionally, teachers with an external locus of control lack confidence in their abilities; they do not see the value of personal effort to positively impact students' learning outcomes (Koo, 2016). According to (Vickers et al., 1983), teachers who are influenced by an external locus of control will take a defensive stance to prove that they are not responsible for students' learning outcomes.

According to Bandura (1977), self-efficacy is an individual's personal belief in accomplishing desired outcomes. According to Pajares (1997), self-efficacy significantly influences an individual's thoughts, motivation, and results. Pajares (1997) further states that self-efficacy guides the determination to select activities, effort, and persistence in accomplishing a task. Bandura further posited that there are high and low levels of self-efficacy (Bandura,1977). Based on Bandura's (1977) theory, individuals with high perceived self-efficacy

levels tend to demonstrate a firm commitment to perseverance during challenging experiences. Conversely, individuals with lower levels of perceived self-efficacy are less resilient to changes and are more apt to give up. According to Bandura (1977), an individual's perceived level of self-efficacy beliefs results in actions that determine specific situations' outcomes.

Bandura (1977) further states that self-efficacy is developed through the following four factors: mastery of experience, social persuasion, vicarious experiences, and interpretation of the physiological and affective domain (Bruce & Ross 2008; Cheung, 2008; Gabriele & Joram 2007; Klassen et al., 2011; Milner, 2002; Milner & Woolfolk-Hoy 2003; Tschannen-Moran & Woolfolk Hoy, 2001). Hoy (2003) further states that prior instructional experiences guide a teacher's perception and that improvement in student outcomes increased the confidence level of teachers. The implication is that teachers need to encounter positive instructional experiences to foster and promote life-long learning in students.

Verbal and social persuasion are viable factors that significantly influence self-efficacy (Bandura, 1977). These factors can be conducted formally or informally (Mulholland & Wallace, 2001). Informal situations such as offering praise or formal situations geared towards professional growth are typical examples of verbal and social persuasion. Formal situations include professional development, continued education, and providing various mediums that encourage feedback to teachers. Praise and verbal commendations are positive influences on self-efficacy instructional practice.

In contrast, verbal and social persuasion can also negatively affect a teacher's self-confidence and result in poor instructional quality. Ultimately result in undesirable learning outcomes. Consequently, verbal, and social persuasion can positively and negatively influence self-efficacy (Bandura,1977).

Bandura (1977) states that vicarious experiences influence self-efficacy, which occurs from observation. According to Hoy (2003), observation is a typical practice between inexperienced and veteran teachers. Veteran teachers generally model instructional practice for pre-service teachers to emulate. As a result, the veteran teacher can positively or negatively influence the less inexperienced teacher's self-efficacy (Bandura, 1997). Furthermore, Bandura asserts that modeling is a vicarious experience that supports high levels of self-efficacy. However, a positive effect from modeling is better achieved when the observer has a high level of respect for the model's competency; respect for the model's competence is more significant than other individual characteristics of the model.

Bandura (1977) asserts that interpretation of the physiological and affective domain is the final component that influences self-efficacy. Tschannen-Moran & Hoy (2007) stated that this final component refers to an individual's feelings of accomplishment resulting from successful teaching experiences and may increase the level of motivation to where there is more focus on task improvement. Lower levels of self-efficacy may result from tension and anxiety and can significantly affect the thought process of individuals. According to Tschannen-Moran & Hoy (2007), the implication is for school leaders to ensure that school culture supports classroom environments that are safe where colleagues offer help and encouragement to each other. This culture promotes positive self-efficacy and will ultimately improve students' learning outcomes (Tschannen-Moran & Hoy, 2007).

Bandura (1977) states that teachers with solid levels of self-efficacy have positive mastery of experience, social persuasion, vicarious experiences, and interpretation of the physiological and affective domain. Other researchers suggest that self-efficacy is an integral part of instructional practices and performances is significantly connected to students' learning

outcomes (Riggs et al., 1994). Consequently, teachers with a strong sense of self-efficacy are more apt to demonstrate a more significant commitment to teaching and ultimately improving students' learning outcomes (Cousins & Walker, 2000; Weiner, 2003). Bandura's (1977) self-efficacy theory provides deeper insight for this study since it provides a framework for understanding teacher-efficacy in implementing SBE in eighth-grade mathematics.

The theories of locus of control and self-efficacy are critical to this study and are not mutually exclusive. Bandura (1977) described self-efficacy as the perception of human characteristics that significantly influences thought process, belief system, and action. Teacher-efficacy is an outgrowth of the self-efficacy theory and an integral factor that intertwines with commitment and dedication towards instructional goals. High levels of teacher-efficacy promote a culture of resilience and growth using intentional organizational strategies and specific actions (Bandura, 1977). Additionally, teacher-efficacy addresses generic teacher qualities such as resilience, competency, dedication, and quality instructional practices. Bandura's (1977) self-efficacy theory is relevant to this study because it addresses teachers' personal beliefs in implementing curricula changes.

Fives (2003) attributed the concept of teacher-efficacy as a combination of Rotter's (1966) theory of locus of control and Bandura's (1977) self-efficacy theory. Internal perceptions and external perceptions of abilities define predictions of how reinforcements change expectancies (Rotter, 1975). The implication is that schools must provide structural support that will facilitate high levels of teacher-efficacy since this will positively impact students' outcomes. According to Rotter's (1966) locus of control theory and Bandura's (1977) self-efficacy theory, teacher-efficacy is a resulting construct of both views. It has a profound significance to students' learning outcomes (Tschannen-Moran, Woolfolk-Hoy, 1998). Other research states that the

combination of both Rotter's (1966) locus of control theory and Bandura's (1977) self-efficacy theory provides a deeper insight into teacher-efficacy and how it influences learning outcomes (Nowicki & Duke, 2016). Therefore, teacher-efficacy is self-efficacy for teachers and is crucial in the teaching context (Tschannen-Moran, Woolfolk-Hoy, 1998).

Previous studies defined teacher-efficacy as a teacher's personal belief in teaching abilities to achieve successful learning outcomes in all students (Anderson et al., 1988; Armor et al., 1976; Bandura, 1977; Capara et al., 2006; Midgley et al., 1989; Ross et al., 2001). Research suggests that teachers characterized with higher levels of teacher -efficacy tend to demonstrate positive traits such as effort, persistence, enthusiasm, and confidence which results in high levels of teacher-efficacy (Caprara et al., 2003; Caprara et al., 2006; Lee et al., 1991; Skaalvik & Skaalvik, 2007; Tschannen-Moran & Woolfolk-Hoy, 2001; Wolters & Daugherty, 2007). Research in teacher-efficacy have also identified and associated other factors that are integrally related to teacher-efficacy; these factors include confidence in content knowledge, age, gender, years of professional experience, and professional development (Callea et al.,2008; Cheung, 2008; Karimi, 2011; Ross & Bruce, 2007; Swackhammer et al.,2009; Yeo et al., 2008).

The characteristics reflected by teachers with a strong sense of teacher-efficacy and a positive learning outcome expectancy are ideal for increasing student learning (Tondeur et al., 2017). Therefore, teachers who take responsibility for learning outcomes are typically characterized as having high levels of teacher-efficacy. In contrast, teachers with low-teacher-efficacy attribute students' failure to other factors such as lack of intelligence, poor home environments, and uncooperative administrators.

Teacher-efficacy is the belief that a teacher's actions directly influence results (Bandura, 1977). Teacher-efficacy can be aptly defined as a personal judgment of competency in

instructional and assessment practices (Yoo, 2016). Gibson and Dembo (1984) contended that teacher-efficacy could be described as an essential link between persistence and effort during instruction. The implication is that a high level of teacher-efficacy is vital to the teaching and learning process since it can positively increase student learning outcomes (Anderson et al.,1988; Midgley et al., 1988; Ross, 1992). Guskey (1988) further contended that high levels of teacher-efficacy support a teacher's effort to keep abreast of current best trends and practices and encourage teachers to foster resilience in meeting learning needs. Ashton and Webb (1986) concurred that a high level of teacher- efficacy supports proactiveness and is an indicator of strategic planning and organization. Teacher-efficacy assumes that outcomes are dependent on teachers' behavior (Pajares,1996; Woolfolk, 2007). Bandura (1997) further states that teacher-efficacy is guided by a teacher's intrinsic nature and is used to execute specific tasks based on the perception of abilities.

According to (Hoy, 2000) the operational definition of teacher self-efficacy is the expressed confidence in personal ability that a teacher uses to promote students' learning. Therefore, teacher-efficacy is an integral part of students' learning outcomes. Prior research focused on the general concept of teacher-efficacy but did not examine specific indicators related to the teaching of eighth-grade mathematics within the context of SBE and 21st-century learning (Snyder & Fisk, 2016; Swackhamer et al., .2009; Troia, Graham, 2016). High levels of teacher-efficacy can lead to positive and practical behavioral changes in teachers related to SBE and 21st-century-skills. Therefore, it is crucial to investigate the influence of teacher-efficacy on the implementation of SBE in the eight-grade mathematics classroom. This study will explore teacher-efficacy of eighth-grade mathematics and SBE within a 21st-century framework.

Teacher-efficacy is the foundation of a teacher's belief system and is a crucial factor for supporting student's classroom performance. Therefore, teachers must demonstrate professional competency as they execute instructional practice to improve students' academic performance. Self-efficacy beliefs provide the framework for motivation, resilience, and achievement (Pajares, 1996). The success of students depends on teacher motivation and resilience. Young (2018) suggested that the successful implementation of SBE demands that teachers demonstrate strength and flexibility to meet the curriculum's demands. When the concept of teacher-efficacy is addressed, the reason for teachers' behavior becomes better defined, and the administration will be better equipped to assist them with their learning styles. Teacher-efficacy, the belief a teacher can make a difference, is vital for student success in the classroom and must be motivated to accept the challenges of teaching (Chen, 2019). Teachers must feel motivated to take the challenges of education. The research's foundation is based on each theory's respective contribution. It is crucial in understanding how eighth-grade mathematics teachers perceive their ability to implement instructional strategies that align with SBE. The ideas support developing and maintaining positive teacher qualities that will facilitate life-long learning (Giles et al., 2016).

This research provides a much-needed resource for curriculum specialists and eighth-grade mathematics teachers in professional development sessions. Thus, information gathered from these theoretical foundations can provide targeted professional learning that will significantly impact increasing eighth-grade mathematics teacher-efficacy within a 21st-century framework. Therefore, both theories were relevant for this study because self-efficacy is the core of an individual's belief to influence change. At the same time, locus of control refers to one's belief about an outcome. Simultaneously, teacher-efficacy may be defined as a teacher's

perception of personal ability to take affirmative action. Each theory provides a unique perspective and creates a synchronization that provides the essential framework for grounding the research (Cayirdag, 2017). The research's foundation was based on each theory's respective contribution. It is crucial in understanding how eighth-grade mathematics teachers perceive their ability to implement instructional strategies that align with SBE.

Related Literature

Over the last two decades, stakeholders have expressed concern over the nation's public education system (Carter et al., 2020; Deas, 2018; Greer, 2018). *A Nation at Risk* (1983) was one of the first documents to illustrate inadequacy in the educational system (National Commission on Excellence in Education, 1983). The report indicated that nearly 50% of United States high school graduates were underprepared for the 21st-century workplace (Hoel & Mason, 2018; Partnership for 21st-century-skills, 2006). Furthermore, the report cited that student in the US were underperforming compared to their peers in other first-world countries (Gardner et al., 1983). The information also supported the claim that the quality of education in the United States was rapidly declining (Coburn et al., 2016; Koedel et al., 2017; Young, 2018).

Several initiatives, such as the Every Student Succeeds Act of (2015), have been implemented to improve student's performance and help the United States regain global educational prominence (Klein, 2016). Studies found that while initiatives such as the NCLB Act of 2001 succeeded in developing highly qualified teachers and school accountability. However, the NCLB Act also had unintended consequences that cause struggling schools to increase the achievement gap between students of differing socio-economic standards (Desimone & Pak (2017; Supovitz, 2017; Young, 2018). These studies suggest that many schools have failed to implement SBE coherently, and as a result, there are negative consequences, especially for minority groups

such as African American students. Researchers found that the disparities in students' performance were related to race and socioeconomic status. Students from affluent neighborhoods tend to outperform their peers from the low-socioeconomic background because they enter school with higher levels of preparedness and resources.

Additionally, disadvantaged students are not given adequate resources to help them make significant progress (Bonner et al.,2018; Young, 2018; Young et al.,2018). While supporters of SBE argue the policy resulted in substantial improvements in education (Deas, 2018; Petrilli, 2020). Other researchers argue the policy's limitations towards educational reform (Kornhaber et al., 2017; Polikoff, 2020). The disagreement resulted in another intense educational reform phase that culminated in SBE.

Many critics of SBE deemed the policy ill-prepared with significant administrative and technical drawbacks that would negatively affect students (Bonner et al.; Edgerton & Desimone, 2018; Polikoff, 2020; Young, 2018). School systems faced the annual challenge of producing data that satisfy federally mandated levels of students' proficiency at the risk of losing funding (Edgerton, 2019; Floden,2017; Loveless, 2020). Adequate funding and accreditation for schools are dependent on the successful implementation and maintenance of the required federally funded established standards (Zuber & Altrichter, 2018). Therefore, schools must continually develop new approaches to educate students toward success.

The focus of SBE is to develop educational practices that will allow for more equitable student outcomes (Bonner et al., 2018). States are mandated to use standardized testing data to evaluate teachers, principals, schools, systems annually. SBE encourages educators to assess and adopt programs that work best in schools. The rigor of the accountability system emphasizes the obligations of teachers, schools, state and local educational agencies to implement SBE (Rentner

et al., 2017). Furthermore, SBE uses standardized assessments to determine students' mastery of pre-established required outcomes; the data is then compared to other student outcomes in the states and national (Colburn et al., 2016). The comparison can demonstrate unfair advantages based on social and economic factors (Young, 2018). According to Young (2018). SBE promotes a curriculum that is content-specific and yet fails to account for differences in learning needs.

Overview of Standard Based Reform

With the advent of increased technology during the 1990s and 2000's the content areas of mathematics, science, and technology became focus areas, as the nation continued to search for solutions to avert the educational crisis (National Center for Educational Statistics, 2000; Drew et al.,2018). Policymakers and stakeholders disagreed on the appropriate course of action is. The consensus, however, was that there was a dire need for education reform (Young,2018). Ultimately, policymakers believed that public education would be successful with SBE and the skills of the over three million classroom teachers nationwide (Smith et al., 2017). Consequently, SBE was implemented and was viewed by many as a reasonable response to the much-needed educational reform (Young, 2018).

SBE developed from the *No Child Left Behind policy* (NCLB, 2001) and is considered by many stakeholders as a system of monitoring and accountability (Rentner et al., 2017). Most of the nation's public kindergarten-through-secondary (K-12) schools have adopted the national curricular or learning standards and have established the required accountability system through testing (ASCD 2016; Bennett, 2016; Young, 2018). One of NCLB's recommendations (2001) was that school systems should hire highly qualified teachers in their content areas to improve students' performance. However, the policy did not use a standardized definition for highly qualified teachers, and as a result, each state had its interpretation of the policy. Furthermore,

schools were understaffed because of teachers' shortage in the mathematics and science content areas (Greer, 2018; Deas, 2018). Critics argued that high qualifications and certifications to teach do not necessarily promote learning at a proficient level (Strauss, 2016). However, the combination of the NCLB (2001) policy and the implementation of SBE has changed American education (ASCD, 2016). Researchers found discrepancies in how teachers interpret and execute classroom practice (Greer,2018; Young, 2018). Davis et al. (2017) attributed the differences to vague descriptions and lack of curricular cohesiveness as presented by the standards. Furthermore, Davis et al. (2017) argued that teachers view the measures as divorced from the established standards of mathematical practices.

Policymakers justified the rationale for implementing SBE based on the premise that the reform would include consistency and instructional guidance around prescribed learning standards nationally (Bonner et al., 2018; Howard & Miller, 2016; Greer, 2018; Young, 2018). Perhaps the most significant reason was that the policy would purposefully align curricular practices and improve classroom teaching and learning (Kane et al., 2016; Polikoff, 2017). However, recent studies have concluded that there is no decisive data that supports the instructional alignment of standards to teacher quality (Desimone et al., 2016; Stecher et al., 2018). Furthermore, opponents of the policy's premise of consistency have been criticized because they believe that the standards are not clearly defined and left up to teachers for interpretation (ASCD; Polikoff, 2018). Other critics contended that the curriculum materials do not support the standards and that teachers encounter difficulties assessing quality curriculum materials to align to the standards (Polikoff, 2018). Consequently, there are unanswered questions about how to adequately prepare teachers to implement SBE successfully and close the

learning gap of underachievers and thus increase students' performance in mathematics (Ajayi, 2016).

Other proponents claimed that the framework for SBE was designed from a data-driven background that would support efficiency in meeting a quality education (Pak & Desimone, 2019). However, critics of SBE argue that the evidence used to determine the policy's success is inconclusive (Polikoff, 2017; Supovitz et al., 2016). Some stakeholders view the policy as unfair to teachers since the success or failure of school systems is determined by the students' end-of-year performance on state tests (Bonner et al., 2018; Cox et al., 2018; Dexter 2015; Yost 2015). Furthermore, teachers encounter many barriers that are beyond their control during the teaching and learning process. These barriers may include economic factors such as school funding and available resources, compounded with social issues such as diversity in the student population (Howard & Miller,2016). Other concerns include a fundamental disconnect between administrative policies and standard classroom implementation practices (Greer,2018).

Furthermore, Greer (2018) claimed that a standard generic model of SBE would be beneficial to the classroom and instructional practices. The overarching conclusion is that there is a lack of research about vertical and horizontal alignment between grade levels (Barlow et al., 2018). Aligning the grade levels will allow teachers to make necessary adjustments in aligning standards to content materials and other needed resources (Lalor, 2016). Previous research also cited inconsistencies with SBE in measuring schools' accountability (Bonner et al., 2018; Greer, 2018; Young, 2018). It is fair to assume that the successful implementation of SBE in mathematics requires a high level of teacher-efficacy. However, there is a lack of research on eighth-grade mathematics teachers' perception of teacher-efficacy and implementing SBE (Drew et al., 2017). Consequently, there is a need to investigate how eighth-grade mathematics teachers

with high-self efficacy approach the difficulties encountered in implementing SBE in a 21st-century framework.

Mathematics and Standards-Based Education

The primary focus of SBE is to set goals for teaching and learning (Lalor, 2016). The National Council of Teachers of Mathematics (NCTM) is the largest educational organization that focuses on mathematics (NCTM, 2020). NCTM has delineated the specific structure, purposes, and mathematical standards methods (NCTM,2000). One principal purpose of the mathematical standards is to provide "national cohesion" in the k-12 learning environment (Durand et al. 2016, p.100). The NCTM premise supports uniformity of the standards, promotes accountability, and offers the possibility of comparing students' performance nationally (Greer, 2018). Policymakers justified the introduction and cohesive nature of the standards by claiming that measures "were necessary for national economic competitiveness in an increasingly global economy" (Deas, 2018, p.48).

The NCTM further recommends that mathematical standard includes a required set of grade-based conceptual skills and competencies that students should acquire yearly (NCTM, 2000). The NCTM keeping in tandem with the need for reformed practices in mathematics emphasizes the relevance for teaching 21st-century mathematical skills that focuses on problem-solving, communication, connections, and reasoning. Changes in mathematical techniques are inevitable to meet societal demands and increase global workforce competition (Letwinsky, 2017). Thus, students must be prepared to function in a technologically driven world that needs highly skilled employees equipped with mathematical knowledge and are adept at using critical thinking skills. The content area of mathematics has come under intense scrutiny and drives reform efforts locally and nationally (Bonner et al., 2018; Young, 2017).

Adopting an SBE curricular in United States K-12 schools represents a significant shift in instructional practices (Smith et al., 2017). Furthermore, the advocates claimed that the SBE curriculum allows for consistency in implementing the standards and fosters a collaborative culture across local and state school systems (Deas, 2018). The rationale provided by policymakers reflected the National Governors' Association and Council of Chief State School Officers' recommendations. The governors' association added to the explanation by claiming that the standards would enable the United States education system to improve international academic ranking and global competitiveness (National Governors' Association, 2009). Proponents further asserted that a variegated SBE curriculum and assessment approach would mitigate the reform initiative (Deas, 2018).

One essential component of SBE is the aligning of the standards with a standardized method of assessment. Once again, policymakers provided the rationale that SBE would close the achievement gap and ensure that all students are college and career-ready (U.S. Department of Education, 2010). The standards represent the purposeful intent of focusing instructional practices on conceptual understanding with procedural fluency (Common State Standards Initiative, Core 2016a; Jansen et al., 2017; Smith et al., 2017). The constructivist theories of learning support SBE in the mathematics content area and emphasizes an active and authentic approach to instructional practice (Smith et al.,2017).

Research indicated that almost 90% of middle school mathematics assessments utilized skills and fluency, while less than 33% required written explanations from students to justify their thought process (Sawchuk, 2018). Critics claim that the mandatory requirement for standardized testing makes SBE inefficient (Young,2018). However, opponents of SBE claimed that standardized testing promotes a culture that stifles teachers’ creativity and forces them to

teach to the test to satisfy the policy's federal accountability component (Cooperative Study of Secondary Schools Standards,1939, p. 163).

Most importantly, critics of SBE contended that reports from the National Assessment of Educational Progress (NAEP) show that eighth-grade mathematics students are still underperforming and still require remediation. Greer (2018) argued that the SBE approach lacks cohesiveness in its ability to meet all learners' needs. The implication is that while SBE reform seems intent on rigor in preparing students for higher education, the achievement gap is widening in the mathematics content area (Desilver, 2017). Furthermore, researchers have found that some minority students are still underperforming and consistently lack available comprehensive resources (Kornhaber et al., 2014).

Mathematics is a significant area of the core curriculum, frequently depicted as a low-performing area (Desilver, 2017; NAEP 2018). Critics argue that students' poor performance at the middle school level is a crucial area in which the United States needs to demonstrate growth (Bonner et al., 2018; Desilver, 201; Sawchuk, 2018). Reports from the Program for International Student Assessment (PISA) indicated that the United States is currently ranked 36 out of 79 countries (PISA, 2019). The PISA (2019) results depicted a slight increase in eighth-grade mathematics. However, statistical analysts cautioned stakeholders that the growth is within the margin of error and insignificant. Comparing the data to the 2015 school year indicated a lower performance by students (Camera, 2019). Furthermore, (Camera, 2019) averred that PISA results reinforced the National Assessment of Educational Progress (NAEP) for the same year, which showed a decline in eighth-grade mathematics students' performance.

Education reform requires a clearly defined curriculum that guides teachers regarding mathematics curriculum standards (Koedel et al., 2017). Research has shown that the quality of

mathematics curricula must improve to ensure that all students receive opportunities to succeed in mathematics (Bonner et al., 2018; Desilver, 201; Sawchuk, 2018). Researchers argue that the concept of teacher-efficacy and locus of control are related to the classroom environment and guides the general practices in the teaching and learning process (Dofková & Kvintová, 2017). Other research indicated that high levels of teacher-efficacy in mathematics resulted in teacher qualities that depicted perseverance and creativity in implementing the prescribed mathematical standards (Snyder, & Fisk, 2016). Consequently, this study explored the perception of eight-grade mathematics teacher-efficacy and SBE within a 21st-century framework based on the literature gap.

The Impact of Standards-Based Education, Mathematics, and Student Diversity

The reauthorized Individuals with Disabilities Education Act (IDEA) was signed into law on December 3, 2004, and became effective on July 1, 2005, the United States Department of Education (USDOE, 2016). The mandate ensures that students with or without disabilities be treated equitably in the least restrictive learning environment because of the benefits it affords learners (Capp, 2017; Whitnack et al.,2019). According to (USDOE, 2016) students may be diagnosed as having a learning disability if they are underperforming compared to their peers of similar age or fail to meet state-approved grade-level standards after exposure to learning experiences for their period or state-approved grade-level criteria. Furthermore, the (USDOE 2016) argues that students who consistently fail to meet minimum computational skills and problem-solving progress have a learning disability. As a result, the law ensures that students with disabilities are relatively represented in the K-12 students' population. (Whitnack et al., 2019). Carnoy & García, 2017 asserted that the IDEA mandate challenge educators to provide essential and unique instructional support for students with disabilities so that they have equal

access to general education. Teachers are implicitly required to adjust existing instructional practices to improve learning (Ohito and Oyler 2017).

Additionally, the introduction of SBE reform has caused a shift in how teachers implement mathematics curricula and classroom practices. SBE has led to radical changes to curriculum practices and relies significantly on teacher-efficacy for successful implementation (Whitmyer, 2016). The overarching aim of SBE is to improve the quality of education for students across content areas (Common core state initiatives, 2017). Educators struggle with the increasing mandate to provide a quality education that satisfies all learners' learning needs (Besterman et al., 2018; Hughes & Yakubova, 2019). Whitenack et al. (2019) asserted that there is a need to include English language learners with students with learning disabilities. Eichhorn et al. (2019) reiterated that the English language learners' population in K-12 learning environments had increased significantly.

Furthermore, Eichhorn et al. (2019) contended that many English language learners in the sub-group of the K-12 student population are eligible for special education placement because of communication issues that bear no relation to the presence of a disability. Therefore, technology offers the opportunity to capitalize on English language learners' strengths and meet their academic needs rather than focusing on their limitations (Center for Applied Special Technology, 2018). (CAST).

According to Whitnack et al. (2019) and Greer (2018), English language learners are frequently underrepresented in the student population group that requires customized learning. Thus, the implication is for educators to plan instructions and teach so that students achieve success purposefully. However, technology integration into mathematics instructions offers a viable solution to diversity in classrooms (Yakubova et al., 2016). Technology integration aligns

with current trends and best practices as schools prepare students for the global workforce (de Koster et al.,2017). In the content area of mathematics, SBE focus on mathematical understanding through advanced development in both conceptual knowledge and procedural skill (Common core State Initiatives,2017; NCTM, 2000; Van Boxtel, 2016). The mathematics content standards are prescriptive and specify students' knowledge at each grade level (Greer,2018). Mathematical practice standards further support the content standards. Standards for mathematical practices emphasize grade-level skills, processes, and procedures (NCTM, 2000). According to research, conceptual understanding, and the ability to justify procedural processing are equally important in developing students' critical thinking skills (Lloyd et al., 2016; NGA, 2010; Turner & Drake, 2016). SBE reform in the content area of mathematics aims to develop independent thinking skills in all students (NCTM, 2000).

Thus, the SBE reform encourages instructional practices that build students' confidence and perseverance as they encounter problem-solving. Van De Walle et al. (2016) contended that for students to become proficient in problem-solving mathematics, teachers must be accoutered with techniques and viable instructional practices that support the culture of students' accountability. The challenge is further escalated as teachers work to meet the demands of high stakes testing that satisfy federal and state mandates (Young, 2017). The consensus is that while teachers need to provide opportunities for the diverse student population of learners to become confident and booming in mathematics classes, other limiting factors thwarts the process. Van Boxtel (2017) argued that while proponents view SBE as the antidote to the education dilemma in the 21st-century. A notable drawback is that the standards are limited in identifying and meeting clearly defined actions needed to support exceptional students and students who are not traditionally English speakers and perform below grade-level expectations. Therefore, SBE

remains elusive in meeting students with disabilities' needs since customized curriculum plans generally guide them.

Bouck et al. (2018) contended that the mathematics performance of students with disabilities and the English Language learner population in k- 12 learning environments is an indicator of curriculum success for schools. The implication is for educators to include curricula planning that strengthens students' academic experience in these subgroups of the K-12 student population. Furthermore, researchers found that students with disabilities and students with limited English language ability are consistently underperforming in mathematics, as indicated by reports from NAEP (Bouck et al., 2018; The Nation's Report Card, 2016; Whitenack et al., 2019). The report stated that students with disabilities in the K-12 student population underperformed compared to their peers without disabilities in the same age groups on standardized mathematics assessments (The Nation's Report Card, 2016). The implication is that schools need to be proactive to improve students' mathematics performance despite disabilities. Thus, educational experts suggested that the successful implementation of SBE requires teachers to align curriculum and instruction with its paradigm (Bouck et al., 2018; Common core State Initiatives, 2017). According to research, the paradigm shift will ensure that teaching reaches all learners and complements the rigorous expectations of each mathematical standard (Ortiz and Robertson 2018; Whitenack et al., 2019).

Bouck et al. (2018) argued that the population of students with disabilities is classified into sub-groups. One of the subgroups is students with learning disabilities in mathematics. Some students with learning disabilities experience challenges in mathematics, such as organizational challenges, low or limited problem-solving strategies, problems with computational skills, and limited working and long-term memory (Tomlinson, 2014). Experts in

exceptional learning recommended using various practical instructional strategies to combat the challenges faced by these learners (Agrawal & Morin, 2016; Bouck et al., 2017; Tomlinson, 2014). Among the offered strategies to combat the learning deficiencies are differentiation, explicit instruction, computer-assisted instruction, mnemonic strategy instruction, schema-based instruction, and incorporating the universal design for learning (UDL) into curriculum planning. UDL is a curriculum practice that includes instructional strategies that help to give all students an equal opportunity to succeed (Grant & McTighe,2005). These strategies are not inclusive of customized learning and can be included in the UDL curriculum plan. The UDL is based on a scientific approach to learning and encourages teachers to focus on students' individual learning needs. The UDL curriculum design is flexible and allows teachers to integrate adaptable differentiation strategies (Elchorn et al., 2019). Research shows that teachers who intentionally adjust mathematical instruction and include various engaging techniques significantly reduce barriers to increased student learning (Council of Chief State School Officers, 2016).

Studies in special education and SBE have contended that the use of manipulatives is beneficial to secondary students with disabilities in developing conceptual skills such as fractions (Bouck et al., 2018; Jitendra et al., 2016; Root et al., 2017; Satsangi et al., 2016; Siyam, 2019). The NCTM (2000) considers manipulatives essential in developing abstract mathematical concepts and benefits all students, especially students with disabilities. Lambert (2018) and Takemae et al. (2018) have urged school leaders to provide resources that will engage students with disabilities and help them to make sense of concepts. Takemae et al. (2018) also proposed restructuring teacher training programs as a practical solution for maintaining federal guidelines and improving the quality of education for all learners. Furthermore, researchers suggested an improved teacher training program will equip teachers with the essential skills and knowledge

for combatting barriers that prevent learning in the classroom (Besterman et al., 2018; Takemae et al.,2018; Lloyd & Howell, 2019). Additionally, Takemae et al. (2018) asserted that teachers should be mandated to participate in frequent professional development exercises to improve their instructional quality.

Approaches to Student Diversity and 21st-Century Skills

Florian (2017) contended that educators should perceive diversity as a reflection of the global community and plan instructions to satisfy global needs. Additionally, (Florian 2017; Paris & Alim, 2017) stated that embracing diversity in the student population will remove marginalized and improve students' learning experiences. Therefore, educational reform, such as SBE, can be beneficial to all learners if curriculum practices recognize each student with unique educational needs (Blanton et al., 2017). According to Santos et al. (2017), technology provides significant benefits to the diverse student population. Technology is specifically helpful to students with disabilities and English language learners' progress. The art of technology allows the diverse student population to visualize and manipulate tools to develop conceptual skills and understanding (de Koster et al., 2017).

Ashraf (2019) asserted that 21st-century-skills in instructional practices foster improved student performance. Bouck et al. (2017) found that integrating technology into mathematics classrooms has significant benefits to students with disabilities in middle school grades. However, Bouck et al. (2017) cautioned teachers to use apps and tools of high quality and socially appropriate for middle school students. Being mindful of the technology tools' social viability and appropriateness will increase students' confidence and academic performance. Akmal (2017) further asserted that technology integration is the answer to the dilemma that education faces. Kessler and Hubbard (2017) contended that integrating technology into

traditional classroom practices can shift from an environment that is teacher-centered to one that is student-centered. A student-centered environment promotes independent learners and creates an engaging and interactive learning environment (Bowen & Peterson, 2019; El Shaban, 2018). Orak and Demirci (2018) contended that active learners use their cognitive skills to explore and make connections between existing knowledge and new materials. Ashraf (2019) further asserted that it is essential to prepare students for living in the 21st-century by equipping students with the required knowledge and skills to foster critical thinking skills, the art of communicating, innovation, and collaboration.

Nelson et al. (2016) found that 21st-century learning environments provide positive learning experiences for all learners and mimics the global community. Nelson (2016) further asserted that integrating technology into instructional practices provides an effective means to enhance learning. Students employ technology to practice the required skills and concepts for mastery consistently. Tomlinson (2014) asserted that technology allows students with disabilities to learn at their levels and hence develop master concepts. Technology will enable teachers to differentiate instructions which will improve students' learning. Differentiation using technology provides a balance for all students and allows each student to work confidently in mastering content and skills at their specific competency level (Hughes, & Yakubova, 2019). Consequently, students with disabilities are also allowed to experience success.

Integrating technology supports the implementation of SBE in the content area of mathematics because it provides evidence of students' performance (Bouck et al., 2017; Common Core State Standards Initiative, 2017; National Center on Intensive Intervention, 2016; Watt & Therrien, 2016). Hughes and Yakubova (2016) asserted that technology tools are significant in increasing students' mathematical performance with disabilities. The technology

supports the customized plans of students with disabilities and reinforces essential conceptual skills. Technology includes games and apps that document students' data as they practice conceptual and procedural skills (Haßler et al., 2016; Satsangi et al., 2016). Technology integration should be implemented based on criteria aligned with standards (NGA, 2010). Teachers are, therefore, equipped with data to make informed decisions related to students' performance. Before implementing technology into instructional practice, teachers are encouraged to be personally conversant with manipulating them (Nelson et al.,2016).

Nelson et al. (2016) further recommended that mathematics teachers use various strategies to alleviate frustrations for themselves and students during technology implementation. The methods include scheduling times for using the technology and identifying software and hardware platforms for building specific concepts and having a clearly defined strategic plan for monitoring students' use and storage of the devices. Proactive planning will thwart related obstacles with the implementation (Besterman et al., 2018; Nelson et al., 2016). The implication is for teachers to provide guidance and clarity for students with the integration of technology. Ultimately, a change in mathematics instructional practices and the provision of appropriate accommodations, supports, and the meaningful integration of technology will maintain a culture of increased learning for all students, including students with disabilities and English language learners (Besterman et al., 2018).

Mathematics Teacher-Efficacy and 21st-Century Practices

Smith et al. (2017) suggested that the SBE proposed reform in pedagogical practices indicated a basic level of success among middle school students compared to their high school counterparts. The conceptual pedagogical approach utilizes an exploration of concepts using available technology tools to support the learning of required concepts. Research indicated that 21st-century instructional technology tools are becoming a standard part of instructional practices in mathematics classrooms because they improve learning outcomes (Turk, & Akyuz, 2016). Letwinsky (2018) argued that it is vital to integrate 21st-century-skills seamlessly with mathematical practices.

Nepo (2017) argues that technology should improve students' learning and prepare them for functioning efficiently in the global workforce. 21st-century-skills satisfy the primary purpose of schooling and prepare students for higher education and international employment. Many studies showed that technology positively affects students' performance (Edwards et al., 2017; Foster et al., 2016; Kitchen & Berk, 2016; Takači et al., 2017). Experts in educational reform recognize the importance of integrating technology with instructional practices to help the U.S. regain dominance in education (Anglum et al., 2000; Kaufman et al.,2019; Loveland et al., 2020). Other studies suggested that technology integration into the mathematics classroom holds the promise of increasing positive learning outcomes, fostering innovation and creativity that will address critical global issues such as cybersecurity attacks (Love & Strimel, 2016). The United States Department of Education continues to push for technology integration in classrooms across the country (Bakir 2016; Ronan 2018).

However, integrating technology into the process of instructional practice is difficult. Teachers encounter varying obstacles such as training and, in some cases, up-to-date technology

resources (Moye & Reed,2020). Ronan (2018) asserted that implementing reformed pedagogical practices further challenges integrating technology across content areas. Li et al. (2019) contended that technology implementation is a significant part of curriculum reformation. Call to Action and P21's Framework for 21st-century learning are initiatives that support technology inclusion in classroom practices (U. S. Department of Education, Office of Educational Technology, 2010).

The focus of technology integration aligns perfectly with the SBE since they aim to develop students' critical thinking skills in preparation for a globally competitive world (P21, 2009). Furthermore, major educational organizations such as the NCTM support integrating 21st-century-skills into mathematics teaching (Lloyd &Howell, 2019; NCTM 2017). Technology provides a medium where students can explore mathematical concepts to foster deeper understanding (Tondeur et al., 2019). Furthermore, technology promotes a culture of inquiry and discovery, and as such, students become more interactive and engaged in learning, which supports knowledge retention (Edwards et al., 2017). Teachers are crucial to the pedagogical reformation regarding the use of technology in mathematical instructional practices (Tondeur et al., 2017). However, the successful integration of 21st-century-skills is dependent on several critical components; significant among these vital components are the factors of high teacher-efficacy and positive outcome beliefs.

Letwinsky (2017) argued that teachers' attitudes toward technology integration influence the level of teacher-efficacy. High-teacher-efficacy is a significant indicator of a teachers' willingness to embrace technology with new instructional designs (Letwinsky, 2017; Tondeur et al., 2017). Bowman (2018) found that teachers with low teacher -efficacy are more likely to exhibit a negative attitude towards technology integration. Bowman (2018) further argued that

teachers with low self-efficacy view technology integration as overly problematic and less likely to willingly engage in technology reform practices.

Bulman and Fairlie (2016) found that while there is an increase in the availability of 21st-century technology tools, there is a notable reluctance on the part of some teachers to integrate technology in classroom instructions. In contrast, previous research suggested that experience is an indicator of a teacher's willingness to incorporate technology into their instructional practices (Li et al., 2019). Engaging students in diverse, active, and authentic learning experiences are the aims of the mathematics reform process. Thus, instructional reform in mathematics supports life-long learning. However, with the change in instructional practices comes the risk of alienating teachers who view their ability to integrate technology as less than competent. Teachers' belief systems and experience will guide their responses to a shift in instructional practices and SBE implementation practices (Li et al., 2019). Bulman and Fairlie (2016) suggested that teachers' beliefs are directly proportional to their teaching and thoughts about teaching and learning mathematics.

Consequently, low teacher-efficacy can foster poor technology perception in teachers and decrease the chance of integrating technology in the classroom (Thomson et al., 2017). Research focusing on teacher-efficacy and mathematics is conducted at the elementary level (Lee et al.,2017; Polly et al.,2017). However, a lack of research provides information about teacher-efficacy and technology integration in the mathematics classroom at the eighth-grade level (Smith et al., 2017). This literature gap offered the opportunity to investigate the perception of eighth-grade mathematics teachers' efficacy in using technology to implement SBE within a 21st-century framework.

Professional Development and SBE Within a 21st-Century Framework

Researchers have found that there is a need for modification in some of the stipulations that govern SBE, such as how to evaluate school performance and how to provide adequate professional development training and resources for teachers (Desimone et al., 2016; Hill et al., 2017; Kaufman et al., 2018). Lalor (2016) contended that instructional resources must be strongly aligned to standards to achieve positive and measurable learning outcomes. Many of the barriers to implementing SBE in mathematics classrooms require significant adjustment from the mathematics teacher. The expected rigor is a new concept for many teachers (Crowley, 2017; Desimone & Hill, 2017; Pak et al., 2020). Although teacher training and experience practically prepare the mathematics teachers' conceptual knowledge, they may be inadequate in preparing them for the rigor of educational reform related to SBE implementation within a 21st-century framework (Lu & Bonner 2016). Teachers may be more apt to rely on procedural knowledge and traditional teaching practices. Traditional teacher-centered pedagogical strategies defeat the aim of SBE because they focus on strategies that the teacher believes students should know.

Furthermore, in the teacher-centered approach, students take a passive role in their learning and miss opportunities for developing 21st-century-skills such as collaboration and critical thinking (Lalor, 2016). One proactive solution to this dilemma is to provide frequent professional development training for SBE. Pak and Desimone (2019) contended that school leaders should ensure adequate professional development workshops to deal with the lack of training in SBE for teachers. Other studies also indicated that professional development workshops are essential to implementing SBE in mathematics (Deas,2018; Edgerton & Desimone, 2018; Vantassel & Johnsen, 2016).

Troia and Graham (2016) found that classroom teachers across other content areas also recognized the importance of providing frequent professional development training and resources to address the barriers that educators indicated hinder the success of SBE within a 21st-century framework. Prior research showed that professional associations such as the American Association of School Administrators (AASA), the National Association of State Boards of Education (NASBE), the National Education Association (NEA), the American Federation of Teachers (NFT), and the National School Boards (NSB) support the adoption of SBE curriculum. However, these associations are also strong advocates for the adequate provision of professional development and curriculum resources (Deas, 2018, p.50). Other professional teacher organizations, such as the (NEA), are specifically concerned with the process of creating mathematical standards. However, these organizations support local representatives from the mathematics content area in the reform process (National Education Association, 2009). Hence, organizations such as NEA accept SBE on conditions that the policy will make amendments that will include frequent professional development from the local representatives (Barlow et al., 2018).

The NCTM (2009) argued that professional development workshops are needed to support teachers in accurately aligning the standards vertically and horizontally. According to NCTM (2009), aligning the standards among grade levels will help uniformity and cohesion among grade levels nationally. NCTM (2009) further highlighted that too much emphasis is placed on fractional concepts, while other areas such as statistics and data analysis are underemphasized. According to NCTM (2009), professional development will guide teachers in teaching the mathematical strands. Deas (2018) argued that meaningful professional development would overcome obstacles associated with the implementation of SBE.

Professional development is needed to support the implementation of technology integration and to drive the focus of developing mathematical understanding during instructional practices (Deas, 2018, p.50).

Mathematics teachers must be provided with professional development activities that will serve the dual purpose of increasing conceptual knowledge and energizing high teacher-efficacy levels (Zengler, 2017). High levels of teacher-efficacy are significant for preparing teachers to improve instructional quality in a 21st-century teaching-learning environment (Carney et al., 2016). Hence, professional development will positively influence teachers' confidence in their ability to teach mathematical concepts and ultimately increase teacher-efficacy (Amador et al., 2017). Letwinsky (2017) purported that increased teacher-efficacy levels lead to an increased willingness to continue mathematical reform practices. Previous research at the elementary level suggested that mathematical reform practices include implementing innovative procedures associated with 21st-century-skills (Drew et al., 2017). Based on these assumptions and the lack of literature related to 21st-century practices in mathematics and the implementation of SBE at the eighth-grade level, further research is needed to examine eighth-grade mathematics teachers' perceptions of teacher-efficacy and professional development in executing SBE in a 21st-century environment (Amador, 2017; Appova & Taylor, 2020)

Summary

The successful implementation of SBE within a 21st-century framework relies on teacher-efficacy and outcomes belief systems (Campbell et al.,2018; Zimmerman,2018). High levels of teacher-efficacy support 21st-century-skills immersed in a culture of technology-rich environments. SBE requires that teachers endorse authentic approaches to develop conceptual understanding in mathematical instruction. Previous research suggested that systematic

professional development programs help develop high teacher- efficacy and prepare teachers to adapt to reformation practices (Burkhauser, & Lesaux, 2017; Gresham, 2017; Remillard & Kim, 2017).

The eighth-grade year is made complicated by transitioning as well as students' developmental needs. This adolescence period marks an essential milestone in developing students' early career aspirations and educational opportunities (Martinez & Castellanos 2018). Howard and Miller (2016) averred that learners' success at this development stage depends on teachers' professional expectations. Howard and Miller (2016) further contended that high expectations encourage middle school students in conceptual development. In contrast to Howard and Miller (2016), Busey and Russell (2016) advocated for an integrated approach to instructional practices at the middle school level.

According to Busey and Russell (2016), using the integrated approach to curriculum instruction at the middle school level is pedagogically appropriate since adolescents are social by nature. The study by Busey and Russell (2016) further posited that the integrated approach supports diversity and culture while preparing students for the global society. Critical thinking is a necessary component of 21st-century-skills; therefore, both methods are relevant to reforming instructional practices in mathematics at the eighth-grade level.

Educators in the United States are rising to the challenge of demonstrating optimal performance in the era of educational reform. High levels of teacher-efficacy are the cornerstone behind SBE and are necessary to prepare students for functioning in a globally competitive world. One of The No Child Left Behind Act (2001) stipulations was the requirement for highly qualified teachers. The term indicated the need for teachers' who embodied extraordinary teaching abilities but made no reference to teacher-efficacy. However, further research is needed

to explore the perception of eighth-grade teachers related to teacher-efficacy and the implementation of SBE mathematics content within a 21st-century framework (Donohoo, 2018; Lee et al., 2017).

CHAPTER THREE: METHODS

Overview

The purpose of this case study was to describe eighth-grade mathematics teachers' perception of teacher-efficacy and SBE within a 21st-century framework at a large suburban school district in North Carolina. Case study research began in anthropology and social science (Creswell & Poth, 2018) and is the appropriate methodology for the current research since it focuses on understanding people. Chapter three provides a clear overview of the research design by explicitly identifying and addressing the following components: research questions, participants, setting, procedures, data collection, researcher's role, data analysis techniques, trustworthiness, and ethical considerations.

Design

Quantitative and qualitative research methodologies are used to investigate and represent diverse perspectives (Hammarberg & Kirkman, 2016). Quantitative research employs numerical data to make inferences, while the qualitative research method uses nonnumerical and unquantifiable factors such as words and emotions to determine conclusions and make informed decisions. Creswell and Poth (2018) stated that qualitative researchers use multi-methods of investigation to gather nonnumerical data while focusing on a phenomenon's meaning. The qualitative research method involves using various interpretive strategies in naturalistic settings to make sense of an issue. Applying the qualitative research procedures ensures that the topic is explored through different perspectives and allows the phenomenon to be revealed and understood. Creswell and Poth (2018) further asserted that qualitative research searches for answers to questions explaining why and how humans behave in social interactions. Both qualitative and quantitative methods were applicable for this research; however, I chose a

qualitative methodology because this design provides the opportunity to gain an in-depth frame of reference of eighth-grade mathematics teacher-efficacy and SBE within the 21st-century framework from the narratives of the participants. The case study allowed me to provide a narrative that focused on eighth-grade mathematics teachers' experiences.

A case study methodology provides opportunities for delving deeply into specific questions while maintaining an overall real-world view (Yin, 2018). Thus, a qualitative case study research method was chosen for this investigation because the central goal was to explore, describe, and understand teacher-efficacy and standards-based education (SBE) within a 21st-century framework (Creswell & Poth 2018). Furthermore, a qualitative case study was appropriate for this study because it addressed questions that specific research questions posed. It addressed "how" or "why" questions and incorporated clear propositions, cases, that links the data to the propositions, and the criterion for interpretation of the results (Yin, 2018). Furthermore, a case study approach was appropriate since I explored a phenomenon within a bounded system (Creswell & Poth 2018; Merriam, 1998; Stake 1995). Utilizing the case study design provided answers for implementing SBE and increased the phenomenon's overall understanding (Creswell & Poth, 2018; Yin, 2018). The current case study explored the richness of the phenomenon in the context of real-life (Yin, 2009) and did so through an in-depth exploration of a bounded system—four schools within one school district where participants have been part of an SBE implementation program (Creswell & Poth 2018). A case's parameter was unique since the focus was central to a situation, event, program, or phenomenon. The case in this study was bounded by its context, time, and activity. In this study, the exclusive focus was eighth-grade mathematics teachers who share a collective experience—participation in teacher-efficacy and implementing SBE within a 21st-century framework.

I used a single instrumental case study design to explore the phenomenon of teacher-efficacy and SBE in eighth-grade mathematics within a 21st-century framework (Stake, 1995; Yin, 2009). An instrumental case study illuminates aspects of a case (i.e., SBE implementation within a 21st-century framework) and how it is represented within a setting and context (Stake 2005). This case study focused on developing an understanding of lived experience within a specific social context. This role required me to interact within the research space and allowed me to create rich descriptions of the research context and participants. The qualitative nature of this study allowed me to rely on the perspectives and experiences of various participants (Bennett-Rappell & Northcote, 2016). The instrumental case study approach was an appropriate and was a suitable method for this study. The study allowed me to provide additional insight into the eighth-grade mathematics teachers' unique experiences with teacher-efficacy and SBE implementation within a 21st-century framework.

Research Questions

CQ: What is the perceived self-efficacy of eighth-grade mathematics teachers and standards-based education?

SQ1: What role does professional development play in fostering teacher-efficacy in standards-based education within a 21st-century learning environment?

SQ2: What role does teacher-efficacy play in using technology to implement standards-based education within a 21st-century framework?

SQ3: How do teachers perceive the role of teacher-efficacy with encountered difficulties while implementing standards-based education within a 21st-century framework?

Setting

Every qualitative case study must have a case or cases, a bounded system (Yin, 2018). The bounded system for this qualitative case study is a large suburban school district in North Carolina. The Sunshine School District (pseudonym) has a diverse school population with 18 schools in the district-ten elementary schools, four middle schools, and four high schools. The 18 schools serve over 30,000 students, with 70% of the student population classified as low socioeconomic status and eligible for free and reduced lunch. The school district employs 22,000 faculty and staff within the 18 schools and district offices.

A local education agency made up of the district office Superintendent, five Assistant Superintendents, Business Services, Human Resources, Support Services, System Operations, and the Teaching and Learning department governs the school district (LEA). Each of the four high schools is led by a principal and four assistant principals. The district operates on a traditional school calendar from August to June. Each of the four middle schools has one building principal and two assistant principals in charge of discipline issues, daily administrative and curriculum responsibilities. The elementary schools each have a principal, and two assistant principals, and an instructional coach. Each school has a leadership team and a local school improvement team involved in making school decisions.

All schools within the district are currently mandated to implement the SBE curriculum design. The district provides an annual professional development workshop that focuses on SBE implementation (Ernst et al., 2017; Mehta, 2016). To ensure that educators follow the SBE design and accountability measures, the Sunshine School District has developed pacing guides and mandatory end-of-quarter benchmark testing for each of the core subject areas. Each school uses the generated data to guide future instructional delivery. For the past ten years, the student

body's diversity has seen a significant and steady increase across the K-12 learning environment. As a result, the school district has embarked on technology integration in response to the changing demographics of the student population and their learning needs (Georgii-Hemming, 2017; Kraehe, 2019). Before the 2014-2016 school year, the school system has deemed a failure based on state assessments and annual students' performance reports. However, middle schools have indicated high growth in overall student performance for the past three years, especially in eighth-grade mathematics.

Based on needs assessment and data-driven responses, the school district focuses on 21st-century learning and adjusts instruction structures to achieve. The tenets of community partnership have profoundly influenced the framework for technology integration for 21st-century-skills (Howard, 2018; P21, 2018). Each school in the district has adopted and implemented SBE mathematics classrooms at the eighth-grade level. Professional development and county expectations are similar concerning how SBE in mathematics is implemented in each school so that teachers positively directly influence student learning. Each of the three schools participates in county on-site professional development to ensure that teachers implement SBE in the mathematics classrooms. In the classrooms, teachers incorporate SBE into instructional practices and assessments. School-specific professional development happens in individual school buildings and county-sponsored professional development at various times throughout the school year. Each of the three schools has adopted different ways to ensure students are achieving at grade-level standards. For example, Sharon Middle School has implemented a Wednesday Explorers Academy, a program where students stay after school to complete missed work. Teachers also utilize early morning help sessions, after-school detention, and parent contact to ensure the completion of work to master standards. Rosedale Middle has a gifted

education program where students are provided with extracurricular support in science and mathematics. Students are encouraged to integrate mathematical content through designs and invention.

Additionally, students in the gifted class are part of the afternoon Mathematics Scholastic Explorers. These students are supervised by two mathematics teachers who are staff advisors. The program provides enrichment in mathematics studies and prepares students for local and international mathematics competitions. Lake Middle School has adopted and implemented the center for opportunities program. The opportunity center is an after-school program geared towards students who are at risk for failing mathematics. Students are tutored in mathematics in small ability groups with up-to-date technology and manipulatives. Each student's progress is monitored and documented daily. The program offers incentives and tangible rewards in gift cards, certificates, and free passes to various games. Mathematics teachers and parent volunteers supervise the program. Pseudonyms will be used to protect each school and participant.

Sharon Middle School (SMS) has approximately 603 students. The school serves a diverse population: 80% of students are African Americans, 5% Hispanics, 10% are Caucasian, 3% are Asians, while 2% are a mixture of two or more races. The gender demographic is 51.7% male students and 48.3% female students. The school caters to students from sixth through eighth grades. There are five eighth-grade classes, each consisting of students with mixed abilities. The student-teacher ratio is approximately 17 students to one teacher. The mathematics department consists of roughly 15 teachers across grade levels. The school encourages the looping (the practice of having a teacher spending two or more years with the same group of classroom students) of classes and team teaching in mathematics. Five of the mathematics teachers are highly qualified because they each have a master's degree in education and are also

veteran teachers with more than 15 years of teaching experience. Five teachers possess lateral entry (lateral entry is the process of allowing qualified individuals to obtain a teaching position and begin teaching in a classroom while getting a professional educator's license) qualification.

In comparison, the other four teachers each possess a bachelor's degree in science. Students are grouped according to abilities in each grade level. Each grade level is divided into four teams. Most students live in depressed neighborhoods with one or both parents missing. 98% of the students qualified for free or reduced lunch. As part of the local school improvement initiative, teachers must frequently attend in-school mathematics and technology- integration workshops.

Rosedale Middle School (RMS) has a student population of approximately 1,232 students and 65 faculty and staff members. The school represents the diverse population of the community: Caucasian 66.2%, African American 15.5%, Hispanic 10.4%, Asian 4.2%, Multiracial 3.7%. 23.7% of the students are from low socio-economic backgrounds, while 16.6% of the students experience disabilities. The percentage of gifted students is 30.0% and, the percentage of English Language Learners is 1.2%. The school caters to students from grades six through eight and employs a homogenous grouping of students. The school has a gifted program for the core areas of mathematics, science, and language arts. Currently, the school has a total of six eighth-grade classes. One of the eighth-grade classes is a part of the gifted program. Each gifted program teacher is highly qualified and possesses a professional teaching license issued by the state. The state has also certified three of the four teachers in the gifted program. There are currently 20 teachers across grade levels in the mathematics department. Ten of the mathematics teachers are highly qualified, while six teachers possess lateral entry qualifications. The other

four teachers each include a first degree in science. The school has monthly departmental meetings to ensure uniformity in instructional practices.

Lake Middle School (LMS) has a total student population of 1,010. The school serves a diverse population that includes the following makeup: Caucasian 34.6%, African American 31.7%, Hispanic 19 %, Asian 10.3%, and Multiracial 4.4%; the percentage low socio-economic students is 50.8%, while the percentage of students with disabilities is 14.7%. The percentage of gifted students is 18.1%, and the percentage of English Language Learners is 4.3%. The school has 72 faculty members and staff and serves students from grades 6-8. Students are grouped heterogeneously across grade levels. There are five, eight grade classes and eighteen mathematics teachers across grade levels. Eight of the mathematics teachers are highly qualified, while five teachers possess lateral entry qualifications. The other five teachers each possess a bachelor's degree in science. The school has frequented in-house workshops to support instructional practices.

Participants

A case study allowed me to obtain an in-depth understanding of a phenomenon. Thus, researchers are obligated to find participants who will provide thick, rich perspectives of the phenomenon (Patton, 2015; Yin, 2018). I used a sample size of 12 individuals to participate in this study from a pool of over 800 faculty members from the Sunshine School District. Patton (2002) asserted that studying information-rich cases has the added benefit of producing insight and in-depth generalizations rather than empirical generalizations. Researching the characteristics of the eighth-grade mathematics teachers implementing SBE within a 21st-century framework provided valuable insights that will be added to existing literature and will provide beneficial information for educators, especially eighth-grade mathematics teachers. I used

specific criteria to select a minimum of 12 participants from middle schools in the Sunshine School District. For this study, the standard criteria were:

1. Teachers who had to implement SBE
2. Participants had to be highly qualified with a minimum of five years of experience teaching mathematics at the eighth-grade level.

In North Carolina, highly qualified means that the teacher has obtained full state certification as a teacher or has passed the state teacher licensing examination and holds a license to teach in the state. The study utilized an extreme case sample to select participants. Extreme case sampling is an exploratory qualitative research method that focuses on participants with unique or special characteristics (Creswell & Poth, 2018). Extreme case sampling fostered the discovery of themes and relationships in the data subjectively. Patton (2002) contended that an extreme case sampling method is used to select information-rich cases because they are unusual or extraordinary in some way with outstanding successes or notable failures. An extreme case sampling allowed the researcher to focus on participants with distinctive characteristics. I used an extreme case sampling approach to select the three middle schools within the Sunshine School District.

Procedures

A case study must begin with a well-developed procedural plan for data collection and analysis (Stake, 2002; Yin, 2003). A procedural plan ensures that the design is appropriate for studying the case of interest (Stake, 2002) and provides a detailed overview that promotes easy replication of the methods to be used by future researchers (Yin, 2003). The Sunshine School District and the three participating schools permitted me to collect data from the participants (Appendix F). After successfully defending my proposal, I sought and gained approval from Liberty University Institutional Review Board (Appendix B) before collecting data. The review

packet included a completed IRB application, that included the supporting documents: (Appendix B) Recruitment Email (Appendix A), Demographic survey (Appendix D), Informed Consent Form (Appendix C), participant email letter (Appendix E), field notes (Appendix F) and journal prompts (Appendix H).

Each principal of the three middle schools identified a potential pool and allowed me to email the pool of employees to gain interest. I recruited participants by inviting the entire population of 30 mathematics teachers to participate in the study by email. The email letter (Appendix E) outlined the study's purpose, participation requirements, projected time of the study, and the reason for recruitment to participate in the study. After the participants responded to the email, I emailed the demographic survey (Appendix D) for them to complete. The demographic survey was used to screen participants' responses and ensure that each participant met the study's criteria. Participants were asked to sign, date, and return the demographic survey by email. I then ensured the participants fit the criteria by contacting the potential participants via telephone to verify that they met the specified criteria. After three weeks, I collected, examined, and coded the responses to the demographic survey and used it to identify 12 potential participants who met the criteria for the case study. I then emailed acceptance letter Appendix C) to participants and requested their consent and voluntary involvement in the study. I attached an electronic journal prompt to the acceptance letter and requested that participants document their responses weekly for three weeks. Participants were asked to return the journal prompts via emails at the end of three weeks. I then scheduled the interviews for each of 12 participants and arranged a time for the Zoom interview. I followed up by emailing each participant a confirmation of the scheduled time and a copy of the interview's zoom link. Zoom allowed me to observe participants and record responses during the teleconference. Zoom also allowed me to

accommodate participants' schedules and geographical locations. Each interview was conducted at the convenience of each participant and lasted for approximately 90 minutes each. The interviews were semi-structured and followed an interview protocol. Interviews were audio recorded with participant's signed permission.

I attended to ethical matters such as confidentiality and privacy of all the participants. I used pseudonyms to label and shield participants. For confidentiality and security purposes, all participant data and responses are stored on a password protected external hard drive and locked in my filing cabinet with the documentation received through document analysis (Creswell & Creswell, 2018). Further assurance of confidentiality was given through the removal of participant's names from the study (Creswell & Creswell, 2018). I collected data from three primary sources: documents, journal prompts, and interviews. Additionally, participants were asked to share documents such as teacher evaluation tools, portfolios, lesson plans, professional development plans, specifically those strongly connected to SBE and technology, via email. The documents collected were used to support themes, provide viewpoints and perceptions. Participant's names were replaced with pseudonyms on all documents

The Researcher's Role

I am employed at a small private school in the same district where the study was conducted. The researcher is the curriculum and instruction specialist, as well as the eighth-grade mathematics teacher. I am driven by the philosophy that every child can learn when exposed to the right learning environment. I am allowed to develop new curricula and implement strategies that are focused on improving existing instructional approaches. Part of my role includes evaluating existing curriculum material and assessing the quality of instructional interaction in the teaching and learning process. The low performance of students in the mathematics content

area and the need to expose teachers to the current best trend and practices have given me a pertinent window of opportunity to conduct this study. I believe that education is the vehicle through which society can be changed to benefit humanity. I am passionate about the teaching-learning process, and I am motivated by the need to see students learn and become efficient problem solvers. I firmly believe that educators should be provided with the tools needed to equip students with practical strategies to help them function efficiently in the 21st-century. I support the use of technology to advance critical thinking skills; I firmly believe that instructional design should be used for the holistic development of student's cognitive abilities. I have an avid interest in understanding factors that influence teachers' level of teaching -efficacy. Understanding these factors can help me help other teachers' instructional practices, ultimately improving student engagement and achievement. I recognize a dire need to increase efficacy in the mathematics core content area. This study has helped me identify and understand the factors that affect teachers' overall teaching efficacy and help target professional development and staff support toward positively affecting those factors.

The researcher's role in a case study can take many different forms, such as a teacher, advocate, evaluator, biographer, or interpreter (Stake, 1995). For this study, I took an interpretive stance through the process of observation, exercising subjective judgment while analyzing and synthesizing data. As the human instrument in this case study, I listened, observed, documented, and transcribed collected responses from the participants who lived the experience. My biases came from my belief in active student engagement and technology integration in classroom practices. I bracketed out my bias by writing memos throughout the data collection and analysis process. Memoing is the process of recording reflective notes about what the researcher is learning from the data (Creswell & Poth 2018). Memoing provided me with an opportunity to

separate my biases while focusing solely on the transcribed data with the intent of identifying themes from the participant's interviews (Yin, 2018). I used memoing to record and document the exact phrasing of participants' conversations during the interview process. I further practiced restraint from making assumptions by clarifying and ensuring that I recognized all the dimensions of the bigger picture. Being the human instrument, my background in curriculum development was relevant to this study. However, I did not personally know participants since I work in a different setting. I had no authority over the participants. I intentionally refrained from implying any assumptions and judgment during the research phase. I carefully documented the participants' direct perspectives and ensured that their voices led the data analysis output (Yin, 2009).

Data Collection

A critical aspect of qualitative inquiry is rigorous and varied data collection techniques. Yin (2009) suggested six sources of data that can be used effectively in case studies: documentation, archival records, interviews, direct observations, participant observations, and physical artifacts. In this single case instructional case study, I used documents, journal prompts, and interviews. The primary data source was in the form of semi-structured interviews. In contrast, the secondary sources included lesson plans, teacher evaluation tools, professional development plans, and journal prompts.

Data was collected systematically (Stake, 1995) using three data collection methods: documents (lesson plans, teacher evaluation tools, professional development plans), journal prompts, and interviews. The order in which data collection was performed was significant since the data gathered corroborated and supported patterns and themes that were uncovered. The sequential order for this study began with examining demographic surveys that was used to

provide insight into the schools' and mathematics department's purpose, mission, and vision. I followed up with a collection of documents, such as lesson plans, teacher evaluation tools, and professional development plans. The final data collection method was conducting individual interviews. An interview guide (Appendix F) was used to guide the questions. The questions for the interview were semi-structured and open-ended. They were used to provide additional insight, where necessary. I wrote field notes during the interviews and recorded the interview process using a digital voice recorder.

Documents

Merriam (1998) stated that "documents of all types can help the researcher uncover meaning, develop understanding, and discover insights relevant to the research problem" (p.118). Documentary data are exceptionally reliable sources for qualitative case studies because they ground the investigation in the context of the problem being investigated. Documents include archival records and valuable insights for case study research since they provide evidence of the past and implications for future directions. I collected archival records from the three middle schools, and I also examined documented data of staff members, school policies, and handbooks for staff and students. Documentation may also exist in the form of active projects within the school. I used lesson plans and evaluation tools to support and substantiate findings identified in the interview and fieldnotes transcripts.

Documents are an essential means of corroborating and augmenting evidence from other sources (Yin, 2009). Archival documents may be used to corroborate and enhance evidence from other sources (Yin, 2003). According to Patton (1990), documents can inform the research context and provide informal insight into participants' thoughts and actions. I collected lesson plans, teacher evaluation tools, and professional development plans and agendas. The lesson

plans provided documented evidence of teachers' proficiencies in planning mathematics lessons (Bowers & Ernst, 2018). The teacher evaluation tools provided documentation of the expected level of teachers 'instructional performance (Amjad & Nusrat, 2020). The professional development plans provided evidence of continuing education programs for teachers to improve instructional skills (Aldosemani, 2019). Furthermore, the collected documents were used to address sub-question two and three: SQ2**:** What role does professional development play in fostering teacher-efficacy in Standards-Based Education within a 21st-century learning environment? SQ3**:** What role does teacher -efficacy play in using technology to implement SBE within a 21st-century framework?

Journals

Journal prompts serve the multifaceted purpose of documenting reflection, criticism, and self-analysis (Bashan & Holsblat, 2017). Participants used journal prompts to offer descriptive insight into their lived experiences. In this study, journal prompts allowed participants to voice autonomous professional opinions and classroom experiences. Teachers were asked to maintain an electronic file that recorded personal reflections and anecdotal notes related to the implementation of SBE. Journals allowed teachers to document their initial concerns and perception of SBE integration with technology. The journals were insightful since they supported themes and provided viewpoints and perceptions related to the four research questions. Participants responded to the following prompt weekly for three weeks: "Think about your experiences in the classroom over the past week; your answers do not necessarily need to be related to events that occurred during official work hours but should be related to your overall professional experience."

1. What was your biggest challenge in implementing SBE in your eighth-grade mathematics class this week?
2. What made it so challenging?
3. How did you approach this challenge?
4. How did you overcome this challenge?
5. What would you do differently next time?
6. How do you see this relating to your professional experiences?

Question 1-2 invited participants to share insight into lived experiences of implementing SBE. These two questions provided participants with the autonomy to share without inhibition. Participants can offer more richness and detail to their narrative (Creswell & Poth, 2018; Young, 2018). These questions addressed the central research question: What is the perceived self-efficacy of eighth-grade mathematics teachers and standards-based education?

Question 3-4: allowed participants to describe in detail evidence of resilience and level of teacher-efficacy (Cayirdag, 2017). These two questions aligned with the theoretical framework that the study is grounded in (Lombardo-Graves, 2017). Participants' answers to these questions allowed the researcher to understand teacher -efficacy and the eighth-grade mathematics teacher (Rentner et al., 2017). These questions addressed research sub-questions two, three, and four: What role does professional development play in fostering teacher-efficacy in Standards-Based Education within a 21st-century learning environment? What role does teacher-efficacy play in using technology to implement SBE within a 21st-century framework? How do teachers perceive the role of teacher-efficacy with encountered difficulties while implementing SBE within a 21st-century framework?

Question 5-6 are opinion and values questions "aimed at understanding the cognitive and interpretive processes of people" (Patton, 2015, p. 444). These questions invited participants to describe their experiences as reflective practitioners and provides an opportunity for participants to reflect on improving the implementation of SBE in eighth-grade mathematics (Donoo, 2017). These questions addressed the three sub-questions that guided the study: What role does professional development play in fostering teacher-efficacy in Standards-Based Education within a 21st-century learning environment? What role does teacher-efficacy play in using technology to implement SBE within a 21st-century framework? How do teachers perceive the role of teacher-efficacy with encountered difficulties while implementing SBE within a 21st-century framework?

Interviews

Stake (1999) asserts that an interview is the most effective method of obtaining each person's reality. Therefore, perception can be seen through the lens of reality. In qualitative research, interviews are used to delve deeper into topics and allow the researcher to ask participants to explain their answers, give examples, and describe their experiences. "Interviews are the foundational data used with other sources to validate information obtained from the interviewees" (Smith, 2018, p. 1046). Obtaining each educator's experience was critical to this case study; the responses provided perspectives on the primary research question and the other three sub-questions. Patton (1990) explained that the purpose of an interview is for the researcher to obtain unique information that will uncover beliefs and perceptions. Similarly, Merriam (1998) indicated that interviews are necessary to collect information about feelings and behaviors one cannot observe or replicate.

Semi-structured interviews were used to understand participants' experiences with SBE in eighth-grade mathematics related to a 21st-century environment (benefits, challenges,

perception, and action). Participants were interviewed individually for 90 minutes as I sought to get answers for each of the four research questions. Participants' names were replaced with pseudonyms on transcripts and printed documents to ensure confidentiality. Interview protocols (Appendix F) were used to discover eighth-grade mathematics teachers' experiences with SBE and technology.

I utilized semi-structured questions to gain information from the interviewees (Stake, 1999) while allowing flexibility and follow-up inquiry. The questions were intentionally designed to solicit information related to the research questions and let the interviewees speak candidly. Before the interviews, an email was sent to participants to confirm the interview time and outline their expectations. I followed up with participants who failed to respond to the email and rescheduled where it was necessary. All interviews were digitally recorded and supported by field notes and personal reflections. I used teleconferencing in response to the school's Covid 19 social distancing and contact policy.

Interview Protocol for Eighth-Grade Mathematics Teachers:

1. What are some unique characteristics of eighth-grade students?
2. Describe your self-confidence in your role as a mathematics teacher.
3. Explain what you know about standards-based education.
4. What are the impacts of standards-based education as it relates to instructional practices?
5. What are your perspectives on how standards-based education has shaped instructional mathematics practices?
6. Describe any unintended consequences or effects that have emerged as a result of the implementation of standards-based education.

7. What professional development experiences have influenced your ability to integrate 21st-century learning skills in your mathematics class?
8. How do you integrate technology into your instruction? Provide an example.
9. Describe some technological devices that you use to enhance conceptual development in mathematics.
10. Based on your experience, what resources and support would help you be more effective in infusing technology into your eighth-grade mathematics standards-based lessons?
11. Based on your experience: If you had the opportunity, time, and resources to design a professional development workshop that focuses on the eighth grade SBE mathematics program with technology integration, what would be your emphasis? Explain.

Closing Questions:

12. What else you would like to share?

Question 1-2 are knowledge-based questions (Patton, 2002). These questions were purposely designed to create a rapport between the researcher and participants. These questions addressed the central research question: What is the perceived self-efficacy of eighth-grade mathematics teachers and Standards-Based Education?

Question 3-5 were based on participants' knowledge and experience with SBE. According to Young (2018), Standards-Based Education is the teaching, assessment, and reporting of student performance based on consistent and equitable measurements aimed at improving the quality of education for American students. SBE requires that teachers spend adequate time in instructional planning (Young, 2018; Zengler, 2017). Therefore, participants need to reflect on their knowledge and training and in SBE. These questions will address sub-question two of the research: What is the perceived self-efficacy of eighth-grade mathematics

teachers and Standard Based Education? What role does professional development play in fostering teacher-efficacy in Standards-Based Education within a 21st-century learning environment?

Questions 6-7 invited participants to add their opinions and values to the cognitive and interpretative process of SBE within a 21st-century framework (Patton, 2002). There are varied reactions to the implementation of SBE, and it is essential to acquire participants' perspectives since this is the focus of the study. Conn and Tenam-Zemach, (2019) asserted that high-stakes standardized testing plays a pivotal role in SBE and serves more of a financial benefit to business stakeholders than improving the educational system. Probing provided a holistic view of the influences of SBE in the teaching and learning process (Alves et al.,2019). These were non-threatening questions that allowed participants to talk more in-depth about the phenomenon of SBE reform without requiring them to be highly vulnerable. The questions-maintained focus on the issue and produced valuable data. The questions addressed sub-questions two and four of the research: What role does professional development play in fostering teacher-efficacy in Standards-Based Education within a 21st-century learning environment? How do teachers perceive the role of teacher-efficacy with encountered difficulties while implementing SBE within a 21st-century framework?

Question 8-10 were designed to foster deep reflections and gain a value-added perspective from teacher participants (Patton, 2002). At this point in the interview, a good rapport was established with the participant (Patton, 2002). For this reason, participants were willing to provide personal details about struggles or success in implementing SBE within a 21st-century framework. Researchers found that many teachers struggle to integrate instructional practices with technology based on teacher-efficacy (Ronan, 2018; Verschaffel et al., 2019).

Question 11 was designed to explore the expertise of participants in the field of education. Various critiques of SBE have argued the significance of the different components such as content, testing, and instructional practices (Zuber & Altrichter 2018). Probing for school context, federal mandate, and professional goals will allow for deeper insight into the issue and provide added data. I rephrased the first part of the question for teachers with less than eight years of teaching experience. This question addresses sub-question three and four of the research: What role does teacher-efficacy play in using technology to implement SBE within a 21st-century framework? How do teachers perceive the role of teacher-efficacy with encountered difficulties while implementing SBE within a 21st-century framework?

Question 12 serves as the closing question and is designed to allow the participant to add or reinforce previous information based on his/ her perspective. This question addressed sub-questions two, three, and four of the research: What role does professional development play in fostering teacher-efficacy in Standards-Based Education within a 21st-century learning environment? What role does teacher-efficacy play in using technology to implement SBE within a 21st-century framework? How do teachers perceive the role of teacher-efficacy with encountered difficulties while implementing SBE within a 21st-century framework?

Data Analysis

Yin (2009) stated that a researcher must analyze the evidence during data collection to determine causal links or themes. Additionally, Creswell (2007) asserts that data analysis takes place through the development of codes, and then themes are analyzed and discussed in depth. The data analysis of a study provides empirical knowledge related to the problem being studied and is critical to the research process:

> Data analysis is a complex process that involves moving back and forth between concrete bits of data and abstract concepts, inductive and deductive reasoning, description, and interpretation, and–the practical goal of data analysis is to find answers to your research questions (Merriam, 1998, p. 178).

Document Analysis

Document analysis is done systematically and includes examining data to discover meaning and gain an understanding that will aid in the development of empirical knowledge (Corbin & Strauss, 2008). I analyzed documentary evidence such as lesson plans and teacher evaluation tools, and professional development documents. I used codes to organize the data and discover themes and patterns relevant to the research. Themes obtained from documents were used to collaborate other documentary evidence**.**

Journal Analysis

Journals are used to provide current information for research (Qasim & Khan, 2015). Since the journal entries provide participants' perspectives based on instructional experiences, the insight gained will be invaluable to the research (Bashan & Holsblat, 2017). Theme analysis is an essential component of evaluating the responses from the participants in the study to

identify patterns and themes. The journal entries were coded and analyzed for themes. The identified themes were used to collaborate and support themes from other data sources.

Interview Analysis

I began by creating an Excel spreadsheet to organize each interview question. I then transcribed each participant's response to the interview questions into text format. I reread the transcripts to ensure that the text corresponded with participants' responses. Rereading also helped me become familiar with the data. I conducted member checking by emailing the transcriptions to the participants to confirm that the transcriptions were an accurate representation. I coded each participant's data using open coding—an analytical process for identifying concepts, properties, and dimensions within the data (Strauss & Corbin 1990). I used a color code to pattern the data for each response and recorded the codes in a column next to each answer. Each code was analyzed to identify significant themes. I then created Excel Sheets for each theme (Strauss & Corbin 1990).

The codes and responses were rearranged to fit into appropriate themes. Coding is significant to the data analysis portion of this study; therefore, I compared codes and notes about the codes. To ensure that there was no deviation in the definition of the codes, I purposefully examine the data for recurring ideas and commonalities. This was further categorized by axial coding. Axial coding is a process used to create a link between data inductively. The primary purpose of axial coding was to prioritize and reorganize the most significant themes from the data (Strauss & Corbin, 1998).

Axial coding is beneficial to research utilizing multiple resources such as documents, physical artifacts, interview transcripts, field notes, and journals (Saldana, 2016). During axial coding, "categories are related to their subcategories to form more precise and complete

explanations" (Strauss & Corbin, 1998, p.24). Saldaña (2016) further stated that one coding method might adequately serve the research; however, if the data is not satiated, the researcher may need to select other strategies to meet the study's needs. I analyzed the data by looking for recurring ideas and identifying categories based on similarities. I then employed axial coding by identifying relationships among the categories.

After coding I used diagrams to established relationships among codes, concepts, and themes (Creswell & Poth, 2018). I was able to visualize and recognize where the codes overlapped. The visualization of codes was needed because it demonstrated additional perspectives not found during coding and memoing (Creswell & Poth, 2018). I summarized all recurring and noteworthy aspects of data. Additionally, I identified and incorporated the outstanding outliers.

After completing the analysis, I applied the themes and patterns from the data back to the research questions, which created the collected data results (Creswell & Poth, 2018). I employed an external auditor to code the data and check the procedures to ensure data validity. The auditor and I compared the results to ensure the data were saturated within both sets of results (Creswell & Creswell, 2018; Creswell & Poth, 2018).

Trustworthiness

I applied various methods of credibility, dependability and confirmability, and transferability to ensure the trustworthiness of the collected data. Throughout the process, I used anecdotal notes to record and code emerging patterns and themes. I used codes to increase efficiency in memoing notes. Creswell and Poth (2018) described memoing as the practice of researchers recording reflective notes about what is being learned from the data. Thus, memos added to the trustworthiness of qualitative research and supported the collected evidence of

documented meanings derived from the data (Patton,2015). Memoing allowed me to established common themes among the transcribed documents (Creswell & Poth 2018). I used anecdotal notes in the memoing procedures. Memoing was done by color coding and theme analysis. Additionally, the collected data was synthesized and stored securely, and only the researcher has access to it. Memos were used to generalize from the data.

The combination of the data collected ensured the triangulation of data. The purpose of triangulation is to reduce participant bias and increase reliability (Stake, 1995). The information was triangulated across the three data collection methods: documents, journals, and interviews. The data collected provided a thick, rich description of the phenomenon (Creswell & Poth 2018; Yin 2018). I first gathered evidence and compared and cross-checked information (Stake, 1995). Stake (1995) suggested using member checking after the interviews to ensure that the essence and intent of the interviewees are captured.

Triangulation is a crucial component of increasing the trustworthiness of the study using multiple sources of data collection. Multiple data sources ensured a cross-comparison of the responses in identifying themes and subthemes in a holistic manner (Creswell & Poth 2018). I applied the professional feedback provided by my director, chair, committee member, and peers. I ensured that I communicated regularly with my chair through personal meetings, emails, and telephone calls to ensure that my methods were accurate. The feedback provided by the experts strengthened the validation of the study. I conducted a debriefing and member checking after the interviews to ensure that the interview reflected the intent of the interviewees (Stake,1995). Participants were given a copy of their transcribed coded interview and asked to review their interview responses for accuracy. Allowing participants to provide feedback about the transcript fostered accuracy and indicated any areas of concern. I asked an expert in qualitative research

transcripts to read the unidentifiable transcripts, my journal notes, the coding and thematic analysis, and the findings.

Credibility

Member checking is an effective way to provide credibility and reduce researcher bias (Stake, 2009). Member checking was used to capture the experiences of the participants and the intent of recorded statements accurately. The collection of documents, journals conducting a minimum of 12 individual interviews, and field notes allowed for a corroborated insight into the realities and experiences of eighth-grade educators. Member checking helped to reduce researcher bias (Stake, 1995). Member checking is necessary to enhance the credibility of the research (Birt et al., 2016; Lincoln & Guba, 1985). Lincoln & Guba (1985) asserted that findings must be credible, based upon the data presented in this study. I sought to maintain credibility by providing detailed descriptions based on the analysis of data. The participants were allowed to review the information and themes from the documents, journals, interviews, and field notes. Verifying the researcher's accuracy and understanding of the participant's contributions to the study strengthened the study's credibility. I reviewed documents such as lesson plans using the developed protocol to ensure authenticity and build a logical and coherent justification for identified themes. The data provided thick, rich descriptions that revealed the complexity of the patterns. Reviewing the documents fostered dependability and transferable (Shenton, 2004).

Dependability

Shenton (2004) contended that dependability highlights consistencies in all areas related to the potential in repeating a study. Dependability of research is also enhanced when a detailed description of a study's methodology is provided (Krefting, 1991). Obtaining the same results from multiple sources improves dependability in the research. This case study used the

demographic survey, journals, interviews, and field notes to describe attitudes towards teacher-efficacy and technology integration. Also, by examining documents and the journal prompts for each participant, I identified themes and patterns related to SBE implementation. Providing consistent rich detail regarding the context and setting will increase the study's dependability.

Confirmability

Confirmability is the process of analyzing the degree to which a study is free from bias (Patton, 1990). I avoided personal bias by incorporating data triangulation. Personal bias has the potential to influence the data analysis process based on preconceived assumptions. I kept a research journal that documents research activities, thoughts, and feelings throughout the research process. The journal was used from the beginning of the design process and included notes from the data collection and analysis to the writing and presentation of the study. I critically reflected upon personal assumptions, worldviews, and biases concerning this study. Ongoing entries enabled me to review the research motives thoroughly.

I employed an audit trail to confirm data accuracy. Field notes and transcripts were used to maintain and provide an accurate audit trail. The audit trail was established by maintaining, systemizing, and cross-referencing the data from multiple sources (Hoepfl,1997). The audit trail was used to provide evidence and support for all research procedures throughout the study (Koch, 2006).

Transferability

Stake (1995) asserted that thick and rich description is essential for transferability. Transferability, in this study, was performed in the four data collection methods of documents, journal prompts, interviews, and field notes. In terms of transferability, thick, rich descriptions intentionally outlined data collection and data analysis procedures. This study adhered to

Shenton's (2004) recommendation by providing contextual background information that aided in establishing the setting of the investigation. Specific details of participants' characteristics and the research setting will allow others to replicate this study. Triangulation of data collected was be used to establish the transferability of the study findings. Although this is a single case study about a specific phenomenon, the potential exists to transfer the results to other learning environments.

Ethical Considerations

I completed an IRB application that included the supporting documents: Informed Consent Form, participant email letters. I paid close attention to ethical matters such as confidentiality and privacy for all participants. Participant's identities are protected by using pseudonyms. All materials used in this study such as, demographic surveys, audio recordings, transcripts, journal prompts, and interview notes, are stored and secured in a locked cabinet in the researcher's office and home, both of which are accessible only by me. I stored the transcribed data (with member-checking notations) in a password-protected computer. All digital information stored on the researcher's personal computer are kept secured by a password known only by the researcher. After five years, all participants' data will be destroyed to safeguard participants' privacy. These security actions will adequately protect the integrity of the study.

I used bracketing, to suspend any preconceived assumptions present due to prior personal experiences (Miskovic & Lyutykh, 2017). According to Tufford and Newman (2012), bracketing will allow me to voice participants' perceptions without rendering judgment. Reflecting on personal assumptions and experiences allowed me to act only as a non-participant observer of the specific phenomenon within the identified bounded system. I used the interview guide to stay bounded within the study.

I used pseudonyms to negate reviews for the school and stakeholders. Interviews were conducted individually and at separate times and locations to ensure each participant felt comfortable to speak frankly on the issues of concern. Participation in the study was strictly voluntary, and the interviews were conducted at the convenience of participants. Participants were informed of their ability to withdraw from the study at any time. A password-protected computer protects electronically collected data, and tangibly collected data are stored in a locked filing cabinet. The study was conducted in a school district where I am not an employee and have no professional or personal influence. Therefore, none of the participants are under my professional supervision. Participants signed a letter of informed consent (Appendix C); the letter outlined the study's nature and the possible risks posed by participating.

Summary

The purpose of this case study was to describe eighth-grade mathematics teachers' perception of teacher-efficacy and SBE within a 21st-century framework at a large suburban school district in North Carolina. My goal was to gain insight into the eighth-grade mathematics curriculum by examining educators' perceptions. Data collection through multiple sources gave voice to eighth-grade mathematics teachers and will contribute to the literature regarding their impact on teacher-efficacy to increase student achievement. These documents provided important information pertaining to the eight grade teachers' perception of teacher-efficacy and SBE within a 21st-century framework. Based upon previous literature, the study was credible, transferable, and trustworthy, and there were not any foreseeable risks to the participants. I adhered to all professional and ethical guidelines to ensure that this study showed concern for the participants The next chapter will detail the results gained from the data analysis.

CHAPTER FOUR: FINDINGS

Overview

The purpose of this case study was to describe eighth-grade mathematics teachers' perception of teacher-efficacy and Standards-Based Education within a 21st-century framework at a large suburban school district in North Carolina. The study explored the dynamics of this curriculum shift within the Sunshine School District. The study intended to add to the current body of literature in mathematics. The goal of standards-based education is to promote students' cognitive development and skills essential for lifelong learning. SBE increases rigor and critical thinking during instruction to better prepare students for the global society (Lee & Brook, 2020). This chapter contains the results of the data analysis that developed from documents, journals, and individual interviews. This study examined the perceptions of 12 participants who were current employees of the Sunshine School District. A brief description of each educator participant is included in this chapter. The following research questions guided the study:

CQ: What is the perceived self-efficacy of eighth-grade mathematics teachers and standards-based education?

SQ1: What role does professional development play in fostering teacher-efficacy in standards-based education within a 21st-century learning environment?

SQ2: What role does teacher- efficacy play in using technology to implement standards-based education within a 21st-century framework?

SQ3: How do teachers perceive the role of teacher- efficacy with encountered difficulties while implementing standards-based education within a 21st-century framework?

Participants

This study examined the perceptions of twelve eighth-grade mathematics teachers in the Sunshine School District regarding teacher-efficacy and SBE within a 21st-century framework. The educators' teaching experience of mathematics at the eighth-grade level ranged from five years to 30 years. The highest level of education obtained by the participants was a master's degree. Although it had no bearing on the research, the participants in this study included eight females and four males. Seven participants were Caucasian, and five were African American. All participants contributed to each of the data collection methods. *Table 1* displays a demographic breakdown of the participants for the study, their pseudonyms, years of educational experience years of being an educator, level of education, grade level, and the current content area that they teach. Additionally, *Table 1* follows a brief overview of each participant. The participants' schools' names have been excluded to protect the identities of all participants involved in this study. Pseudonyms were assigned randomly and were not connected to the participants' real names, gender, or ethnicity.

Carol

Carol has been teaching mathematics at the eighth-grade level for 30 years and has various educational experiences, including collaboration with special education teachers and early intervention teachers. Carol is the gifted education program coordinator at her school and focuses on enrichment activities for mathematics at the eighth-grade level. The enrichment program is held after school three times weekly. Carol shared that the students who participate are gifted in mathematics. Carol has a master’s degree in middle school mathematics.

Mary

Mary holds a master's degree in mathematics and teaches eighth-grade mathematics to regular education, gifted, and special education students. She has 19 years of experience teaching mathematics at the eighth-grade level. Mary is the head of her school's mathematics department. She has experience working with various student ability levels within her classroom, including several students receiving additional educational support such as response to intervention and individual education plan.

Susan

Susan has been teaching mathematics for ten years but has only been teaching eight-grade mathematics for five years. She is also a mentor to beginning teachers at her school. Susan also teaches eighth and seventh-grade science. She works with a special education inclusion teacher who comes into the classroom for student support. Susan is a member of several committees at her school, including the school improvement team.

Fred

Fred has been teaching mathematics at the eighth-grade level for six years. He has a bachelor's degree in special education and teaches mathematics to a special education population in eighth grade. Fred is the lead teacher for special education at his school. He also supports the general education teacher in eighth-grade science and is the afterschool detention coordinator. Fred shared that he is also the baseball coach at his school.

Sam

Sam is in his 15th year teaching. He has a master's degree in education and is pursuing a second master's degree in school administration. He currently teaches mathematics to eighth-grade students, and he is also a science teacher. Sam previously taught middle and high school

history and middle school science. He serves on various committees at school and is the teacher representation for his school's Parent Teachers Association.

Evette

Evette is in her eighth year of teaching mathematics. She has a master's degree in special education and has been teaching special education mathematics to eighth grade for five years; she also teaches science to sixth and seventh-grade regular education and gifted students. She is a part of her school's improvement team. She is the team leader for her team. Evette shared that this would be her last year in teaching.

Anna

Anna has a master's degree in middle-grade education and currently teaches sixth through eighth-grade mathematics. She is in her fifth year of teaching and is responsible for coordinating professional development training for her school. Anna also teaches chorus to eighth grade. She is one of the staff advisors to her school's quiz team. She revealed that she is pursuing a doctoral degree in educational administration.

Samantha

Samantha has a bachelor's degree in special education and has been teaching eighth-grade mathematics for five years. She currently teaches a general education population, but she taught a special education population at the eighth-grade level for two years. Many of Samantha's students have support from an RTT program instructor. Samantha assists with the after-school program at her school. She also shared that she tutors students from her community at her church.

Trudy

Trudy is a veteran teacher with over 20 years of teaching experience. She has been teaching mathematics at the eighth-grade level for the past 15 years. Trudy holds a bachelor's degree in education and is currently pursuing a master's degree in school administration. Trudy shared that she was currently pursuing a masters' degree in school administration. She is a member of her school's improvement team.

Joe

Joe has been teaching mathematics at the eighth-grade level for 18years. Joe expressed that he was passionate about teaching mathematics. He holds a master's degree in education and is the head of the mathematics department at his school. Joe is frequently selected to represent his school at the district's professional development training. He is responsible for training the teachers at his school after attending each district's professional activity.

Randy

Randy is the head of the mathematics department for his school. He has a master's degree in mathematics and has been teaching eighth-grade mathematics for seven years. Randy organizes his school afterschool program. Randy is a member of his school's improvement team and several other school committees. Randy revealed that he is presently pursing a doctoral degree in mathematics.

Ven

Ven has a bachelor's degree in education. She began her tenure as a high school mathematics teacher before transitioning to middle school. She has been teaching eighth-grade mathematics for five years. She has also taught eighth-grade science to regular education, gifted,

and special education students. Ven expressed that she enjoyed teaching eighth-grade mathematics.

Table 1

Teacher Participants

Teacher Participant	Years Taught	Highest Degree Earned	Content Area	Grade Level
Carol	30	Masters	Mathematics	8th
Mary	19	Masters	Mathematics	8th
Susan	10	Bachelors	Mathematics	8th
Fred	6	Bachelors	Mathematics	8th
Sam	15	Masters	Mathematics	8th
Evette	8	Masters	Mathematics	8th
Anna	5	Masters	Mathematics	8th
Samantha	5	Bachelors	Mathematics	8th
Trudy	20	Bachelors	Mathematics	8th
Joe	18	Masters	Mathematics	8th
Randy	7	Masters	Mathematics	8th
Ven	5	Bachelors	Mathematics	8th

Results

The purpose of this case study was to describe eighth-grade mathematics teachers' perception of teacher-efficacy and SBE within a 21st-century framework at a large suburban school district in North Carolina. The data collected from the documents, journal prompts, and interviews were analyzed and coded to identify common themes. Upon careful review of the

collected data, as the researcher, I organize the data into tables and analyze the data without the use of a computer program. This chapter details the steps used to analyze the data and discuss the themes that developed. Following the theme development is a discussion of research participants' responses within each theme and the answers that emerged to the research questions.

Theme Development

Theme development is a critical data analysis component in any qualitative study (Creswell & Poth 2018). Seven participants shared copies of documents; they included evaluation forms, agendas for professional development activities, minutes from professional learning communities, staff handbooks, student handbooks, mission statements, and vision statements. An examination of these documents created by the district and schools demonstrated a distinguishable pattern in the formation of the participants' perspectives related to SBE within a 21st-century framework. Additionally, after three weeks, all participants emailed me their responses to the journal prompt. I examined the participant's insights for emerging themes and patterns related to the four research questions. According to (Creswell & Poth, 2018), qualitative research requires the researcher to look for patterns in the data to determine its meaning. Interviews were scheduled at the convenience of the participants via Zoom. I recorded each interview with the approval of participants. The recording device served as a data collection tool in which to transcribe the semi-constructed interviews. During the interview sessions, each participant displayed a willingness to respond to questions in an engaging manner. I recorded and transcribed each participant's responses as they shared experiences and discussed personal thoughts. I transcribed the data and then shared the transcription with each participant to ensure that the data analysis protocol of member checking was satisfied (Creswell & Poth. 2018). Member checking allows participants to review and discuss interpretations. Additionally,

participants were allowed to clarify their experiences and ensure that their experiences were accurately captured, interpreted, and reported (Creswell & Poth, 2018).

According to (Creswell & Poth, 2018), bracketing is a method used by qualitative researchers to reduce the impact of unacknowledged biases and increase research rigor. Memoing was used to ensure that biases were separated from the collected data (Creswell & Poth, 2018). Memoing allowed me to reflect subjectively on the process of data analysis. Additionally, I maintained a reflective journal during the research process. The reflective journal documented my reflections and enhanced my ability to remain subjective during the data analysis process.

Upon careful review of the data collected, I decided to organize the data manually into tables. The collected information was examined for evidence of interrelationships, connections, and patterns. Each analysis identified and provided essential answers to the research questions that guided the study. Data from each collection method were clearly and meaningfully integrated into common themes. Each transcribed interview was carefully analyzed to identify codes that defined the data analysis (Creswell & Poth, 2018). The data was color-coded for patterns and grouped. Abbreviations were used as codes and assigned to each emerging theme. Codes were compared to ensure they were consistently aligned with each theme and the three research questions that guided the study. Excel sheets were then created for each theme (Strauss & Corbin 1990). Data was highlighted and annotated on several occasions during the phase of data analysis.

According to Yin (2009), it is essential to use more than one method of data analysis to ensure data authenticity. Therefore, the themes' development resulted from multiple grouping strategies used throughout the entire coding process. Through the lens of the social

constructivism theory, the paradigm of the themes was derivative of the thoughts that shaped the experiences of 12 eighth-grade mathematics teachers implementing the standards-based curricula within a 21st-century framework. The four main themes and subthemes that emerged from this analysis provided a clear description of the experiences of the 12 teachers in the Sunshine School District. The reports satisfied the study's intent to offer the eighth-grade mathematics teachers' perception of teacher-efficacy and SBE within a 21st-century framework at a large suburban school district in North Carolina. The perspectives of each of the 12 teachers were analyzed separately to determine what themes were specific to implementing standards-based curricula within a 21st -century framework.

Additionally, by checking and rechecking the collected data, I ensured that the protocol of validity satisfied confirmability (Creswell & Poth, 2018). Chapter Three provided a discussion that supported the triangulation of the study through multiple data source collection and confirmability—data was confirmed and corroborated (Creswell & Poth, 2018). Codes are presented in a meaningful table to demonstrate how they were organized to inform themes. *Table 2* provides a detailed list of the codes that led to the development of the four themes.

Table 2

Codes Leading to Themes

Themes	Sub-Themes	Theme Frequency from Documents	Theme Frequency from Journals	Theme Frequency from Interviews	Totals
Accountability	Improvement	35	54	65	154
Collaboration	Teacher Support	35	40	60	135
Teacher Confidence	Teacher Attitude	27	43	50	120
Knowledge of 21st Century Skills		20	30	44	94
Outliers	Negative Comments	15	23	30	68

Theme 1: Accountability

The participants discussed several factors that impacted their perceptions of teacher-efficacy while implementing SBE within a 21st -century framework in the eighth-grade mathematics classroom. Accountability was the most prevalent of themes noted that describes educators' perceptions of the effectiveness of the policy in reforming educational practices. Teachers are professionally and morally obligated to ensure that the instruction they provide supports students' learning. Therefore, teachers must be accountable to provide instruction that will hone the cognitive skills of the students they teach and fulfill the vision and mission of the school to which they are employed. The theme of accountability was revealed from analyzing the collected data from documents (lesson plans, teacher evaluation tools, professional development plans), journal prompts, and interviews. The data analysis from the documents supported a

notable consistency of the Sunshine School District's effort in ensuring that educators and other stakeholders involved in the implementation of standard-based eighth-grade mathematics curriculum are held accountable for students' success.

Nine of the twelve participants stated that they were appreciative of the district's accountability policies because they have contributed to measurable curricula changes that resulted in improved student performance. Carol felt that the districts' focus on eighth-grade mathematics was well-orchestrated since the eighth grade is pivotal for students. Carol stated, "eighth-grade is the make-or-break year for students." She further explained, "eighth-grade year is when students begin thinking about graduation or dropping out of school and college and career choices." Mary said, "students experienced physical and emotional pressures during the eighth-grade year." Mary added that teachers are professionally responsible for using evidence-based instructional strategies since many students experience challenges with the mathematics content during eight-grade year. Mary further explained, "each teacher is accountable for the learning that takes place in the classroom we must therefore use strategies that will improve students' learning." Ven stated that many students felt overwhelmed with eight -grade mathematics because the content requires abstract thinking. However, Ven believes that in her instructional ability to reach all students. She was confident that her instructional practices were adequate and were pedagogically appropriate for her students. Trudy stated, "the implementation of SBE in the eighth-grade mathematics class required teacher accountability and forces teachers to design lessons geared towards authentic learning experiences and supported by extensive research-based strategies."

Most participants expressed the view that the policies that have been implemented encourage high levels of teacher-efficacy by focusing on the creation of a student-centered

environment. Evette stated that the school's accountability measure toward student achievement revolves around the district's assessments and grading policies. According to Evette, "testing and grading went through a complete revolution, forcing teachers to embrace a new mindset on how to meet students' learning needs and also how to assess students." The data from documents, teacher portfolios, journals, and the interviews demonstrated documented student performance data that supports the vision of the school district and school leaders to hold teachers accountable for students' performance. The team leaders Randy and Carol both stated that they work with their teams to set goals and implement research-based pedagogical strategies.

Documents from previous professional development sessions showed that the district emphasized data-driven practices to achieve accountability. One professional development goal was to guide teachers in preparation for data-driven instructions. These practices are highlighted in the daily lesson plan templates as required components such as teacher reflections, learning outcomes, and formal and informal assessments. Mary reflected in her journal that she frequently struggled with designing authentic reviews that align with the standards and gives an accurate reflection of students' performance. Carol also shared in the interview that she meets with her team to design weekly assessment that monitors students' progress. Susan stated that "standards-based education holds me professional responsible for educating the students in my classroom." Ten out of twelve participants wrote in their journals that they felt personally responsible for students' performance. As a result, these 10 participants intentionally research and design instructional practices and assessments to improve students' performance. Anna stated that she took a considerable risk with implementing standard-based education in the eighth-grade mathematics classroom. She feels her most significant trouble was "thinking outside of the box" and "taking an unconventional approach to motivate students and improve learning outcomes."

Anna further stated that sometimes she felt ostracized because her teammates thought she was "overwhelming them with too many instructional changes within a short time." Anna noted that "I do and will continue to do whatever it physically takes to effect change in students' performance… I feel that I am accountable first to the students, teammates, school, district, and most importantly, myself." She explained, "As the team leader, I am held personally responsible for initiating the change in the dynamics of instructional practices in the eighth-grade mathematics classroom and ensuring that eighth-grade students are successful and ready for high school and the future."

Teacher evaluation forms from the three middle schools showed that teacher accountability is essential in implementing SBE curricula. The teacher evaluation forms across the schools were the same and required a rating of teachers' planning and lesson preparation, learning climate, and instruction. One of Fred's evaluation feedbacks stated that he needed to use more open-ended questions to facilitate the development of critical thinking skills in students (see figure 1). Evette also documented in her journal that all eighth-grade mathematics teachers need to "get in the groove of changing instructional practices to meet students' learning needs." Evette feels that teacher effectiveness is achieved through frequent evaluations and feedbacks. She stated that it is crucial for teachers to "take a proactive stance rather than a reactive attitude to improve students learning." Evette wrote, "both special education and the general classroom teacher should do more than simply being compliant by just touching each standard." When asked to clarify this statement further, Evette said that teachers needed to "embrace the concept of instructional accountability." Carol also stated that there needs to be a significant change in instructional practices. Effective practices will guide students in demonstrating proficiency." She further added, "one school at a time until it becomes the norm."

Figure 1

Sample of Participant's Evaluation Form.

Walkthrough Observation Report

Teacher's Name: [redacted]	School: [redacted]	Grade Level/Subject: 8th/Mathematics
Evaluator's Name [redacted]	School Year: 2020-21	Observation Date: 10/7/2020

Instructions: This form serves as a record of an informal walkthrough by the evaluator. The evaluator will likely not observe all the teaching elements listed below in any one informal observation. This record, along with records of additional informal observations, will be used to inform the summative evaluation of the teacher. This report will be provided to the teacher within five workdays and prior to the formal evaluation.

Evaluator Observations

X	Instruction is developmentally appropriate	X	Lesson content is linked to previous and future learning
X	Learning outcomes and goals are clearly communicated to students	X	Classroom learning environment is safe and conductive to learning
X	Varied instructional tools and strategies reflect student needs and learning objectives	X	Teacher provides students with timely and responsive feedback
X	Content presented is accurate and grade appropriate	X	Instructional time is used effectively
X	Teacher connects lesson to real-life applications	X	Routines support learning goals and activities
X	Instruction and lesson activities are accessible and challenging for students	X	Multiple methods of assessment of student learning are utilized to guide instruction
	Other: No evidence of technology integration		Other: Groups are clearly defined and activities match students' abilities

Evaluator Summary Comments

Teacher communicates effectively with students. The lesson was presented using multiple formats. Students observe classroom procedures and expectations. Objectives were clearly aligned to standards. Students were aware of lesson targets.

Commendations and Recommendations

Teacher made students accountable by providing independent activities as well as group activities. The lesson could be improved by the teacher using more open ended questions to facilitate critical thinking in students. Lesson went over by three minutes, teacher needs to be mindful of the allotted instructional time.

I have reviewed this evaluation and discussed it with my evaluator. My signature indicates that I have been advised of my performance status; it does not necessarily imply that I agree with this evaluation.

[redacted] _____ 7/10/20 _____

Teacher Signature Date

[redacted] _____ 7/10/20 _____

Evaluator Signature Date

Susan stated that it was "important for the school district to celebrate small successes because teachers are working hard to adapt to the instructional changes and teacher expectations." She further added that "people, in general, thrive on recognition." When asked to give an example, Susan reflected that if teachers are to be "honestly held accountable for students' learning, they must own the entire process of teaching and learning." According to Susan, "owing means accepting failures as well as successes." She further clarified that the school district and administrators must recognize that "teachers are the foundational point in students' success and must be treated as such." Susan said that incentives such as luncheons would go a long way in" encouraging teachers to go above and beyond the call of duty as they prepare future leaders." Susan feels that the district should own poor students' performance, mainly if they refuse to encourage and support teachers' efforts to improve learning outcomes. When asked to clarify her statement, Susan said, "not all instructional strategies will work; teachers must therefore have the flexibility to take risks and make adjustments in classroom practices." She further noted that school administrators must determine how best to implement accountability within their schools. In their interviews, nine participants indicated that teachers needed the flexibility to experiment, take risks, and ownership of the results, whether good or bad since ownership will promote instructional accountability of students' learning.

Other measures of accountability that emerged from that data were all teachers' experiences with the SBE eighth-grade mathematics implementation process. The implementation process requires teachers to design measurable goals that align with student achievement measures. Carol explained during the interview that before administering the end-of-grade examination, teachers must predict and document scores for each student based on the teacher's knowledge of their academic ability. The district and each school later compare the

predicted scores with students' actual performance. Carol further stated," this is one part of the accountability model. Teachers must know the students they teach." Carol said that "data-driven strategies allow teachers to effectively and consistently monitor students' progress." Carol further explained that teachers must use formative and summative assessments to ensure that students are mastering conceptual skills. Anna said that teachers must analyze students' testing data and then use the analysis to plan instruction. Archival documents revealed that the district's frequent professional training on data-driven instructional strategies prepared teachers for the process of teacher accountability for student learning. One professional development plan for Rosehill Middle School indicated that the activity was grounded on the students' scores for the prior school year. Susan explained," each school within the district are required to administer a benchmark test at the end of each quarter." The test comes directly from the district and is graded and analyzed by the district. According to Susan, each teacher is provided with feedback about their students' performance. The district offers quarterly incentives in luncheons for the teachers and classes with the highest growth. Susan further stated that the teacher with the highest growth in each school is given the title teacher of the month for the school and district.

Joe expressed that implementing the standards-based approach in eighth-grade mathematics was a significant step in "getting students engaged." He further stated that "high student engagement optimizes student learning." In the interview, Randy supported Joe's perspectives and said that "mathematics standards should be used as a foundational point for designing learning activities." According to Randy, "using the standards as focal points in designing learning activities serves the dual purpose of preparing students for assessment as well as creating life-long learners." Several other participants took the stance that using the standards as guides to design appropriate learning activities will help teachers address 21st-century

learning needs and support students' progress toward critical thinking, which will transfer to solid content retention and mastery.

Sub-Theme: Improvement

Students' improvement a subtheme within accountability is improvement: teachers are required to set goals for learning outcomes and used those goals to measure the effectiveness of their instructional strategies. All teachers agreed that the implementation of SBE in the eighth-grade mathematics classroom made teachers accountable for students' learning. Nine participants took the stance that standard-based education in the eighth-grade mathematics classroom supported research-based instructions that improved students learning. The data from each school's professional development documents provided a timeline for supporting the standard-based education implementation curricula plan. The district professional development plan stated that students' performance would improve at the end of the first year of implementing SBE. However, the three team leaders noted that professional development plans are crucial to changes in instructional practice. According to Mary, the professional development training supported evidence-based strategies aimed at improving students' learning. Teachers adopted the process and provided consistent feedback to the district. Susan added that the constant effort of the district to support a culture of evidence-based practices through professional workshops and training proved to be successful in the implementation process. Susan explained that SBE was complex and required strategic planning. During their interviews, Carol, Susan, Mary, and Trudy stated that students' performance data indicated improved learning during the first year of implementation. However, the participants all suggested areas of struggle that needed significant improvement during the first year of implementation.

Data from the three sources support the subtheme of improving students' learning. Effective teachers use strategies to enhance students' academic performance. The overarching consensus is that teachers should use the standards to design instruction and thus ensure that students meet targeted lesson objectives. Mary supports the implementation of standard-based education because she recognizes the advantages it offers in providing data that tracks students' performance and allows teachers to focus on specific learning needs of students. Mary stated that standards-based education aims to improve instructional practices, increase student learning, and promote higher student achievement for American students. Mary noted that teachers are professionally responsible for facilitating growth in each student. Joe feels that once the "kinks in SBE are ironed out, and the majority of teachers are on board will regain prominence in mathematics; we are the best in whatever we set out to accomplish." One of Joe's journal entries describes his efforts to meet the needs of the students in his eighth-grade mathematics classroom while implementing standards-based education. Joe wrote," I feel that technology is relevant for engagement, in conceptual development." Joe further explained in his journal that "I plan intentionally for student collaboration, as well as individual assignments that will help in students' mastery." I also use technology in small groups as well as whole group lessons using differing platforms." Most participants expressed that technology was beneficial in monitoring students' progress and reinforcing critical concepts, particularly the concepts that would be tested on the end-of-year examination.

Theme 2: Collaboration

Teacher collaboration was the second most prevalent theme that emerged from the data analysis of this study. Teachers collaborate in various ways when they interact with other stakeholders, such as other teachers and parents. Collaboration between teachers contributes to

school improvement and student success SBE fosters a culture of teachers working in a collaborative environment to improve students' learning. Teachers collaborate on essential curriculum issues such as strategic instructional planning. Collaboration also offers emotional and psychological support for teachers. Anna stated that teacher collaboration was a core feature for professional workshops and added that her school encourages collaborative practices among teachers. Carol noted that collaboration among teachers was vital to the entire school community and promoted students' success. She wrote in her journal that collaboration was the least inexpensive yet most valuable tool at the eighth-grade mathematics teachers' disposal.
Mary stated that collaboration was essential to successfully implementing SBE in the eighth-grade mathematics classroom within a 21st-century framework. She added that "collaboration forges a cohesive bond that supports a united approach in overcoming obstacles associated with the SBE implementation process." Ten out of twelve participants stated that formal and informal avenues of collaboration were essential for successfully implementing standards-based education within the eighth-grade mathematics classroom. Trudy wrote in her journal, "peer communication has supported my instructional practices during the implementation of standards and integrating technology." Trudy and four other participants noted that communication is "key to overcoming the challenges that come with educational reform." Mary wrote in her journal, "evidence-based practices can only be effective with frequent collaborative practices that include the entire team." The participants believe that collaboration among teachers has a positive effect on students' performance and transcends the physical classroom boundaries.

Teachers recognize the value of cooperation in improving students' performance and extend the partnership to include parents. During the interview, Ven expressed her support for parental collaboration. She stated, "parental collaboration is essential, especially at the middle

school level." Ven also expounded that change is easier to implement using a collaborative approach and should be done frequently. Anna also explained that she collaborates with parents as part of her strategy for meeting students learning needs. She added that parental support is integral to students' success. Samantha noted the need to collaborate with parents and other stakeholders. She explained that it was essential to "let parents be a part of the learning process so that they understand the use of current trends and best practices in education." However, she further elaborated that parent do not see the value of projects and do not necessarily understand rubrics in the grading scheme. Samantha shared that she has personally experienced "the wrath of parents at the end of a project or assignment and further explained that students sometimes earn a less than satisfactory grade because they do not follow the prescribed rubric, and this can be confusing to both students and teachers." Samantha offered that frequent collaboration with home and school could alleviate confusion.

Mary wrote that collaboration was beneficial to instructional practices in a constructivist learning environment. She further added that the constructivist approach fosters appropriate social behavior because students are working with each other. Mary said that it is vital for students to collaborate as it is an essential 21st-century skill. Anna also felt that collaboration is "an ideal method of unpacking the mathematics standards." Anna further explained that unpacking a standard means analyzing the verbiage used through context clues to get specific clarity that describes what students need to know in terms of essential knowledge and essential skills.

Interestingly, 10 out of twelve participants took the stance that collaborating with peers was usually initiated by teachers on the same team. Mary and Carol felt that informal collaboration during breaks provided a culture that supports instructional reform. They both

stated that informal collaboration "made teachers more reflective and open to suggestions." Susan, Evette, and Joe explained that they frequently shared strategies and instructional tools with colleagues throughout the school year. Each expressed that professional teacher websites such as Teachers Pay Teachers offered collaboration through materials supporting standards. Carol pointed out that it was essential to collaborate as it provided the opportunity to subjectively compare the quality and effectiveness of instructional tools recommended by the district.

Samantha and Ven found that collaborating helped teachers effectively use manipulatives in the mathematics kit to support learning. Ven stated that teachers are more apt to use tools and manipulatives to enhance understanding when taught how to use them appropriately. According to Ven, team collaboration helps teachers understand what students should know from the standards. Ven stated that teachers are sometimes more comfortable working with people they know and will not hesitate to ask for clarity in interpreting the standards. Ven added that teachers must have a clear expectation of the standards to plan effective instruction.

Sub-theme: Teachers Need Support

A sub-theme of collaboration is that teachers' need of support. While collaboration is relevant to helping teachers support students' learning, it is also essential that teachers have a support system to help them be effective in the classroom. Intentional teacher support provides a shift in the collaborative paradigm of thinking that only students benefit from collaboration. Teachers collaborate and support each other so that they can be effective during pedagogical instruction. Teacher support allows teachers to develop confidence in their abilities and be more willing to contribute to appropriate solutions to circumstances. Collaboration and support are integral intertwined and combines to help teachers contribute to school improvement and student success.

Six teachers noted in their journals that teachers thrive in an atmosphere of trust and support. For Mary and Ven, instructional support provides "the missing pieces of the puzzle’" They both expressed that instructional support promotes professionalism and encourages teachers to put students at the focus of their planning. Professional development documents indicated that the schools within the district provided support for teachers by implementing mandatory learning communities. According to several participants, their newly created professional learning communities focus on using data specific to eighth-grade mathematics students learning needs.

Evette wrote in her journal that she was appreciative of the support she experienced from her team’s professional learning community while implementing the Nearpod software in her classroom. Evette wrote, "The experience from the support made my instruction more effective for that particular lesson." Nearpod is a software program that allows teachers to create various interactive learning resources. Nearpod enables students to engage and learn via their device or a single screen within the classroom. Carol noted that "instructional support makes me more reflective of my instructional practice." Five participants said that collaboration helped them to be reflective practitioners. Teachers who reflect about their instructional experience modify instruction to meet students’ learning needs. Carol wrote in her journal, "I think about each lesson and find ways to improve so that I am meeting my students’ learning needs." Ven wrote in her journal that "instructional support from your team allows you to have professional discourse and leads you to discoveries and different ways of thinking." Joe expressed that the instructional support he receives from the district, school, and his team has helped him relinquish his classroom control. He further clarified that he was getting better at being a facilitator and having students discover conceptual information for themselves.

Professional development supports teachers by allowing them to engage in practical training focused on the skills they need to address students' significant learning challenges and improve their performance. One professional development plan for Rose Hill Middle school stated that the objective of a particular meeting was to allow teachers to discuss their philosophy of education and the impact it had on instructional planning. The plan also suggested that teachers benefit from the discussion and help them implement SBE. The feedback from that professional development stated that the group discussed how personal philosophy could design an exemplary curriculum for eighth-grade mathematics. The document also described the experience as "enlightening as teachers brainstormed and described different philosophies and the cognitive science associated with students' learning."

Eight participants expressed that it was essential for the administration to offer instructional support. Teacher evaluation documents revealed that the administration consistently provided support through unannounced and announced classroom visits and written feedback. It was noted that in each of the three schools, the teacher evaluation forms were similar and that the evaluator recognized the teacher's strengths and areas of marginal performance. Suggestions for improvement were also documented for each marginal area.

The collected data revealed consistency in terms of instructional support from the district, school administrators team leaders. Additionally, the district also hired outside consultants and academic coaches for instructional support. Several teachers also documented in their journals that they engage in self-research and leaning upon the professional development offered by the school or district to prepare for instructional classroom readiness. Two schools had instructional coaches that provided professional support to teachers. These instructional coaches advocate for the eighth-grade mathematics teachers to use data-driven strategies to improve students' learning.

Nine participants acknowledged that they were appreciative of the district's support in providing instructional coaches. For these participants, the instructional coaches have influenced their decisions to use data to drive instruction more intentionally. Ten participants expressed that the establishment of data-driven instruction has supported monitoring students' needs and ultimately has improved students' performance. Joe stated that instructional support had changed his mindset towards the integration of technology integration. Joe said, "working with my team members and the academic coach, I realize that technology integration increases students' motivation and provides an easier alternative for me to monitor students' progress." Carol views instructional support as a "vehicle that mimics the global society as people work together for a common goal, that is improved student performance." For Evette, instructional support has justified the instructional changes that come with standards-based education and has set the stage for developing rigor and improving student performance.

Mary sees instructional support as a tool for developing and maintaining a professional relationship and improved teacher-student relationship. According to Mary, "if relationships improve all around, the environment becomes conducive for learning." Ten participants admitted during their interviews that instructional support could only be practical if done in a constructive environment aligned with transparency. When prompted to clarify, the consensus was that teachers needed to accept that not all instructional strategies are geared towards meeting the learning needs of all students. Susan stated, "that one size does not fit all and that teachers need to be honest and admit when a strategy does not work." She further noted that "transparency is the operational factor that will make this implementation process easier." Susan explained that transparency referred to a safe environment where teachers feel free to share successes and struggles related to the process of teaching and learning. Ven stated that instructional support

made her feel confident and valued as a teacher. Five other participants supported Ven's statement and added that instructional support was an effective tool that teachers can use to maximize learning in the eighth-grade mathematics classroom as they implement it within a 21st-century framework.

Theme 3: Teacher Confidence

Confidence was a recurring theme across all the data collection. Eight participants wrote that experience within the classroom, specifically the mathematics content area, boosted their confidence and allowed them to use student-centered strategies. Mary and Carol expressed during their interviews that self-awareness made them overcome challenges. When pressed for clarification, the consensus was that confidence enables individuals to accept strengths and weaknesses. Anna stated that confidence in her teaching practice allowed her to meet learning needs. She said, "I must first extend my cognitive knowledge so that I am comfortable and confident in what I am teaching; only then can I expect my students to persevere during problem-solving." She added that it was impossible to be an effective teacher if she did not know the content, "I cannot teach what I do not know. I must therefore ensure that I am more knowledgeable than my students." She further explained that "each year she uses her students 'growth to assure herself that she is an effective teacher. Several participants voiced that their years of unwavering dedication and commitment have made them self-assured and enthusiastic about learning and implementing new strategies. For these participants, obstacles in the classroom bring out "their creative genius."

Participants also said they felt encouraged whenever the district or administration recognized their teaching abilities. One of Susan's evaluations revealed a compliment from her evaluator about her apparent confidence level during instruction. The evaluator wrote, "The

teacher demonstrated confidence as she guided students in creating a PowerPoint to illustrate the steps used in problem-solving." Four journal entries showed that teachers are more confident in their instructional abilities when they receive adequate training and support from professional development, even during informal settings. Several participants felt that their success with implementing standards-based education in the eighth-grade mathematics classroom was based on resilience and confidence over the years. The three-team leaders all felt justified in saying that they "led by example and set the tone for instructional expectation." Mary stated that her years of experience made her confident in sharing effective strategies in a formal or informal setting. Mary voiced that she spent extra time planning, "I try to be proactive and not reactive as I plan each lesson." She further explained, "I play all the possible scenarios in my mind so that I am not taken by surprise." She added, "teachers must be one step ahead of students, especially as technology is their game." "I am the last one to leave school and the first on here." For Mary and nine other participants, strategic planning improves confidence during instruction. Evette and Joe shared that confidence is choosing to overcome implementation challenges and improving students' performance. Several other participants also explained that determination and perseverance drive confidence and increase teacher motivation and student success.

Sub-theme: Teacher Attitude

Most participants felt that teachers' attitudes are reflections of personal beliefs systems. Mary and three other participants expressed that the successful execution of SBE in the eighth-grade mathematics classroom depended on teachers' belief systems. These teachers' personal beliefs drive teachers' instructional practice and help them to cope with daily responsibilities. Randy and Ven felt that teachers' "attitude reflects internal behavior." They both state that caring for their students is a result of positive personal attitudes. They both felt that effective teachers

could portray desirable professional attitudes because they can distinguish between professional and personal obligations. Joe noted that "personal beliefs are manifested in a teacher's mindset and reflected in the teachers' attitude." He further stated that a "positive mindset sets the stage for a thriving learning environment despite challenges." For Joe, attitude depends on individual's belief system and influences decision making.

Six participants noted that teachers who believed in themselves transfer that value to students. Anna explained that her attitude is to recognize the potential in each student and then use whatever it takes to make a difference in each life." Anna further explains that it "takes a personal belief system to fan the flicker of a flame to a burning inferno." Eight participants explained that teachers' attitudes determine how teachers deal with perceived biases and classroom prejudice. For these participants, the quality of instruction is dependent on personal belief systems and attitudes toward challenges, student-teacher relationships, and students' performance. Ten teachers indicated that their attitudes were indicative of the process they use for decision-making, during planning, and learning new strategies to implement in the classroom. Joe shared that he constantly tries to display a positive teacher attitude. For Joe, this is easy because he is committed to excellence for his students. "I allowed students to see that I enjoy teaching them." He further explained that students emulate teachers who are happy and hardworking, and this encourages learning. Other participants also shared that their belief systems make them "go over and beyond the call of duty." Carol stated that students would respond more favorably to positive teachers' attitudes. She further explained that "if the teacher is lazy, then students behave that way too." Carol wrote in her journal about the excitement and passion experienced in her content area. She wrote,

> This week, I started a new unit, the Pythagorean theorem; I am excited to introduce this topic because it makes geometry applicable to daily living…the students were engaged as they learned to label the legs of the right triangle and identify the hypotenuse; I was thrilled to see the excitement on students faces as they use squares, strings, and rulers to calculate the missing legs of right triangles.

Carol noted that the Pythagorean theorem was one of her favorite topics to teach, and her positive attitude motivated and supported the students' willingness to learn. Susan also explained that if she was having a difficult day, she intentionally ensured that students only saw a positive, supportive, and caring attitude.

Theme 4: Knowledge of 21st-Century Skills

Ten participants expressed that technology integration in the eighth-grade mathematics classroom was essential for the successful implementation of SBE. Mary felt that "21st -century skills and SBE were inseparable." When prompted to clarify, she stated that "SBE complimented 21st-century skills because they work in unison and do not exist in isolation as they are both designed to make students college and career ready." Six other participants echoed similar sentiments about the knowledge of 21st-century skills. Carol expressed that her students were more engaged in mathematical concepts when she integrated 21st -century skills. For Carol and the seven other participants, the integration of 21st-century skills engaged students and contributed to knowledge retention. Anna stated that implementing 21st-century skills in her lessons made her students "become active learners." Journal entries also revealed that teachers felt that including technology in mathematical concepts provided an easy way of monitoring students' performance and supported independent learning.

A review of a professional development plan revealed that the district and schools encouraged a technology-rich learning environment. At the start of the 2020 school year, there were four professional development plans by the Sharon Middle School. Sharon Middle school focused on using Google classroom to meet the learning needs of students while students were in a remote or hybrid learning environment due to the COVID 19 … pandemic of 2020-2021. One objective from a professional development workshop from the district stated that teachers would be trained on current technology trends and encouraged to create professional learning networks on social media between schools within and outside of the district. The prescribed lesson plan template for the district also revealed that teachers were required to include a component of technology integration in each lesson. In each lesson plan teachers were required to align as well as list the targeted 21st-century skills. Most participants indicated in their lesson plans that they integrated technology in their instruction by teacher and student demonstration, and by using whole group and small group instructions. Most participants expressed during the interviews that the school and district expected teachers to utilize technology during instruction. When she conducted peer observation, Mary stated that she supported the school and district's vision by looking for technology emersion in the classroom. Other participants also noted that the administration uses classroom walkthroughs and observation post conversations to engage teachers in technology integration in the mathematics classroom.

Several participants noted that the integration of technology offers a new horizon for improving students' learning. Most of these participants felt that a significant benefit of technology was the ability of schools to continue educating students during the lockdown periods of the COVID-19 pandemic. Mary offered that technology allowed students to practice social

distancing when they were present at school. She explained that each student was given an electronic device to participate in a near typical classroom learning environment. For Mary and other participants, technology offers a viable alternative to closing the physical doors of schools or clustering in an unhealthy environment.

Additionally, participants expressed that integrating technology in mathematics classes improved students' performance. Participants attributed the improvement in students' performance to high levels of conceptual engagement. Ven said that she uses technology to enrich instructions. According to Ven, students are more interested in "lessons that are integrated with technology." Trudy wrote in her journal that integrating technology in mathematics classes served the dual purpose of improving cognitive knowledge and preparing students for 21st - century skills. Most participants expressed that it was essential to integrate technology in the mathematics content area because students are being prepared for college and career readiness. Several participants noted that technology integration is necessary for Title I students because they are generally economically and academically disadvantaged.

Outlier Data and Findings

Among the four themes found, there were two outliers that emerged from the data analysis in the interviews. The two outliers are unexpected findings and do not align with specific research questions or themes presented. The first outlier is that there was a resistance to SBE. The second was teachers' resistance to technology integration. These perspectives are different from the themes that have emerged and adds value to the study.

Outlier Finding 1: Resistance to Standards-Based Education

Most participants expressed that SBE within a 21st-century frame was an excellent policy for increasing students' academic performance. However, during the individual interviews three

teachers noted that the reform was ineffective. For these participants, the SBE relied heavily on standardized testing and made learning meaningless. Fred stated in his interview that "teachers were expected to train students to focus on acing the end of year test rather than concentrate on knowledge." He further explained that the reform practice was ineffective because there was no depth to the standards, and students learn in isolation. For Fred, isolated learning is a hindrance to lifelong learning. Two other participants shared similar sentiments and noted that SBE does not allow for a deep conceptual understanding of content since only selected standards are tested at the end of the year. Three participants indicated that SBE did not have clearly defined policies. They further noted that SBE was adopted without a definitive plan of how teachers should implement it in the classroom. Fred remarked during the interview that the focus of SBE was misguided and that "teachers were fighting a losing battle with the implementation of SBE in the eight-grade mathematics classroom." Three participants noted that teachers' confidence was essential to instruction but challenging to maintain because of frequent curricula changes. Fred explained "there is no consistency with curriculum policies; once you are confident in a reform practice, it changes suddenly, and as a teacher, you must roll with the punches." Sam stated that experience is needed to bolster confidence. However, there is not enough time for Sam to gather the experience while implementing the standards because of frequent curricula changes. He stated that "it is impossible to be confident in the classroom with sudden changes."

Fred noted that society expects SBE to fail, "school leaders make do with whatever they can do until the next change comes." Sam and Fred's view revealed that they are easily overwhelmed when implementing SBE because they are expected to do much with minimal resources. Fred further explained that he finds that the district and school administration does not "respect his time." For Fred, "unpacking," which is interpreting the standards for instructional

purposes, should be done during school. He further explained that he is offended when asked to stay after school for professional training when pressed to clarify. He noted that the activities were too frequent and time-consuming. "I am not being paid for all the time that I put in for instructional planning, and the district and administration still need more of my time." He suggested that the administration plan for professional training during the regular school day. He said, "these professional meetings must be done during the regular school day; that is one reason for having substitute teachers."

Another participant, Sam, perceived that SBE was designed to label school systems particularly, teachers. According to Sam, "the policies and expectations are designed to make teachers more accountable for student achievement." He further explained that while SBE pushes for more rigor in instructional policies, "it is impossible to add more rigor; the standards themselves are not rigorous and are not clearly defined so that teachers can plan effective instruction." He further noted that interpretation of the standards was left up to the teacher. For Sam interpreting the standards was a "chaotic process because teachers do not all think the same way." Fred noted that the end-of-grade assessment did not align with the standards and that the learning gap between high-performing and low-performing schools keeps widening.

Fred noted that students in minority groups continue to perform poorly in mathematics compared to their peers in high-performing schools "because there is a disparity in the allocation of resources." He explained that low-performing schools were at a disadvantage because they are typically located in low-income communities with minimal resources. He further noted that it was a challenge to apply rigor in the classroom for students in minority groups who are from low-income communities. He stressed that minority groups include students of color and students who use English as a second language. Sam said that with SBE, minority students had

been set up for failure because other outside factors affect their learning. He cited nutrition and lack of parental support as factors that negatively affect minority students. "How can we expect these students to excel using a curriculum that expects rigor?" For Sam and Fred, minority students are expected to perform poorly on standardized tests. Samantha noted that the state labels schools as high performing or low performing and makes these statements public. She further noted, this is discouraging for teachers in low performing schools, year after year." She added," we are not miracle workers, we work with what we have." She stated that "high levels of teacher-efficacy cannot change these facts."

The three teachers noted that SBE was "an unfair method of teacher evaluation by holding teachers accountable for students' poor performance with a blatant disregard for outside factors that affects learning." Fred and Samantha felt that the reform was a "waste of time and would be changed soon." Both Fred and Samantha expressed the view that SBE is a "political move aimed at overwhelming teachers and bringing additional chaos to education." Samantha further said that SBE was a political policy designed to benefit affluent families." She further stated that minority students in low-performing schools did not stand a chance of meeting the educational standards of students in high-performing schools. Two participants felt that factors beyond their control affected students' performance and not the level of teacher-efficacy. Sam and Fred both expressed that it was challenging to maintain a positive professional attitude when the education system "fights against teachers." Fred asked, "How can I be positive about administering a state assessment knowing that my students are going to flunk after all that I have done to prepare them?" He further questioned, "How can you be positive when your students' results will label you as being ineffective?" Both Sam and Fred explained that a part of their frustration came from the amount of time collecting and analyzing data at team-level meetings.

Fred added, "the learning gap between high-performing schools and low-performing schools will continue to widen unless there is equitable distribution of resources." For Fred, quality education for all students can only be achieved when all schools are treated equally."

When asked about the role of professional development and teacher-efficacy while implementing SBE, Fred expressed that "formal professional development activities typically resulted in more confusion rather than clarity on how to implement the standards successfully." For Fred and Samantha, formal professional development" was an avenue of taking teachers' ideas without giving them credit." Fred noted that he disliked attending professional development workshops because teachers are expected to develop solutions to problems, but the presenter takes the credit. For Fred, professional development is meaningless and does not support his instructional performance. He stated, "I am generally more confused after a professional development session." He further added that he finds professional development "tedious and overwhelming." Fred was very open during the interview and voiced his disapproval of the district's effort to collaborate with teachers. He feels that the district should rely on teachers' professional judgment to determine the effectiveness of instructional strategies or resources. He stated, " the district or administration should not coerce teachers into using strategies or resources." He added, "we should be allowed to use strategies that are practical and ones that we are confident using." He was adamant that the district's role was one of chaos. He stated that the district "experiments with implementing SBE and then holds me accountable for their confusion." He further expressed that collaborating was a "waste of valuable instructional time and it will not change students' performance in low-performing schools." Samantha shared that professional development training on "data-driven practices was usually not practical because some students are just not at that level of thinking and do not consistently make

adequate efforts at school. "Samantha expressed during her interview that "it is ok to meet occasional for cohesive efforts, but it should not be done frequently or during planning time." When asked to elaborate, she stated that "collaborative planning is overrated and should not be relied on as the only strategy to implement change." Fred explained that collaborating with other educators can at times "frustrate the process of change." When pressed to elaborate, he said, "I am the manager of my classroom, and the buck stops with me." He felt that he was held accountable for students' performance and should solely use strategies that he deemed effective. Fred believes that if he needs assistance in his classroom, he should be the one to reach out for help and not be forced to meet in a group. Samantha said, "I do not like to collaborate." She further explained, " Collaborating is all about who has the biggest platform." She added, "some people's ideas are accepted without questions, while others are not considered." When asked to elaborate, she explained that "some teachers, especially leaders, are always going to push their agenda." She added that collaborating sometimes makes her feel inadequate in her abilities. Ven wrote in her journal that she finds collaborating with peers "chaotic because there are people who will always get off-topic during discussions. Then we all lose focus of whatever we are discussing."

Outlier Finding 2: Teachers Resistance to Technology Integration

While most participants felt that technology must become an integral part of implementing SBE in the mathematics classroom, three expressed frustrations. Three participants noted that professional training offered by the district was inadequate to increase the level of confidence that teachers must have to integrate technology in the eighth-grade mathematics classroom. According to Fred, he felt overwhelmed with adapting SBE and incorporating technology at the same time. Fred explained that he was not technology-savvy and that he felt

uncomfortable using technology tools during instruction. Fred and Sam shared that they were afraid of failing as they attempted to integrate technology during instruction. Fred emphasized that "most times a teacher will carefully plan a lesson and the outcome is not effective due to technical issues beyond the teacher's control."

Three participants felt that the use of technology as a tool that supports SBE was overwhelming. Additionally, they expressed that "technology integration was ineffective because students get distracted easily and find ways to visit inappropriate websites." For these participants, technology takes away from these teachers because teachers spend much of the time monitoring students' digital behavior. Fred explained that technology integration required teachers to monitor students' use more closely and contribute to a breakdown in student-teacher relationships. He further explained that students resent teachers for adding more classroom rules related to technology and that this can cause students to shut down and not learn. For Sam, students typically approach technology integration as a time for social media interactions. He noted, "students enjoyed using the various social medium platforms rather than staying on designated software mathematics programs." Joe also expressed that "learning to manipulate the new technology devices was time-consuming and took away from planning for his instructional time.

Three participants noted that other barriers that prevented the successful integration of technology in the mathematics classroom include inadequate resources. Fred indicated that resources were sometimes insufficient and that some devices were sometimes outdated and ineffective in developing mathematical concepts. He cited the smart board as an example of a useless device. He stated that students must know the mathematical concept before using the smartboard. He added, "the smart board is not teaching students the concept; it provides

entertainment." Two participants mentioned that there were also issues with the availability of technology tools. When asked to clarify, Fred explained that there are times when classrooms cannot access the internet readily because of system overload or a lack of devices for individual students. Fred further explained that these technical nuances are beyond the teachers' control and add to their frustrations. Fred did not see much value in using digital games to develop mathematical concepts. For Fred, software programs that utilize gaming features are geared towards entertainment and do not support learning. He added that "playing mathematical games is a waste of valuable instructional time." For Fred, technology integration impedes learning. When asked to explain, he commented that technology has caused students not to "think anymore." "Why think when the answer to a mathematics problem is available on google platform or some software programs?".

Sam feels that "technology integration took away his control as a teacher." He explained that software programs such as *Math Focus* provides students with the solution to problems instead of helping them to develop conceptual skills. *Math Focus* is a software program that students can subscribe to for help with problem-solving. For Sam, students typically approach technology integration as a time for social media interactions. He noted, "students enjoyed using the various social media platforms rather than staying on designated software mathematics programs." Three other participants also voiced that they were hesitant to use new technology because they feared failing before their students. Joe also expressed that he is willing to integrate technology with SBE but felt like the students "knew more about technology than he does." Joe noted, "I feel embarrassed each time that I do not quite get how to manipulate a device or a software program adequately." Joe explained that he finds it embarrassing whenever a student

comes to his aid and demonstrates the use of a software program or technology device to the class."

Seven participants stated that they needed more time to become familiar with some software programs or tools. Randy said that he is partially supportive of technology "infusion in the mathematics classroom." However, he wonders if there is a way to balance preparing students for the end-of-year assessment and learning 21st-century skills. When prompted to clarify, Randy explained, "21st-century skills do have a place in the classroom" but believes that the focus should be on implementing the testing standards of the curriculum. Randy asked, "why are we even mandated to place so much emphasis on technology when students are not required to use technology for the end-of-year test?". Trudy believes that "classrooms have become overly dependent on technology and are missing opportunities of developing adequate mathematical skills in students. Overdependence on technology was not an isolated view. Two other participants echoed that technology took away from developing meaningful professional and social relationships among teachers, students, and students. For Randy and three other participants, it is a daunting challenge to adapt to all the changes that come with implementing SBE and focus on integrating 21st-century skills.

Three participants noted that professional training offered by the district was inadequate to increase the level of confidence that teachers must have to integrate technology in the eighth-grade mathematics classroom. Trudy said that the district's level of technology integration training did not provide the necessary level of instruction to incorporate the technology into the eighth-grade mathematics curriculum thoroughly. Additionally, participants felt that technology training offered by the district for teachers is inadequate and time-consuming. Samantha explained that "the technology learning opportunities are simply not enough to convince the

teachers who are against technology to take the risk and invest in 21st-century skills." Trudy said, " the district's training is highly encouraged but not mandatory and usually takes place after school dismisses." Samantha explained that teachers who need technical support would not attend the meetings voluntarily. She noted, "these teachers usually say that they have prior commitments and are unable to participate in the training." Five participants expressed the need for the districtwide technology training to focus on pedagogical integration. Trudy noted that "it is time-consuming to plan an effective lesson that integrates technology." Eight participants explained that with the COVID-19 pandemic, they were expected to post virtual lessons into the Google Classroom online platform. Five participants felt that corresponding with parents and students via email was overwhelming. Samantha noted that "emailing parents as a method of establishing and maintaining support during online or hybrid classes is one more added responsibility that teachers do not need." Fred noted that Google Meet was a challenge because parents did not adequately supervise some students, compounded by technical and social media issues beyond the teachers' control. Fred said," "Google classrooms added to the already out of control cyber bullying."

Research Question Responses

The information that emerged for the three data analysis sources was used to answer the central and sub-questions that guided this case study. The first theme, that emerged from the data analysis are accountability and the sub-theme of improvement. The second theme that emerged from the data analysis are teacher collaboration and the sub-theme of support. The third theme that emerged from the data analysis are teachers' confidence and the sub theme of teachers' attitudes. The fourth theme that emerged from the data analysis is knowledge of 21st- century

skills. This section outlines the results of participants' experience with teacher-efficacy and SBE for eighth-grade mathematics in a 21st-century skill framework.

Central Research Question

The study's central research question was: What is the perceived self-efficacy of eighth-grade mathematics teachers and standards-based education? Participants' unique experiences indicated that high levels of self-efficacy are needed for a successful outcome of SBE within a 21st-century framework in the eighth-grade mathematics class. The data revealed the four major themes that shaped an understanding of the participant's experiences: accountability (Theme 1), teacher collaboration (Theme 2), teachers' attitude (Theme 3), and knowledge of 21st-century skills (Theme 4). Most participants felt that teacher-efficacy is the factor that determines the level of success of school reform, in this case, the successful implementation of SBE in eighth-grade mathematics. The transcribed data from the teacher participants provided a general description of their mainly successful experience implementing SBE within a 21st-century learning environment. During the interview process, Mary stated that "Teacher-efficacy is the intrinsic expectations of individuals that accounts for talent and the ability to be an effective teacher." Participants' responses from the journal prompts were consistent with the perspective that self-efficacy was an essential component for successfully implementing the SBE curricula for eighth-grade mathematics in a 21st-century skill framework.

The implementation journey of SBE in the Sunshine School district required participants to be accountable for students' performance by adapting evidence-based instructional strategies. (Theme 1). Participants frequently engaged in teacher collaboration and strategic planning to ensure that the implementation process was consistent and systemic in the eighth-grade mathematics classroom and improved performance (Theme 2). Participants took the risk to

establish and maintain positive teacher attitudes while effectively embracing standards-based education within a 21st-century framework (Theme 3). Participants expressed resiliency and competence towards the knowledge and integration of technology into the standards-based curriculum (Theme 4).

Research Sub-Question 1

The first sub-question of the study was: What role does professional development play in fostering teacher-efficacy in standards-based education within a 21st-century learning environment? Participant's responses to Theme 1 indicated that professional development is essential for teachers to develop the knowledge and skills they need to address students' learning challenges as they implement SBE within a 21st-century environment. Participants shared that engaging in professional development was beneficial to their teaching repertoire and improved students' learning experience. Participants stated that the professional activities throughout the school year gave them the needed tools and resources to implement standards-based education within a 21st-century framework. Participants referenced district-wide professional, comprehensive action, school-wide professional training as well as grade-level team professional development. Participants also spoke of informal professional training with colleagues. When considering responses for theme3 participants agreed that improved student performance resulted from teacher attitudes and confidence resulting from support and professional development resources. Participants discussed the role of professional development in challenging and changing the mindset of teachers unwilling to integrate technology. The change in attitude resulted in improved teacher-efficacy and, ultimately, student performance. Participants described that systematic professional development improved their levels of teacher-efficacy and

allowed them to make consistent improvement in instructional strategies immersed with technology integration. This was addressed by all four themes of this study.

Theme 2 was revealed in individual interviews and documents as participants described their shared experiences with the district's vision of teacher accountability and implementing the standards in a 21st-century environment. Participants shared that the school district hired consultants and academic coaches to provide professional support for teachers. Participants felt that the district's various professional development initiatives helped teachers develop student-friendly strategies aligned with the mathematical standards. Additionally, participants expressed that partnering with consultants and academic coaches boosted their self-confidence. The team leaders also told of their roles in conducting professional development training and providing feedback to eighth-grade mathematics teachers. Mary expressed that she enjoyed "sharing her knowledge and skills with other teachers." For Mary, the intrinsic reward that she gained from this role "is priceless." She further explained that she is that educator who is willing to go beyond the call of duty, "for the good of the institution and most importantly seeing students grow."

Participants also described the benefits gained from school-based professional development training, such as professional learning communities. Susan explained that because of the eighth-grade mathematics team mandatory professional learning community, her confidence level improved, and she could interact in a meaningful way with other teachers. Ven also shared that each teacher demonstrated confidence as they shared instructional strategies that kept students engaged. Joe described that professional development improved his level of teacher-efficacy and made him more confident integrating technology with his instruction.

Documents provided evidence to support the district's initiatives of implementing data-driven practices. The district's data-driven initiatives ensured that teachers had the support they

needed to monitor students' performance and make any necessary adjustments. Team leaders provided copies of professional development workshops and their objectives. One of the objectives was to help teachers use data-driven instruction to make informed decisions about teaching and learning." A few participants expressed in their journals that the data-driven professional development workshops allowed them to tailor instructions to meet students' needs. Trudy and Sam both stated training from the data-driven workshop made them more confident in monitoring students' progress throughout the year. Trudy noted that professional development training improved her level of teacher-efficacy because she was now more confident in aligning instructional activities that helped develop critical thinking skills in students. She further explained that students needed to create critical thinking skills because
they are crucial to improve students' performance.

Research Sub-Question 2

The second sub-question of the study was: What role does teacher-efficacy play in using technology to implement standards-based education within a 21st-century framework? The four themes addressed participants believe that high levels of teacher-efficacy are required to implement technology in the mathematics classroom. Mary is the head of the department for her team and enjoys integrating technology into her lessons. She finds that the prescribed eighth-grade mathematics textbook is inadequate in developing proficiency in the required standards. She is confident in her ability to use technology to increase students' performance. She said, "I integrate technology in a meaningful way in my lessons." Mary uses technology and other supplementary materials to introduce and build her lessons. The participants believe that technology requires grit and consistency in teaching methodology at each specific grade level. Participants also stated that it was essential for the district and school administrators to provide

consistent support to improve teacher-efficacy. Mary felt that help should be given to teachers with low levels of teacher-efficacy until they become comfortable integrating technology in mathematics instructions. She added high levels of teacher-efficacy as it relates to technology integration will improve students learning**."**

Nine participants expressed that using technology to implement SBE requires teachers to be flexible and open to new perspectives and instructional strategies to meet students 'learning needs. Joe said that teachers need to have high levels of teacher-efficacy. They must be closely aligned to the districts and schools' vision and goals of efficiently preparing students to function in a global society. For Joe, this means that teachers must ensure that "they are equipped with the knowledge and practices of 21st-century skills to impart to students." Other participants agreed that using technology to implement SBE requires teachers to take extra initiatives to ensure that they are comfortable creating learning environments that support 21st-century skills. For these participants, teacher-efficacy is essential to changing the mindset of teachers who are resistant to change and do not see the value of technology as a tool used to provide students with the most significant opportunity for academic success. According to Sam, "we aim to provide our students with the critical thinking skills necessary for them to be competitive in a global society."

During her interview, Ven stated, "some teachers are more willing to take risks outside their comfort zone." Teachers with high levels of teacher-efficacy are willing to take risks to improve learning outcomes The participants believe that teachers with higher levels of teacher-efficacy will learn how to integrate technology to ensure student success effectively. She agreed that she was one of those teachers ready to go the extra mile to see her students succeed. Participants explained that teachers with high levels of teacher-efficacy ensure that other members on their team use technology in a meaningful way to support learning. Participants

discussed that intrinsically driven teachers are usually effective in creating a learning environment that supports the immersion of 21st-century skills in the eighth-grade mathematics classroom.

Participants typically felt that teachers must develop high levels of teacher-efficacy so that they can use technology to help keep students engaged. Most participants voiced that 21st -century skills prepare students for college and carrier readiness and should be a mandatory requirement in teacher training programs. Participants further explained that if teacher training programs offer mandatory 21st-century skill training in content areas, integrating it into regular instructional practice will be more seamless. Several veteran teachers indicated that they became more confident with improved levels of teacher-efficacy after receiving support through professional development and have begun modifying lessons to incorporate 21st-century skills.

The consensus for the participants was that integrating 21st-century skills in the eighth-grade mathematics classroom requires teachers to have a high level of teacher-efficacy. Anna explained that teacher-efficacy allows teachers to be more willing to take risks and step outside their comfort zones to implement new strategies. Anna further explained that teachers with high levels of teacher-efficacy are not afraid of failing. "They are willing to accept that even the best technology plans may not go well, and it will require them to regroup and make necessary changes." According to Anna, teachers with high levels of teacher-efficacy reflect honestly and are open to constructive criticism or negative feedbacks as they strive to improve students' academic performance in a 21st-century environment.

Research Sub-Question 3

The third sub-question of the study was**:** How do teachers perceive the role of teacher-efficacy with encountered difficulties while implementing standards-based education within a

21st-century framework? The four themes provide a response for sub-question 3. Most participants believed that high levels of teacher-efficacy are needed to overcome the challenges associated with implementing SBE within a 21st-century framework. Participants shared that SBE has the right motives for education. There are areas of "inconsistencies and uncertainties that limit the program's effectiveness. They believe that technology integration is an excellent tool for reinforcement but requires teachers to go the "extra mile in developing executing lessons. According to Sam, the successful implementation of a standards-based curriculum depends on frequent peer collaboration and support, especially in a technology-rich classroom environment. For Sam and most of the other participants, the successful implementation of SBE within a 21st-century environment requires high levels of teacher-efficacy. Participants believe that teacher-efficacy is an essential factor that provides flexibility to plan instruction for eighth-grade mathematics students in a special education setting. Evette states that she enjoys using technology to plan meaningful activities for her special education students. "At the end of the school year, I am being measured through my students' academic performance." "It is incumbent on me to overcome the hurdles; that is my professional responsibility." Evette disclosed that her students enjoy playing mathematics games that allow them to simulate conceptual development. She wrote in her journal that including technology in her mathematics lessons "creates a level playing field for her special needs learners and provides an easy method of assessing students' progress.

Participants believe that teacher-efficacy is an essential component that drives instructional practices and is even more effective when it works in conjunction with "content knowledge.". For Samantha, teacher-efficacy is taking action to overcome challenges. Anna expressed that teacher-efficacy is central to implementing SBE in the eighth-grade mathematics

class within a 21st-century framework. She wrote in her journal that "overcoming challenges means being proactive and planning to make sure that students are immersed in technology while meeting the standards expectations."

In addition to teaching eighth-grade mathematics, Ven teaches eighth-grade science to regular education, gifted, and special education students. She enjoys implementing the standards-based education curriculum since it allows her to "go beyond rote and drill practices." I wish that this curriculum was available to us during my eighth-grade year." Participants confirmed that high levels of teacher-efficacy drive teachers to understand them and develop appropriate pedagogical methodologies that make the concepts applicable for students. Participants believe that teacher-efficacy allows teachers to differentiate and provide each student equal opportunities for success. Participants admitted that while there are obstacles associated with SBE, high levels of teacher-efficacy, proper planning, and professional support can improve students' learning. Participants affirmed that teacher-efficacy is all about the teachers' passion for fostering growth in students."

Summary

This qualitative case study was conducted to describe eighth-grade mathematics teachers' perception of teacher-efficacy, and SBE within a 21st-century framework at a large suburban school district in North Carolina. The study generated four themes, which corresponded to the research questions guiding the study. These four themes found are accountability, collaboration, teachers' confidence, and knowledge of 21st-century skills. Additionally, among the four themes found, there were two outliers that emerged from the data analysis in the interviews. The outliers found are resistance to SBE and teachers' resistance to technology integration.

The experience gained from professional development training supports high teacher-efficacy levels that are needed to implement SBE within a 21st-century environment. Participants attended district and school initiated professional training to help instructional practices. Additionally, schools encourage collaboration through professional learning communities and team meetings to encourage high levels of teacher-efficacy. Most participants embrace technology integration but admit that it requires high levels of teacher-efficacy to overcome its barriers. Participants discussed that high levels of teacher-efficacy are connected to teachers' willingness to integrate technology in the classroom. The benefit identified by most teachers included student engagement and meeting the technical requirements specified in 21st-century learning.

The districts provide resources and hire educational consultants and academic coaches to support high levels of teacher-efficacy. Teachers need to have high levels of teacher-efficacy to improve students' performance. The overarching consensus by participants is to use proper planning and professional support to implement SBE within a 21st-century framework to overcome the shortcomings of the curriculum and improve students' learning. Participants affirmed that teacher-efficacy is synonymous with teachers' passion for the teaching-learning process and is needed to drive effective instruction and foster students' academic growth.

CHAPTER FIVE: CONCLUSION

Overview

The purpose of this single instrumental case study was to describe eighth-grade mathematics teachers' perception of teacher-efficacy and standards-based education within a 21st -century framework at a large suburban school district in North Carolina. Twelve experienced eight-grade mathematics teachers served as participants. This study was designed to answer the study's central question and three sub-questions to understand the experiences and reflections of what the participants perceived as best practices from their interaction with the implementation process of standards-based education at the eighth-grade mathematics level within a 21st-century framework. This chapter presents the findings and implications of this study. The results correlate with Rotter's (1966) locus of control theory, Bandura's (1977) self-efficacy theory, and current supporting literature. This chapter discusses delimitations and limitations, as well as recommendations for future research.

Summary of Findings

After reviewing the documents, journal prompts, and conducting the interview, the findings from the analysis of the transcripts and data revealed four themes and provided answers to the central and sub-questions for this study. The major themes that resulted from the data analysis were (a) accountability, (b) teacher collaboration, (c) teacher confidence, and (d) knowledge of 21st-century skills. The central question for this study was, "What is the perceived self-efficacy of eighth-grade mathematics teachers and standards-based education?" The three sub-questions for the study were: What role does professional development play in fostering teacher efficacy in standards-based education within a 21st-century learning environment? What role does teacher efficacy play in using technology to implement standards-based education

within a 21st-century framework? How do teachers perceive the role of teacher efficacy with encountered difficulties while implementing standards-based education within a 21st-century framework? There were two outliers that emerged from the data analysis in the interviews. The outliers found are resistance to SBE and teachers' resistance to technology integration.

Sunshine school district like other districts, implemented SBE in mathematics at the eighth-grade level. However, unlike most other school districts, Sunshine School District has experienced success with the implementation process of SBE within a 21st-century framework in mathematics at the eighth-grade level. The middle schools within the district have strategically engaged in a 21st -century districtwide initiative that supports the standards-based curricula. For the past three years, the district has seen improvement in student's performance, especially at the eighth-grade mathematics level. The 12 participants of this study are eighth-grade mathematics teachers in the Sunshine School District. Three participants are also eighth-grade team leaders and have embraced the district's initiative to improve students' academic performance. Each participant provided distinct reflections about the implementation process at the time of data collection.

Participants were all mandated to follow the district's SBE curricula within a 21st-century framework. Each participant was a teacher of eighth-grade mathematics but was able to approach the implementation process with flexibility in instructional practices aligned to prior experiences, school, and district expectations of improved students' performance. As a result, the data indicates participants' unique experiences and sense of teacher-efficacy in their role as eighth-grade mathematics teachers. Each participant's implementation process was new since they had not implemented this curriculum before the 2015 school year.

Sub question one was, "What role does professional development play in fostering teacher-efficacy in standards-based education within a 21st-century learning environment?" Before the 2015 academic school year, the Sunshine School District began engaging teachers in structured professional development training. All teachers were mandated to participate in these professional development activities since SBE was new to the district. Each school was required to elect leaders in each content area. These school-based leaders were first trained how to unpack and implement the standards within a 21st-century framework. The school-based leaders were trained in professional development workshops to navigate instructional changes and were encouraged to utilize proactive strategies that would arise from the changes. The leaders were then required to use the professional experience gained to initiate the implementation process during the 2015 school year.

The team leaders used the knowledge gained from the district's professional activities to engage in school-based professional workshops through the implementation process. By the second year of implementation, the leaders with their team unpacked the eighth-grade mathematical standards. Professional development has directly impacted the significant gains in students' performance during the implementation process of SBE within a 21st-century framework. Participants agreed that there are still challenges to overcome; however, they are more prepared and determined to implement instructional strategies immersed in a 21st-century learning environment to improve students' academic performance because of professional development activities.

Discussion

The following is a discussion of the research findings concerning the empirical and theoretical literature reviewed in Chapter Two. The empirical evidence from this study explains

the perceptions of the 12 eighth-grade mathematics teachers implementing SBE within a 21st-century framework. Furthermore, this section will compare the related literature to the findings of this study and will detail how this study adds to the limited body of research in eighth-grade mathematics. The theoretical framework is discussed in light of the related literature and the findings. The study applies the theoretical framework of Rotter and Bandura to provide insights and explain findings of the level of perceived teacher-efficacy.

Empirical Literature

The findings of this study demonstrated the experiences of eighth-grade mathematics teachers during the implementation of a standards-based education initiative in a large suburban school in eastern North Carolina. Considering the empirical significance of this study, there is a lack of literature that explores teachers' perception of implementing SBE in mathematics at the eighth-grade level within a 21st-century framework (Drew et al., 2017; Lee et al., 2017; Tassel et al., 2018). Additionally, available studies are mainly quantitative and have focused on other variables associated with SBE such as gender, race, elementary education, and teacher education (Barlow et al. 2018; Douglas & Salman 2020, Hudson,2018; Moloi et al. 2019; Young et al. 2017). This study adds to the limited body of current empirical research for the eighth-grade mathematics teacher.

This study confirms two previous findings to increase teacher-efficacy and ultimately students' academic performance within a 21st-century framework. First, as evidenced by the study's themes—accountability, collaboration, teachers need to be confident, and knowledge of 21st-century skills, teachers are aware that professional development is essential and supports evidence-based instructional practices. Therefore, they have the professional obligation to study and implement instructional strategies that will engage students and foster improvement in

performance. Secondly, the study's themes— accountability, collaboration, teachers need to be confident, and knowledge of 21st-century skills, addresses the role that teacher-efficacy plays in implementing SBE within a 21st-century framework. Many teachers are not comfortable with integrating technology in the eight-grade mathematics classroom. Consequently, a lack of research created a need to investigate teacher-efficacy, SBE, and technology integration in the mathematics classroom at the eighth-grade level (Bowman 2018; Letwinsky; 2017, Smith et al., 2017; Tondeur et al., 2017).

There are other findings in the related literature that also needs to be discussed with consideration to this study. Despite the success of the SBE initiative, there are still notable shortcomings. One issue is that teachers need to interpret the standards before instructional planning. As presented in Chapter Two, researchers found discrepancies in how teachers interpret the standards and execute classroom practices (Greer, 2018; Young, 2018). The standards leave room for individual interpretation resulting in a lack of curricular cohesiveness (Davis et al., 2017). The findings of this study also support the previous research discussed in Chapter Two; standards are not clearly defined resulting in a problem of how to adequately prepare teachers to implement SBE successfully and increase students' performance in mathematics (Ajayi, 2016; Polikoff, 2018). Addressing this, may perhaps close the achievement gap. The outliers' comments in this study confirm the confusions of SBE. The three participants (outliers) articulated that the challenge they faced resulted from unclear explanations of the expectations of the standards and the inability to plan practical lessons that meet the learning needs of all students. The discrepancies support the need for further investigations that focus on the interpretation of SBE standards.

Previous research conducted showed that some teachers felt uncomfortable with technology integration because they were inadequately trained and felt incompetent (Moye & Reed, 2020). Three participants (the outliers) in this study expressed that they did not consistently integrate technology into their instructional practice because of their lack of skills, fear of failure, and time constraints. These same participants' perception also supports previous findings that SBE does not develop students' knowledge to use technology (Bouck et al. 2017). These participants contended that integrating technology in the mathematics classroom hinders learning because students become overly dependent on technological tools in problem-solving. The participants cited that during the 2020-2021 Covid-19 pandemic, when classes were conducted virtually or in a hybrid format, students circumvented the assignments and did not use the necessary technical skills required. These mitigating factors support the need for further research into the effectiveness of SBE to develop the 21st-century skills needed for technology.

In a previous study, Van Boxtel (2017) contended that SBE does not adequately identify and define instructional actions needed to support student diversity. In this study participants did not comment on SBE and student diversity. In previous studies, researchers found that students with disabilities and limited English language ability are consistently underperforming in mathematics and that it is imperative to address diversity (Bouck et al., 2018; The Nation's Report Card, 2016; Whitenack et al., 2019). Addressing student diversity is urgently needed in schools (Bouck et al., 2018) and therefore, research must be conducted that focus on this issue as it relates to SBE.

This qualitative study transcends the inference behind numerical representation. It provides the perceptions of teachers who have engaged in the implementation of SBE for eighth-grade mathematics within a 21st-century framework at a large urban school district in eastern

North Carolina. The study has provided new empirical data to understand the factors influencing effective implementation practices on eighth-grade mathematics teachers. The experience may provide clarity and support to eighth-grade mathematics teachers and school districts seeking to improve students' academic performance (Bonner et al., 2018; Polly et al., 2018; Smith, 2017; Van Boxtel, 2017).

Theoretical Literature

Rotter's (1966) locus of control theory and Bandura's (1977) self-efficacy theory provided the theoretical framework for this study. Locus of control theory refers to an individual's personality trait to influence decisions and actions (Zimmerman, 2000). Locus of control can be affected by internal attitudes such as belief, confidence, or external factors such as fate and luck. The theory also suggests that educator beliefs are performance-based and context-specific (Zimmerman, 2000). Teachers' locus of control determines the beliefs they have about the reasons for students' performance. Typically, teachers with high levels of internal locus of control will assume responsibility for students' outcomes. Conversely, teachers with a high external locus of control will not accept responsibility for poor students' performance. They will place the blame of poor students' performance on external circumstances beyond their control. According to Rotter (1966), internality is the expectation of humans that one can take rewards from the environment personally; it is not dependent on external factors. Externality attributes luck, fate, and other behaviors to determine outcomes. Previous studies used Rotter's (1966) locus of control theory to demonstrate an individual's attitude toward accomplishing a task (Houts & Kassab, 1997; Krause, 2007; Pajeres, 2008; Zimmerman, 2000). Individual motivation is influenced by locus of control and tied to teacher-efficacy (Miller, 2002). The implementation of SBE within a 21st-century framework requires teachers to be highly motivated to explore the

instructional strategies to increase students learning. The successful implementation of SBE within a 21st-century framework is dependent on teachers who have high levels of locus of control and are internally driven in their beliefs regarding both student successes and failures as addressed by this study's themes— accountability, collaboration, teachers need to be confident, and knowledgeable of 21st-century skills.

Bandura's theory of self-efficacy is an outgrowth of Rotter's locus of control theory. The theory assumes four primary sources of self-efficacy—mastery experiences, vicarious experiences, social persuasion, and physiological/emotional state (Bandura1977, 1997). According to Bandura's theory, the level of teacher-efficacy can be used as a predictor of job performance (Pajares, 1996; 2002; Zimmerman, 1995; Zimmerman et al., 2017). The results in this study support the idea that accountability, collaboration, confidence, knowledge of technology, and effective instructional practices strengthen a teacher's level of self-efficacy as addressed by the study's themes— accountability, collaboration, teachers need to be confident, and knowledge of 21st-century skills.

Bandura (1977) contended that experience supports the development of personal confidence. Teachers with high confidence levels are comfortable exploring the use of technology more frequently than those with a lower level of confidence (Bandura, 1977; Miller, 2002). Previous research suggests that experience fosters high levels of confidence which teachers need to successfully integrate technology in the mathematics SBE curricula (Bowen & Peterson, 2019; El Shaban, 2018). Conversely, low levels of confidence and lack of experience with technology integration promote an attitude of fear in teachers, resulting in teachers avoiding integrating technology in the mathematics classroom (Besterman et al., 2018; Nelson et al.,

2016). A combination of confidence and hands-on experience helps teachers improve instructional performance and, ultimately, students' achievement.

There is a strong correlation between teacher-efficacy and student achievement (Bonner et al., 2018; Pajares, 1996; Young 2018). Findings have indicated that teachers with high levels of teacher-efficacy are confident and will intentionally research and use instructional methods to engage students to improve achievement (Kane et al., 2016; Polikoff, 2017). Conversely, teachers with low levels of teacher-efficacy are easily discouraged when faced with classroom challenges and are less effective in improving students' achievement Bonner et al., 2018; Young, 2018; Young et al., 2018). This research addresses the increasing need for professional development activities to provide practical support that enhances teachers' confidence, and collaborative relationships with colleagues as significant contributors to the efficacy of eighth-grade mathematics teachers implementing SBE within a 21st-century environment as evidenced by this study's themes of — accountability, collaboration, teachers need to be confident, and knowledge of 21st -century skills.

Teacher-efficacy defines the level of confidence teachers have in their ability to guide students to success (Cayirdag, 2017). Teacher-efficacy can be described as possessing the innate ability to be confident in one's set of skills and actions while being under pressure (Miller, 2002). Hence, teacher-efficacy is needed to develop cognitive competencies and instructional and technical skills to prepare students for success in the eight-grade mathematics classroom using the SBE curricula. In reviewing the previous qualitative literature surrounding the implementation of SBE within a 21st-century framework, both theories have been used to show how social-cognitive development supports teacher-efficacy. Previous studies such as (Bruce & Ross 2008; Cheung, 2008; Gabriele & Joram 2007; Klassen et al., 2011; Milner, 2002; Milner &

Woolfolk-Hoy 2003; Pajares 1997; Tschannen-Moran & Woolfolk Hoy, 2001) show that teach-efficacy is developed through the concept of locus of control and self-efficacy. Teacher-efficacy influences instructional practice, teacher persistence, and student achievement (Carleton et al., 2008). The current study uses the unique perspective of both Rotter's (1966) locus of control theory and Bandura's (1977) theory of self-efficacy to provide a supportive framework that explains the perception of eighth-grade mathematics teachers related to SBE within a 21st - century environment.

Implications

Rotter's (1966) locus of control theory and Bandura's (1977) theory of self-efficacy theories have been previously used by researchers when investigating topics other than SBE implementation in eighth-grade mathematics within a 21st-century framework (Koo, 2016; Krause, 2007; Tschannen-Moran et al., 1998; Trang, 2017). Rotter's (1966) locus of control theory has been applied in academic areas such as student performance and teacher preparation (Batson,2020; Juslin, 2020). These studies found that beliefs are typically predictive of behavior. Consequently, behaviors are influenced by successes or failures and ultimately influence individual thoughts and actions. Rotter (1966) postulated that the locus of control might be internal or external. This current study applied Rotter's theory as a framework and confirmed that locus of control does affect teacher-efficacy when implementing SBE. In application, it was found that participants who viewed SBE favorably had an internal locus of control. Conversely, it is possible that the participants who did not support SBE had an external locus of control. Both groups of participants demonstrate the viability of the theory in context of the study.

Bandura's (1977) theory of self-efficacy is an outgrowth of Rotter's (1966) locus of control theory. Bandura asserted that self-efficacy is an individual's personal belief in

accomplishing desired outcomes. He further posited that there are high and low levels of self-efficacy. Bandura (1977) believed that self-efficacy is developed through four factors: mastery of experience, social persuasion, vicarious experiences, and interpretation of the physiological and affective domain (Bruce & Ross 2008; Cheung, 2008; Gabriele & Joram 2007; Klassen et al., 2011; Milner, 2002; Milner & Woolfolk-Hoy 2003; Tschannen-Moran & Woolfolk Hoy, 2001). Hoy's (2003) study supported Bandura's stance and found that prior instructional experiences guided teachers' action into improving student outcomes. Previous studies lend credibility to the current study and align with Bandura's theory regarding the impact of all four factors of self-efficacy and his theory that mastery experiences are the most influential sources for desired outcome (Bruce & Ross 2008; Cheung, 2008; Gabriele & Joram 2007; Klassen et al., 2011; Milner, 2002; Milner & Woolfolk-Hoy 2003; Tschannen-Moran & Woolfolk Hoy, 2001). The findings in this study imply that most teachers knew the content of their required curriculum and were more able to design instructional activities that aligned with the standards. The current study has theoretical implications for these two theories because it applies them in a new educational context not previously explored. Consequently, these two theories are viable to address teacher-efficacy and SBE within a 21st-century framework in a similar context and other educational investigation.

The empirical implication of this study is that the findings contribute to the vast database of educational research. As mentioned previously, a gap in the literature exists as earlier studies on SBE and mathematics are mainly focused on elements of SBE reform or for a gender-related population (Barlow et al.; Douglas & Salman 2020; Hudson,2018; Moloi et al. 2019; Young et al. 2017). Furthermore, most investigation into SBE is quantitative as well and analyzes the importance of educator preparedness. It is evident through the literature the researchers have not

explored the perceptions of the eighth-grade mathematics teacher within a 21st-century framework. This study contributes to narrowing the gap in the literature because it explores the narrative of the individuals beyond numerical data of quantitative research and addresses the people behind the numbers presented in quantitative research and considers their experiences, thoughts, and feelings. Therefore, this study and its findings have significance for educational researchers because they can use it as related literature for studies in mathematics within a 21st-century environment.

Findings in this study have important practical implications that eighth-grade mathematics teachers could use when implementing SBE within a 21st-century skills framework. The current study aids in clarifying the role of SBE and 21st-century skills. Previous research focused on the accountability element of SBE and failed to address the perspectives of eighth-grade mathematics on the implementation process (Barlow et al.; Douglas & Salman 2020; Hudson, 2018; Moloi et al. 2019; Young et al. 2017). This study provides practical information that may be used by school districts, school administrators, mathematics departments, and eighth-grade mathematics teachers to provide professional training and support in using instructional strategies and technology integration while implementing SBE. Teachers will benefit from increased knowledge as they participate in professional development training and collaborate with their peers. They will also develop and maintain high teacher-efficacy as they adopt reformed instructional practices that increase students' academic growth in eighth-grade mathematics. Professional development training in technology may also increase teachers' confidence and address teachers' resistance to technology integration in the mathematics classroom. The findings of this study may aid in bridging the gap in SBE implementation policies, professional support, technology integration training. Furthermore, this study confirms

the need for schools' professional development training to include research-based instructional strategies and to include other stakeholders such as parents in collaborative planning to develop and implement strategies that engage learners and improve students' performance (Ekawati & Kohar 2016; Letwinsky, 2017; Zimmerman, 2018).

Delimitations and Limitations

The rationale for the delimitation of the study was to ensure that the parameters of the study achieved their intended purpose of describing eight-grade teachers' perceptions of SBE implementation within a 21st-century framework. The following delimitations were placed upon the study:

1. Participants had to be employees of one of the middle schools within the school district.
2. Participants had to be teachers who are implementing SBE.
3. Participants had a minimum of five years of experience teaching mathematics at the eighth-grade level.

Since the focus of the study was specifically aimed at identifying eighth-grade mathematics teachers' perceptions of implementing SBE within a 21st-century framework, it was necessary to establish the delimitations of having participants implementing SBE within a 21st-century environment at the eighth-grade level. To ensure the participants had the proper knowledge to answer interview and journal prompts, they must have had experience implementing SBE within a 21st-century environment at the eighth-grade level, or they might not have a general understanding of the topic. Being an eighth-grade mathematics teacher at the school district for at least five years enabled participants to have had professional training from the district and school and the experience of implementing SBE within a 21st-century framework.

This study has several limitations: the study involved only middle schools from the Sunshine School District. Other middle schools from other districts would provide a wider variety of teachers' perceptions about implementing SBE within a 21st-century framework.

Additionally, the study is limited because the focus was only on eighth grade. SBE is a curriculum for all levels and all subjects, there may be other important topics that must be explored. The study is also limited because the age level of students may also provide different instructional experiences for teachers. Eighth grade is a transitional year for students in terms of physical and psycho-social development; therefore, implementing SBE within a 21st-century framework may be less challenging. Additionally, eighth-grade mathematics students' performance is repeatedly analyzed and used as a reference point in educational assessment. Investigating math teachers from another grade level may yield different results. Another limitation of this study is the sample size. This study was limited to 12 interview participants. Furthermore, due to accommodations that were necessary during the 2020-2021 Covid-19 pandemic, only two of the schools in the district could accommodate research in the study area; therefore, the transferability of the study may be low.

Recommendations for Future Research

While this study analyzed the perceptions of eighth-grade mathematics teachers when implementing SBE within a 21st-century framework and describes the levels of teacher-efficacy used to achieve successes and challenges, there are still a variety of options left for exploring. Through the collection of data from documents, journal prompts, and individual interviews, the researcher understood the implementation of SBE within a 21st-century framework. This study may be foundational for future for future research into different demographics, such as privately funded, Christian, and chartered schools. Studies may be conducted on schools in rural and

metropolitan geographical areas to provide insight into implementation practices and policies of SBE. Additionally, researchers could investigate other types of studies using a quantitative mixed-method approach.

Other studies could be conducted using a mixed-method quantitative approach to measure the relationship between teacher-efficacy and the implementation of SBE within a 21st-century framework. A qualitative approach could describe administrations' perception of teacher-efficacy while implementing SBE within a 21st-century framework. Further research is needed to study the outcomes of middle school students who perform lower on standardized tests than schools that perform higher on standardized tests. Data from the two populations may aid in determining if there is a better approach to implementing SBE within a 21st-century framework. A study comparing the success rates of schools immersed in technology integration and schools that focus on traditional teaching and learning methods is also recommended.

Additionally, a study exploring SBE within a 21st-century framework from other states is also needed to provide additional insight into teacher-efficacy and add to the research literature. The frequent discussions about the need for educational reform and teacher training because of the poor performance of US students when compared to other developed countries offer an opportunity to conduct a much-needed quantitative study. Findings from the study could be used to determine the impact that teacher-preparation programs have on teacher-efficacy and SBE within a 21st-century framework. A qualitative study could be conducted on teacher-training programs in the US. It may provide solutions for teacher training institutions to develop programs and strategies that will foster high levels of teacher-efficacy, which will ultimately improve students' performance in mathematics. Another study that may add to the literature of teacher-efficacy and SBE within a 21st-century framework would be to explore if there is a

relationship between teacher gender, race, teacher-efficacy can also be explored. Additionally, education may benefit from research on the impact of the Covid 19 pandemic and teacher-efficacy.

Summary

This qualitative study explored the perception of eighth-grade mathematics teachers' teacher-efficacy and SBE within a 21st-century framework at a large suburban school district in North Carolina. Previous studies found in the literature are centered around defined populations and emphasize the policy's teacher accountability for students' performance. Other studies are quantitative and rely on statistics to describe the phenomenon. This study provided the narrative of the eighth-grade teachers implementing SBE within a 21st-century framework. There is limited research on the eighth-grade teachers' perspectives and experiences while implementing SBE within a 21st-century framework. This study confirmed findings in previous literature that there is a lack of knowledge among eighth-grade teachers about the implementation of SBE within a 21st-century outside the element of accountability to student performance. The study also confirms that districts must train teachers to develop high levels of teacher-efficacy as they research and use evidence-based instructional strategies to improve student performance. The current study bridges the literature gap by studying the eighth-grade teachers' perspectives and experiences while implementing SBE within a 21st-century framework. The theoretical framework of this study consisted of Rotter's (1966) locus of control theory and Bandura's (1977) self-efficacy theory. This study is established upon the previous views by applying the ideas to eighth-grade teachers.

Moreover, the study included eighth-grade level mathematics, with a limited amount of information found in the literature. The study applied the theories to provide new perspectives on

teacher-efficacy and implementing SBE within a 21st-century framework. The view provided will enable future researchers to utilize approaches similar to this study, since it carries several practical implications. Additionally, the previously mentioned empirical and theoretical implications establish the relevance of teacher-efficacy to implement SBE within a 21st-century framework. There is also a recommendation to develop frequent professional development training to support all teachers. They seek to build and maintain high levels of teacher-efficacy while implementing SBE in a technologically rich environment.

The district and schools must use professional development to help teachers use data-driven practices to drive instruction. Teachers must be encouraged to collaborate frequently and offer support to each other to improve students' learning. Collaboration supports high levels of teacher-efficacy by familiarizing teachers with evidence-based instructions that support learning. The district and schools must educate teachers about using assessment strategies and integrating technology in the mathematics classroom. The information garnered from this study may be used by other districts, middle schools, and eighth-grade teachers to create and better implement policies and procedures regarding teacher-efficacy and SBE within a 21st-century framework to improve students' performance. These findings may enable teachers to overcome obstacles associated with SBE and technology and address technology incompetence, the fear of failure, teacher burnout, and discouragement. The study's parameters were limited by teachers implementing SBE and teachers with at least five years of mathematics teaching experience at the eighth-grade level. The study experienced several limitations. The study involved only middle schools from the Sunshine School district. Other middle schools from other districts would provide a wider variety of teachers' perceptions about implementing SBE within a 21st-century framework.

Eighth-grade is a pivotal year for students as they prepare for transitioning to high school. Moreover, students at the eighth-grade level are beginning to think about their future in college and career readiness programs. Teachers at this level are responsible for preparing students in eighth-grade mathematics with the required mathematical, conceptual skills needed for success in high-school. High school reports of students continually underperforming in mathematics at the eighth-grade level on state standardized tests, (Desilver, 2017; NAEP, 2018; NCES, 2013). Teachers, instructional support is beneficial for students' yearly success in eighth-grade mathematics.

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APPENDICES

APPENDIX A: RECRUITMENT E-MAIL

To: [Potential Participant]

From: XXXXXXX XXXXXXX: Doctoral candidate at Liberty University Subject: The purpose of this study is to explore the perceptions and experiences of Eighth-grade mathematics teachers with Teacher -Efficacy and Standards-Based Education within a 21st-century framework.

Dear:

As a graduate student in the School of Education at Liberty University, I am conducting research as part of the requirements for a Doctor of Education Degree. The purpose of this qualitative case study is to explore the perceptions and experiences of Eighth-grade mathematics teachers with Teacher -Efficacy and Standards-Based Education within a 21st-century framework, and I am writing to invite you to participate in my study.

If you are an eighth-grade mathematics and you are willing to participate, you will be asked to complete the demographic survey that will be emailed to you. You may be selected for an interview, which should take approximately ninety minutes. You will also be asked to document your classroom experiences in a journal. You will then be asked to review the transcription for accuracy, which should take approximately 20 minutes. Your name and other identifying information will be requested as part of your participation, but the information will remain confidential.

To participate, please sign and return the attached consent document via email. The consent document contains additional information about my research. After you have returned the signed consent form, please contact me to schedule an interview at XXX.XXX.XXXX or XXXXXXXXXXXXXX@XXXXXXX.com

Sincerely,

XXXXXXX XXXXXXX Curriculum Specialist Email: XXXXXXXXXXXXXX@XXXXXXX.com

APPENDIX B IRB APPROVAL

August 1, 2021

[redacted]

Re: IRB Exemption - IRB-FY20-21-965 TEACHER EFFICACY WITH STANDARDS-BASED EDUCATION FOR EIGHTH-GRADE MATHEMATICS IN A 21st-CENTURY-SKILL FRAMEWORK: A CASE STUDY

Dear [redacted]

The Liberty University Institutional Review Board (IRB) has reviewed your application in accordance with the Office for Human Research Protections (OHRP) and Food and Drug Administration (FDA) regulations and finds your study to be exempt from further IRB review. This means you may begin your research with the data safeguarding methods mentioned in your approved application, and no further IRB oversight is required.

Your study falls under the following exemption category, which identifies specific situations in which human participants research is exempt from the policy set forth in 45 CFR 46.104(d):

Category 2.(ii). Research that only includes interactions involving educational tests (cognitive, diagnostic, aptitude, achievement), survey procedures, interview procedures, or observation of public behavior (including visual or auditory recording) if at least one of the following criteria is met:
The information obtained is recorded by the investigator in such a manner that the identity of the human subjects can readily be ascertained, directly or through identifiers linked to the subjects, and an IRB conducts a limited IRB review to make the determination required by §46.111(a)(7).

Your stamped consent form(s) and final versions of your study documents can be found under the Attachments tab within the Submission Details section of your study on Cayuse IRB. Your stamped consent form(s) should be copied and used to gain the consent of your research participants. If you plan to provide your consent information electronically, the contents of the attached consent document(s) should be made available without alteration.

Please note that this exemption only applies to your current research application, and any modifications to your protocol must be reported to the Liberty University IRB for verification of continued exemption status. You may report these changes by completing a modification submission through your Cayuse IRB account.

If you have any questions about this exemption or need assistance in determining whether possible modifications to your protocol would change your exemption status, please email us at irb@liberty.edu.

Sincerely,

[redacted]

APPENDIX C: Informed Consent

INFORMED CONSENT FORM for RESEARCH

You are invited to take part in a research study aimed at understanding the perspectives of eighth- grade mathematics teacher-efficacy as it relates to Standards-Based Education within a 21st-century framework. The research is being conducted by XXXXXXX XXXXXXX a doctoral candidate at Liberty University in partial fulfillment of the requirements for the degree of Doctor of Education.

Background Information:

The purpose of this study is to explore the perceptions and experiences of eighth-grade mathematics teachers.

Procedures:

If you agree to be in this study, you will agree to:

Participate in a 60 to 90-minute interview.

Voluntary Nature of the Study:

You are under no obligation to participate in this study. You may skip any interview question you do not desire to answer. Failure to participate in this study will have no effect on your standing at Sunshine School District (SSD) or any other school.

Risks and Benefits of Being in the Study:

Being in this type of study involves some risk of minor discomforts that can be encountered in daily life, such as fatigue, stress or becoming upset. Being in this study will not pose risk to your safety or wellbeing.

The expected benefits associated with your participation will provide a better understanding of the Teacher-efficacy and Standards-Based Education within a 21st-century framework.

Payment:

No remuneration is available for participation.

Privacy:

Results of this study will not identify individual participants. Details that might identify participants, such as the location of the study will not be shared. Data will be kept secure by password protection, data encryption, and use of codes in place of names. Data will be kept for a period of at least 5 years, as required by the university.

Contacts and Questions:

If you have any questions, feel free to contact me at XXXXXXXX@XXXXXXX.XXX or XXXXXXXXXX. If you want to talk privately about your rights as a participant, you can call the Research Participant Advocate at my university at xxx-xxx-xxxx. Please sign your consent with full knowledge of the nature and purpose of the procedures. This consent explicitly allows the researcher to record and keep a recorded copy of all interviews.

Please print or save this consent form for your records.

Obtaining Your Consent

If you feel you understand the study well enough to make a decision about it, please indicate your consent by selecting "I agree" below.

__ I agree.

_____ _____

Signature **Date**

APPENDIX D: Demographic Survey

Title of Project: **TEACHER-EFFICACY WITH STANDARDS-BASED EDUCATION FOR EIGHT-GRADE MATHEMATICS IN A 21ST-CENTURY FRAMEWORK. A CASE STUDY.**

Time and Location:

Pseudonym: Current Position Title: _____ Gender: _____

Ethnicity: _____

Years of teaching experience: _____

Teaching Qualifications: _____

Highest level of education: _____

1. How many years of teaching mathematics at the eighth-grade level do you have?
2. Are you currently implementing standards-based education in mathematics at the eighth-grade level?
3. How many years have you been implementing standards-based education mathematics at the eighth- grade level?

APPENDIX E: Email Letter

Title Of Project: Teacher-Efficacy: 8th Grade Mathematics Standards-Based Education Within A 21st-Century-Skill Framework.

January 07, 2021

Dear Teacher,

I am a doctoral student in Curriculum and Instruction program at Liberty University, Virginia. The purpose of this letter to request your participation in my doctoral research study. My research goal is to understand eighth -grade mathematics teachers' experiences as it relates to teacher-efficacy and implementing a Standards-Based Education within the framework of 21st-century learning. I am keenly interested in learning the needs of teachers regarding implementation of innovations.

For the study, I am recruiting eighth-grade mathematics teachers. You are being asked to participate in one face-to-face interview at a mutually agreed upon location. Each interview will take approximately ninety minutes and will consist of a series of open-ended questions.

It is expected that these interviews will take place during the third week of March and end the first week of April 2021. If you are available and interested in participating in this endeavor, please contact me via email at XXXXXXXXXXXXXX@XXXXXXX.com or by phone at XXX-XXX-XXXX at your earliest convenience or no later than February 27, 2021.

I greatly appreciate your time and consideration of this request. I feel this research will be of great benefit mathematics teachers. I look forward to hearing from you.

Kind Regards,

APPENDIX F: District Approval Letter

[REDACTED TO PROTECT THE CONFIDENTIALITY OF THE SCHOOL DISTRICT]

APPENDIX G: Field Notes

Title of project: Teacher-efficacy: 8th Grade Mathematics Standards-Based Education within a 21st-century-skill framework.

Date of Interview

Teacher Name: _____

APPENDIX H: Journal Prompts

Participants will respond to the following prompt weekly, for a period of three weeks: Think about your experiences in the classroom over the past week. Your answers to do not necessarily need to be related to events that occurred during official work hours but should be related to your overall professional experience.

1. What was your biggest challenge in implementing SBE this week?
2. What made it so challenging?
3. How did you approach this challenge?
4. Did anyone else play a role or help you with this challenge?
5. What would you do differently next time?
6. How do you see this relating to your professional experiences?

General Information Questions	
Date	Month: February Day: Year:
Time	Start time: End time:
Location	
Method	Face-to-face
Your Name	XXXXXXX XXXXXXX
Your Email	XXXXXXXXXXXXXX@XXXXXXX.com
Participant Demographics	
Current Age	
Gender	
Race/Ethnicity	
Occupation	
Full or Part time	
Degree Earned	
Time to degree Completion	
Type of Program	

Year completed	
Years teaching eight-grade mathematics	
Certification	

Interview Questions

Observations:

Reflections: