AN INVESTIGATION OF TEACHERS' ATTITUDES, CONCERNS AND SELF-EFFICACY TOWARD INCLUSIVE EDUCATION IN STEM CLASSROOMS

Dissertation

Submitted to

The College of Sciences and Agriculture

Southern University and A & M College

In Partial Fulfillment of the Requirements for

The Degree of

Doctor of Philosophy in Science and Mathematics Education

By

Shiv Kumar, M.Sc. (Mathematics)

SOUTHERN UNIVERSITY AND A & M COLLEGE

Baton Rouge, Louisiana

December, 2019

AN INVESTIGATION OF TEACHERS' ATTITUDES, CONCERNS AND SELF-EFFICACY TOWARD INCLUSIVE EDUCATION IN STEM CLASSROOMS

Name: Kumar, Shiv

APPROVED BY:

Albertha Lawson, Ph. D.

Committee Chair

Professor, Department of Science and Mathematics Education

Southern University and A & M College

Francesca M. Mellieon – Williams, Ph. D.

Committee Member

Professor, Department of Science and Mathematics Education

Southern University and A & M College

Ajay Singh, Ph. D.

Committee Member

Assistant Professor, College of Education

Texas A & M International University

Habib Mohamadian, Ph. D.

Interim Dean of Graduate School

Southern University and A & M College

AN INVESTIGATION OF TEACHERS' ATTITUDES, CONCERNS AND SELF-EFFICACY TOWARD INCLUSIVE EDUCATION IN STEM CLASSROOMS

Name: Kumar, Shiv

Southern University and A & M College

Advisor: Dr. Albertha Lawson

Research in this study examined the factors that affect teachers' attitudes, concerns, and self-efficacy toward inclusive education in the Science, Technology, Engineering, and Math (STEM) classrooms. The study was driven by the following overarching research question: Is there a significant correlation between teachers' attitudes and teachers' self-efficacy toward inclusive education in STEM classrooms? A sample of 198 teachers who taught at least one of the STEM subjects were selected randomly from various K-12 schools in Louisiana. A four-part survey questionnaire with reliable validity was used to collect data indicators. An ANOVA and t-test were used to analyze effect of demographic factors on teachers' attitudes, concerns, and self-efficacy toward inclusive education. Pearson's correlation coefficient was used while investigating correlations between attitudes of teachers and their self-efficacy

toward inclusive education. The results of this research study showed that teachers reported an overall positive attitude, a little concern, and higher self-efficacy toward inclusion in STEM classrooms. There was a medium strength positive correlation between attitudes of teachers and their self-efficacy toward inclusion in STEM classrooms. The findings in this study provided a better insight of teachers' attitudes, concerns, and self-efficacy toward inclusive education and could serve as a basis for creating a framework of trainings and professional developments for teacher support to equip teachers with strategies to make inclusive education more effective for students with disabilities in STEM classrooms.

Keywords: inclusive education, STEM inclusion, teacher attitude toward inclusion, Teacher self-efficacy and concerns toward inclusion

Dedicated to my Parents

ACKNOWLEDGMENTS

I would like to thank Chair Dr. Albertha Lawson, who provided me guidance and support throughout my journey in this research project. I would like to thank Dr. Francisca Williams for her continued support and encouragement in completing my dissertation. I could not have completed my journey without Dr. Ajay Singh's guidance and support as well.

I would like to thank my parents, who always supported me in acquiring my education and progression in life. My mother kept praying for me during this entire process. I would like to thank my wife, Rekha Sharma, who stood by me like a rock throughout my journey of completing my Ph.D. degree. I would like to thank my two kids, my daughter, Isha Sharma and my son, Sambhav Sharma who did their best to support me.

I would like to thank my school principal, Mr. Samuel Baynes, who encouraged me in my career by his motivational talks. I would like to thank my friends Mr. Colimon, Ms. Marier Piper, Tapan Sarkar, and all my friends and colleagues who helped and supported me during this entire journey. Lastly, I would like to thank my classmates in the SMED program for continuous support.

TABLE OF CONTENTS

LIST OF TABLES

LIST OF FIGURES

CHAPTER I

INTRODUCTION

Inclusive education represents a setting in the learning environment where all students, regardless of any challenges they may have, are placed in age-appropriate general education classes in neighborhood schools to receive high quality instruction, interventions, and support that in turn enable students to be successful in the core curriculum (Bui, Quirk, Almazan, & Valenti, 2010; Alquraini & Gut, 2012).

By this means, students with both high and low disabilities will receive a quality education among peers without disabilities, and who are of similar age. According to Salend (2001), inclusion is an attempt to establish collaborative, supportive, and nurturing communities. The inclusion of students with disabilities in general education classrooms was found to be related to beneficial outcomes for students with disabilities (Baker, Wang, & Walberg 1994; Waldron 1997) and their general education peers (Salend & Duhaney 1999; Stainback & Stainback 1996).

According to *The Condition of Education 2019,* found in the annual report from the National Center for Education Statistics (NCES), the number of students ages 3–21 in the year 2017-18 who received special education services was 7 million, or 14 percent of all public-school students. Enacted in 1975, the Individuals with Disabilities Education Act (IDEA), formerly known as the Education for All Handicapped Children Act, mandates the provision of a free and appropriate public-school education for eligible students, ages 3–21. Eligible students are those identified by a team of professionals as having a disability that adversely affects academic performance, and who are in need of special education and related services (NCES, May 2019).

Congress reauthorized the IDEA in 2004 and most recently amended the IDEA through Public Law 114-95, Every Student Succeeds Act, in December 2015.

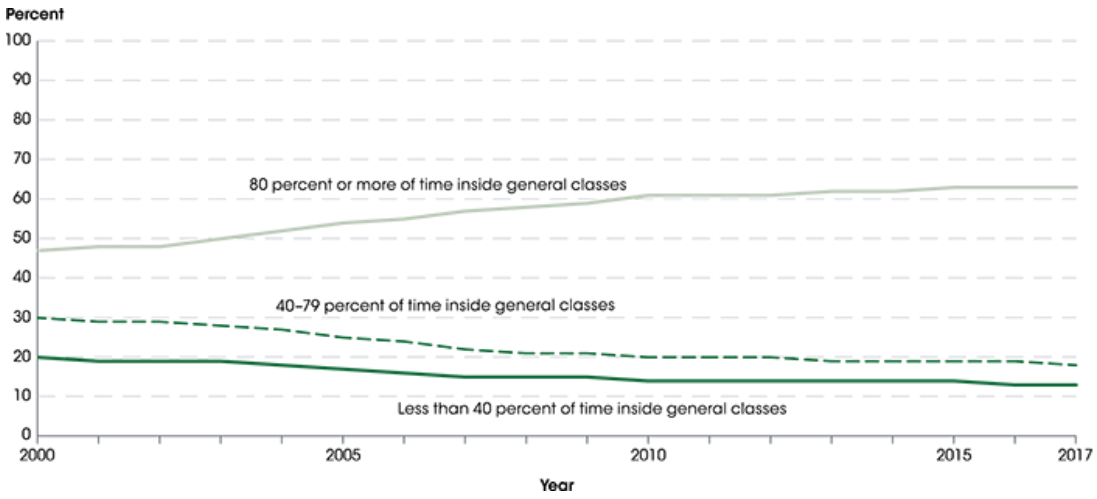
In the law, Congress explained:

Disability is a natural part of the human experience, and in no way diminishes the right of individuals to participate in or contribute to society. Improving educational results for children with disabilities is an essential element of our national policy of ensuring equality of opportunity, full participation, independent

living, and economic self-sufficiency for individuals with disabilities (IDEA, 2015).

Through the implementation of IDEA, students ages 6–21 found it to be advantageous. The percentage who spent most of the school day (i.e., 80 percent or more of their time) inside general classes in regular schools increased from 47 percent in fall 2000 to 63 percent in the Fall of 2017. Figure 1, as follows, describes the percentages of students under IDEA.

Figure 1. Showing the percentage of students ages 6–21, who served under the Individuals with Disabilities Education Act (IDEA). This percentage of students spent various amounts of time inside general classes from Fall 2000 through Fall 2017



NOTE: Fall 2016 and Fall 2017 include fall 2015 data for 6- to 21-year-olds in Wisconsin, due to unavailability of Fall 2016 and Fall 2017 data for children in Wisconsin. Fall 2017 also includes Fall 2016 data for 6- to 21-year-olds in Maine and Vermont, due to unavailability of Fall 2017 data for children in that age group served in those states.
SOURCE: U.S. Department of Education, Office of Special Education Programs, Individuals with Disabilities Education Act (IDEA) database, retrieved January 2, 2019, from https://www2.ed.gov/programs/osepidea/618-data/state-level-data-files/index.html#bcc. See *Digest of Education Statistics 2018,* Table 204.60.

Also, only 71 % of students, 14–21 years of age educated under IDEA. These students exited school during the school year of 2016–17, graduating with a high school diploma (NCES, 2019), as compared to the national high school graduation rate of 84.6 % (NCES,2019). This result exhibits a huge achievement gap for inclusion students. Also, the dropout rate for students ages 14-21, who were educated under IDEA during the school year of 2016-17, was 17 % (NCES,2019) as compared to the national average of 6.1% (NCES,2019). In order to promote and improve inclusive education, the need exists to investigate the factors responsible for such academic achievement gaps of inclusion students, compared to their typical peers. Similar achievement gaps could be expected when inclusion students are placed in classrooms to study science, math, engineering, or technology subjects. The success of inclusion students in these classrooms depend on many factors. The teacher's role is one major factor (Avramidis & Norwich, 2002).

The National Science Foundation developed the word STEM as an acronym for science, technology, engineering, and mathematics. Some choose to use this acronym as the definition of STEM education. In other words, these individuals would identify STEM by the separate subjects, applied as problem-based learning through a STEM curriculum. (Havice, 2009). Certainly, some researchers refer to STEM education as a broad education category involving math, science, engineering, or technology education; thus, teaching any one of these four disciplines may simply be referred to as STEM education (Cotabish, Dailey, Robinson, & Hughes, 2013; Watt, Therrien, Kaldenberg, & Taylor, 2013). For the purposes of current research study, STEM is considered simply an acronym for grouping the four disciplines without a consideration of relationship among these four inter-connected domains.

Accommodating students in K-12 science and mathematics courses often becomes problematic; many students with disabilities are not included within the general classroom and thus are relegated to learning in special education classrooms which do not prepare the students for the rigors of university education in STEM fields (Moon, Todd, Morton, & Ivey, 2012). According to the National Science Board's (NSB, 2015) report, there is a great need for building a strong, STEM-capable, U.S. workforce. Even with a clear need for more diverse

STEM workers, only 5% of students with disabilities (SWD) enter the STEM workforce (Leddy, 2010). Effective inclusion practices in K-12 classrooms may aid to improve representation of students with disabilities in STEM related fields.

To examine the effectiveness of appropriately including students with a disability into regular classrooms, one must first look at the teacher's role in the implementation of inclusive practices. Teachers' attitudes are crucial toward ensuring the success of inclusive practices, since their acceptance of inclusion policies is likely to affect the commitment and enthusiasm to implement the practices (Avramidis & Norwich, 2002; Burke & Sutherland, 2004; Boyle et al., 2013; Norwich, 1994). Also, self-efficacy in implementing inclusive practices remains essential when it comes to successful implementation of inclusive education (Sharma & Nuttal, 2016). Teacher self-efficacy defines how much effort and time the teacher is ready to invest and cope with obstacles, challenges and failures (Tschannen-Moran & Woolfolk Hoy, 2001). Teachers with strong self-efficacy tend to place higher goals both for themselves and their students and consequently try harder to achieve these goals. Also, an examination and address of teachers' concerns toward inclusive education may empower the teachers to become more effective in the implementation of inclusive practices.

Several researches have been mentioned in the literature review regarding teachers' attitudes and those factors affecting teachers' attitudes toward inclusion (Avamidis & Norwich, 2002). Sharma, Forlin, Loreman, & Earle (2006) investigated the nature of concerns and attitudes held by pre-service teachers regarding inclusive education, as well as their sentiments regarding inclusion. Wood (2017) examined the relationship between secondary special educator's attitudes toward inclusion of students with disabilities and their sense of self-efficacy in supporting inclusion students in the general classrooms. Wiesel and Dror (2006) examined Israeli primary teachers' sense of efficacy, as well as their attitudes toward inclusion students. Various other researchers such as Montgomery (2013), Sharma & Desai (2002) , Charley (2015) , and Avery (2017) have also examined teachers' concerns, attitudes, and self-efficacy toward inclusion. However, research studies focusing on teachers' attitudes, concerns and self-efficacy toward inclusive education in STEM classrooms are minimal. Research studies on teachers' perceptions regarding inclusion in STEM classrooms might provide better insights to make inclusive education more effective. The current research study focused on an investigation of teacher's attitudes, concerns, and self-efficacy toward inclusion of students with disabilities in STEM classrooms. This study also investigated demographic factors, such as gender, grade level, age, education level, subject taught, teaching experience,

teacher certification, number of higher education courses studied, and in-service trainings in special education as these relate to teachers' attitudes, their concerns, and their self-efficacy toward inclusive practices. This study also investigated whether there was a relationship between teachers' attitudes and their self-efficacy toward inclusion in STEM classrooms. By assessing the attitudes, concerns, and self-efficacy, as well as factors that impact these elements, the results of this research study added new knowledge in the field of inclusive education and sought to inform trainings and professional development efforts in order to improve teachers' perceptions toward the inclusion of students in STEM classrooms.

Dissertation Organization

This dissertation was organized into five main chapters. Chapter 1 introduces the inclusion practices, condition of inclusion, research gap, and need for the current study as statement of the problem, purpose, and significance of the problem. Research questions with corresponding hypotheses are listed. This study was inclusive of a theoretical framework, discussing the provision of a theory base, and listing a Definition of terms.

Chapter 2 provides a comprehensive literature review for the research, and for teachers' attitudes, concerns, and self-efficacy toward inclusive education. The chapter provided an overview of inclusion, benefits, and barriers to inclusion, as well as listed strategies to make inclusive education successful. Existing studies on inclusive education will be discussed, together with the extant gap in literature.

Chapter 3 presents in detail the methodology steps applied in this study, in order to achieve research objectives and answer the research questions. Instrumentation used to collect data were explained in detail in this study. Sample collection procedures and final participants were also described. Finally, a discussion of research design, sources of data, and tools for collecting and analyzing the data was provided.

Chapter 4 revisits the purpose of the study and details the research questions. The results obtained from analyzing the data collected in this research study were presented. The chapter was organized by research question; for each question, the descriptive and statistical analyses were presented, as well as the answers to questions and reached conclusions.

Finally, Chapter 5 provides the summary of the results of the conducted research and presents its conclusions, contribution to the body of knowledge, and limitations; it also lists the recommendations for future research by the research

Statement of the Problem

Several research studies were conducted regarding teachers' attitudes, concerns, and self-efficacy toward inclusive practices. However, there is a lack of research on inclusive practices done in STEM classrooms on teachers' attitudes, concerns, and self-efficacy. Another issue with most of the existing research on teachers' attitudes, concerns, and self-efficacy toward inclusion is that the bulk of the research has been conducted either with primary teachers or pre-service teachers. Considering a need for improving inclusive practices in STEM classrooms, teachers' attitudes, concerns, and their self-efficacy toward inclusive education need to be investigated to bring attention to the necessity for additional teacher professional development on best practices for STEM inclusive classroom.

Purpose

The purpose of this research study was to investigate the attitudes, concerns and self-efficacy of teachers toward inclusion students in STEM classrooms through a quantitative research. This research study also investigated whether a relationship exists between teachers' attitudes and their self-efficacy

toward an inclusive education in STEM classroom. The outcome of this study might help develop programs and strategies to support current and incoming teachers and prepare them to better meet the needs of inclusion students in STEM classrooms. The findings of this study might also provide beneficial insights for improving teacher trainings in the implementation of inclusive education in order to meet the academic needs of inclusion students and teachers.

Significance

This research study was significantly the first of its kind in Louisiana, in the investigation of attitudes, concerns, and self-efficacy of teachers toward inclusive education in STEM classrooms. This research study was essential to explore solutions for not only inclusive educational problems, but also challenges faced by teachers in fulfilling the academic needs of the students with disabilities. Through a better understanding of teachers' beliefs around inclusion, the goal of this research study was to increase STEM teachers' sense of self-efficacy and improve their attitudes, with the goal of promoting the inclusion of students with disabilities in STEM classrooms. Furthermore, the findings and conclusions from this study added to the extant literature on inclusion practices. The current study contributed to the research from diverse grade levels including elementary, middle and secondary teachers who taught at least one of the four STEM subjects.

Research Questions

Teachers' attitudes towards the inclusion of special needs students is a key issue in studies of inclusion and is perceived as a crucial factor in the assimilation of this change in school (Ballone & Czerniak, 2001). In the research study, in the State of New Mexico, United States, regarding needs of regular education teachers toward special education, Cummings (2003) found that 65% of the respondents perceived themselves to be not at all prepared or somewhat prepared to work with special education students. Regarding teachers' attitudes in the secondary setting, several researchers have concluded that teachers' attitudes are less positive in middle or high schools than in elementary environments (DeSimone & Parmar, 2006; Lopes, Monteiro, Sil, Rutherford, & Quinn, 2004).

Several studies have demonstrated that a sense of self-efficacy as an experienced teacher positively influences teachers' attitudes towards the inclusion of students with disabilities (Meijer & Foster, 1988; Sharma, Loreman, & Forlin, 2011; Soodak et al., 1998; Weisel & Dror, 2006). The following research questions were developed for this study with the use of the existing literature and previous inclusive education findings.

1.What are the general attitudes of teachers toward inclusive education in STEM classrooms?

2. What is the level of concern of teachers toward inclusive education in STEM classrooms?

3. What is the overall self-efficacy of teachers toward inclusive education in STEM classrooms?

4. Are there any significant differences in teachers' attitudes, concerns, and self-efficacy toward inclusion in STEM classrooms based on demographic elements i.e., gender, grade level, age, education level, subject taught, teaching experience, teacher certification, and the number of higher education courses taken in special education, or attended SPED in-service training?

5. Is there a significant correlation between teachers' attitudes and teachers' self-efficacy toward inclusive education in STEM classrooms?

Hypothesis

Based on the first three objectives, the researcher examined the current attitudes, the current state of self-efficacy, and teacher levels of concern toward inclusive education in STEM classrooms. No hypotheses were formed, due to the researcher's use of descriptive statistical methods for the total scores, mean and percent.

In the next research questions, two hypotheses were formed and tested in answer to the research questions. Hypotheses were:

$H1_0$: There are no significant differences in teachers' attitudes, concerns, and self-efficacy toward inclusion in STEM classrooms based on demographic elements i.e., gender, grade level, age, education level, subject taught, teaching experience, teacher certification, and the number of higher education courses taken in special education, or attended SPED in-service training.

$H1_a$: There are significant differences in teachers' attitudes, concerns, and self-efficacy toward inclusion in STEM classrooms based on demographic elements i.e., gender, grade level, age, education level, subject taught, teaching experience, teacher certification, and the number of higher education courses taken in special education, or attended SPED in-service training.

$H2_0$: There is no significant correlation between teachers' attitudes and teachers' self-efficacy toward inclusive education in STEM classrooms.

$H2_a$: There is significant correlation between teachers' attitudes and teachers' self-efficacy toward inclusive education in STEM classrooms.

Theoretical Framework

The theoretical framework for this research study was grounded in Bandura's social cognitive theory (Bandura, 1986) and its important construct known as self-efficacy theory (1994). Social cognitive theory was used to explain teacher attitudes and beliefs and teacher behaviors in the classroom, given the understanding that the underlying causal structure explains development of competencies and regulation of action (Bandura, 1986). Bandura (2002) describes those conditions that control adoption of behavior, which include self-efficacy, possession of adequate resources, outcome expectations, and perceived opportunities and impediments. Social cognitive theory favors a model of causation involving triadic reciprocal determinism. This model of reciprocal causation, behavior, cognition and other personal factors, as well as environmental influences, operates with interacting determinants that influence each other bidirectionally. (Refer to Figure 2)

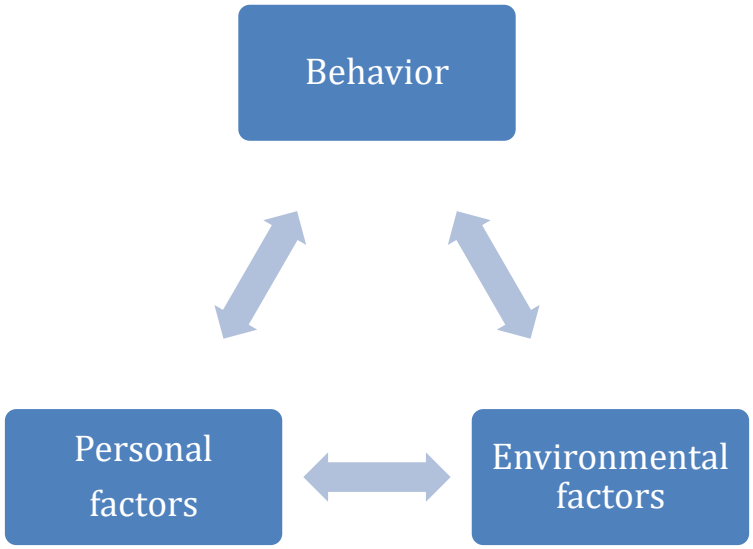


Figure 2. The Triadic Reciprocal Determinism

Teacher self-efficacy is rooted within self-efficacy of the social cognitive theory (Dellinger et al., 2008; Hoy, 2000). The attitudes and concerns of teachers toward inclusion and various factors such as school environment, administrative support, professional development trainings, etc., play important roles in describing inclusive practices. Environmental factors may include physical factors present in one's immediate setting, or social factors such as the influence of family members, friends, and colleagues (Bandura, 2001). Personal factors

include cognitive, motivational, affective, and selection processes associated by applying self-efficacy as an agent of behavioral change (Bandura, 1993).

The self-efficacy of teachers toward inclusion, based on Bandura's (1997) theory of self-efficacy, help to determine whether teachers achieve a positive outlook while teaching students with disabilities in an inclusive classroom and thus will create a conducive environment, not only for self but also will serve to enhance student learning. The various factors needed for successful implementation of inclusive practices were included through different articles in the current study; barriers and solutions to inclusion were thoroughly discussed.

Definition of Terms

The working definitions used for this study were as follows:

Collaboration- "A style of interaction professionals use in order to accomplish a goal they share, often used in inclusive schools" (Friend & Bursuck, 2009). A term used when discussing teamwork and how well people work together.

Disabilities – For the purpose of this study, the term disability will be defined as stated in the IDEA Act of 1992. The only way a student with special needs may receive individual instructional activities and related services is by meeting the eligibility criteria for one of the disabilities categories listed under IDEA. These include visual impairment, hearing impairment, deafness and blindness, orthopedic impairment, other health impairments, mental retardation, specific learning disabilities, serious emotional disabilities, or language impairment, multiple disabilities, traumatic brain injury, and autism (McCormack, Frome Loeb, & Schiefelbusch, 2003).

Least Restrictive Environment (LRE): An LRE is defined as the educational setting in which a child with disabilities can receive a free appropriate public education (FAPE), designed to meet the child's educational needs while being educated with peers without disabilities in the regular educational environment, and to the maximum extent appropriate (IDEA, 2004).

Inclusion: Inclusion is an educational setting where students with disabilities learn in the general education classroom with their non-disabled peers (Ainscow & Sandhill, 2010; Waldron, McLeskey, & Redd, 2011).

Individualized Education Program (IEP): A student individualized education program which addresses students with special education services must use especially designed instruction (Conderman & Hedin, 2012; Forbes & Billet, 2012; King-Sears & Bowman Kruhm, 2011).

***Paraprofessional*:** A noncertified staff member who assists certified staff in implementing educational plans for student who have disabilities (Friend & Bursuck, 2009).

Self-efficacy: "Beliefs in one's capabilities to organize and execute the courses of action required to produce given attainments" (Bandura, 2006, p. 3).

CHAPTER II

Literature Review

The literature for this review was obtained via the EBSCOHost and Google Scholar databases of scholarly journals, ERIC, JSTOR, published dissertations along with books and electronic articles. The following keywords were used in the search: teacher attitudes, inclusion, concerns toward inclusion, inclusive education, self-efficacy, and STEM inclusive education. The review of literature for this study focused on how teachers' attitudes, concerns, and self-efficacy affect the inclusive teaching of students with disabilities, with the literature review composed of multiple sections.

Inclusive Education

Inclusion is an educational setting where students with disabilities learn in the general education classroom with their non-disabled peers (Ainscow & Sandhill, 2010; Waldron, McLeskey, & Redd, 2011). Common disabilities that students may be diagnosed with, both in and out of the school setting, are inclusive of learning disabilities, physical and health disabilities, emotional and behavioral disorders, speech and language disorders, hearing and visual

impairments, and autism spectrum disorders (Waldron et al., 2011). Inclusion was initiated in the 1990s, when children with physical disabilities gained access to neighborhood schools. Inclusion has increased so that 90% of students with disabilities receive education in typical schools. About half of these students were included in the general classroom for 80% of the day" (Torreno, 2012, p. 1).

Benefits of Inclusion

Over 20 years of research consistently demonstrates that the inclusion of students with disabilities in general education classrooms results in favorable outcomes (Bui,Quirk, Almazon, & Valenti, 2010; Scruggs & Mastropieri, 1996). According to Waldron, Cole, and Majd (2001) in a two-year study, 41.7 % of students with learning disabilities made progress in math in general education classes, when compared to 34% in traditional special education settings without the presence of nondisabled peers. McGregor and Vogelsberg (1998) further reported that students demonstrated higher levels of social interaction with typical peers showing improved social competence and communication skills (e.g., Hunt, Alwell, Farron-Davis & Goetz, 1996), and academic gains were made (McDonnell, Thorson, McQuivey, & Kiefer-O'Donnell, 1997). The goal of inclusive education is to eliminate social exclusion, solidly based on the belief that education is a basic human right and the basis for a fairer society (Ainscow &

César, 2006; UNESCO, 1994). Thus, inclusion is about equity of access to quality education, while the lack of it can be linked to educational and social disadvantage and discrimination (Avramidis & Norwich, 2002; Boyle et al., 2012). Briefly, it may be said that inclusion is about increasing participation and decreasing exclusion by eliminating barriers to learning and participation (UNESCO, 2009).

Barriers to Inclusion

There is a body of research available that describes challenges and failures of inclusive education (Eriks-Brophy et al., 2006; Mamlin, 2008; Travers & Ring, 2005). Mamlin (2008) conducted a study on the impact of inclusion regarding a district-wide, restructuring initiative, finding different indicators for failure of inclusion. The two main indicators that accounted for failure to understand and implement inclusion were leadership and the culture of segregation. In contrast Travers and Ring (2005), using a multi-operational approach to data collection of a student with severe disabilities; four teachers instructing inclusion classrooms revealed several barriers to implementation of a successful inclusion. The main barriers included apprehension emanating from non-disabled students' lack of knowledge regarding learning disabilities, teaching materials, teachers' perceptions of meeting the academic needs of special needs students, and the

extent of a student's social inclusion. A study by Eriks-Brophy et al. (2006) found that students with hearing losses were orally educated in inclusive settings.

STEM Inclusion

The National Science Foundation (NSF) has placed a high priority on the cultivation of a diverse science, technology, engineering, and mathematics (STEM) workforce in the United States (NSF, 1996, 2000, 2004). This concern has been reflected by the National Science Board in its 2010 report, "Preparing the Next Generation of STEM Innovators." The inclusion students in STEM classrooms tend to face challenges in understanding the basic concepts. Thus, only 5% of students with disabilities become a part of the STEM workforce, although individual efforts often lend to success in these career paths (Leddy, 2010). As a result, the teachers must use various effective methods to reach each student in STEM inclusive classrooms in order to better prepare the inclusion students for STEM related jobs in both current and future workforces. The use of technology in teaching in STEM inclusive classrooms has the ability to spark student interest, as well as to provide additional support to students with disabilities for a more effective understanding of the STEM concepts. Next, a few strategies to make STEM inclusion successful are discussed.

Universal Design for Learning (UDL)

Educators have applied one such strategy-based curriculum design, called Universal Design for Learning (UDL) to reach inclusion students. The UDL curricula equips teachers to integrate intelligent pedagogy with technology, in order for students to choose the most appropriate medium to access specific content (King-Sears, 2009). Educational video games are readily accessible and provide teachers with tools to create UDL-science curricular materials (Marino, Basham, & Beecher, 2011). Students practice with these games repeatedly, and thereby may interact with a complex vocabulary and other processes in multiple ways. The Universal Design for Learning (UDL) assumes a completely different stance in the use of technology. This model places an emphasis on educators being proactive and flexible in order to teach students with diverse needs (Nepo,2016). The Universal Design (UD) consists of seven guiding principles, (1) equitable use, (2) flexibility in use, (3) simple and intuitive use, (4) perceptible information, (5) tolerance for error, (6) low physical effort, and (7) size and space for approach and use (Connell et al., 1997). UDL can help the inclusion students in myriad ways.

First, the use of technology would make the strategies in UDL more easily implemented, since technology already affords various accommodations and

adaptations suitable for students. For example, the accessibility options on many devices include texts for speech, magnification, or auditory output. These options are necessary for those with dexterity, visual, or learning impairments. These devices also reduce the need for creating special accommodations for individual students (Nepo, 2016). Second, a technology-based curriculum can provide immediate feedback and additional prompts, thus promoting the application of UDL principles (Edyburn, 2004, 2010; King-Sears, 2009; Woodward & Rieth, 1997).

Third, the readily available high-technology devices in UDL could increase the respect and dignity for students with disabilities. Parette and Scherer (2004) emphasized the importance of an ‘‘aesthetically appealing’’ design for reducing the stigma associated with disabilities. For example, while portable tablets or mobile phones can assist in improving communication skills (Kagohara et al., 2013), leisure skills (Carlile et al., 2013), and independent skills (Kagohara et al., 2013) for students with disabilities, these devices do not attach a stigma as other traditional assisting devices might do; other students without disability also used these devices for similar or other purposes.

The Flipped Classroom

The flipped classroom is a teaching method that has gained recognition in primary, secondary, and higher education settings. The flipped classroom flips traditional teaching methods, by means of delivering instruction outside the classroom, and spending class time to problem solve with the teacher acting as a facilitator. This methodology provides an opportunity for more hands-on and student-driven learning during class time (Altemueller & Lindquist, 2017). Early research on flipped learning suggests that students benefit from this approach with regard to improved test scores, course completion rates, and attitudes toward learning (Hamden, McKnight, McKnight, & Arfstrom, 2013). A flipped classroom might help teachers in providing differentiated instruction to meet the needs of students with learning difficulties.

The struggling students were found to receive the most help by flipping a classroom. Bergmann and Sams (2012) observed that in this scenario, the role of the teacher changes from one who presents information to one who becomes a teaching coach. This provides the teacher an opportunity to spend additional time either working one-on-one or in small groups, which is a most effective way to meet the needs of students with learning difficulties. The amount of time spent in classroom interaction between the students and the teacher increases, while

student-to-student interaction is maximized. This modification of the traditional classroom allows for more differentiation of instruction in the inclusive classroom (Altemueller et al., 2017). Additionally, a teacher may plan activities for the students to gain mastery over STEM concepts in order to reach every inclusion student in the STEM classroom. Also, the utilization of a flipped classroom teaching model allows for tiered lessons; the in-class activities can easily be created with scaffolds for a variety of learner levels (Tomlinson, 2004).

Use of Assistive Technologies

Students with disabilities (physical cognitive, sensory, language, or emotional) that negatively affect school performance and who are in an inclusive classroom may require specific modifications (Lewis & Doorlag, 2006). Federal legislation requires that various aids and services be provided to students with disabilities in order to support them in accessing the general-education curriculum. Such modifications to the curriculum may include assistive technology (AT) devices and services. AT may be any item, piece of equipment, or teacher-made product that is used to improve a student's functional capability or to help a student succeed in accessing the general education curriculum. Students with disabilities have used items such as pencil grips and text-to-speech devices to become successful in inclusive classrooms (Watson & Johnston, 2007).

Word processing programs, such as Microsoft Word, allow student writers to organize and revise text in order to improve the final writing product, which could easily benefit students in an inclusion classroom. These programs also help students to put their ideas in order and check for errors as well.

Online Learning Programs

Numerous states have shown over 100% growth rates in online education for the last few years (Watson, Murin, Vashaw, Gemin, & Rapp, 2013). Currently, nearly 5% of the K–12 student population (or several million students) are participating in either blended or fully online courses (Watson et al., 2013). With the increase in blended and fully online K–12 instruction, all students, including those with disabilities, are finding online learning a viable option to address learner varieties. Personalized learning or the individualized education programs (IEP) align well with the many features of blended and fully online instruction (Smith & Basham, 2014).

Whether it is blended or online learning, numbers indicate a huge growth for the K–12 classroom, including inclusive classrooms. According to Christensen, Johnson, and Horn (2008) at the K-12 level, online learning is commonly seen as best for situations in which classroom instruction is not available—virtual schools for rural students, credit recovery, courses not offered

by the students' school, and so on. Many original credit and credit recovery software-based programs are available to help inclusion students in order to compete with regular education students. The programs include the following: a) Aventa learning, b) Odesseyware, c) Florida Virtual school, d) Connections Academy, e) Apex Learning, and f) Edmentum. These programs are web based and provide an alternative option for learning to regular and inclusion students. Khan Academy and OER Commons are popular, web-based programs, available for students to provide additional support.

Use of iPads to Improve STEM Inclusive Education

Aronin and Floyd (2013) listed some excellent uses of iPads in a STEM inclusive, pre-school classroom, and averred that to increase motivation and interest, teachers must apply improved strategies when working with students of younger ages on STEM concepts (Moomaw & Davis, 2010). Due to the portability of the device and a bunch of free apps for early childhood, iPads were chosen as technology tools to introduce STEM concepts to inclusion students. Small groups of mixed ability were chosen to deliver the instructions so that

students could repeat directions and learn from peers as well (Aronin et al., 2013). Some of the apps were as follows: Monkey Math School Sunshine, My First Tangrams HD - A Wood Tangram, iLearn With Poko: Seasons and Weather! Bridge Basher, Builder Blocks Preschool, and Build a Robot. When the confidence and independence of students with the iPad increase, the opportunity should be taken to lead discussions and thereby expand learning from the apps to the classroom environment, as well as to careers in various STEM fields (Aronin et al., 2013). Thus, an introduction to STEM concepts at an early age supports the concept of encouraging students to be interested in STEM related career paths. Preliminary research shows that by targeting the youngest learners, student achievement is dramatically improved over the long term when technology is integrated into the classroom (Pentimonti, Zucker, Justice, & Kaderavek, 2010).

Educational technology has long been recognized as a valuable approach to improving the mathematics achievement of elementary school children (Chang, Yuan, Lee, Chen, & Huang, 2013; Pilli & Aksu, 2013). According to the National Council of Teachers of Mathematics (2000), "Technology is essential in teaching and learning mathematics; it influences the mathematics that is taught and enhances students' learning" (p. 11**).** Zhang, Trussell, Gallegos, & Asam (2015) supported the idea of using technology to teach fourth grade STEM inclusive

students by using math apps on tablets such as iPads. In the study, Zhang et al. focused on math apps for decimals and multiplication. Both types represented essential concepts for mathematical competency at the elementary grades and beyond (Rathouz, 2011). Zhang et al. found that the students used Splash Math, Motion Math Zoom, and Long Multiplication in four math class sessions over the course of one month. Each session, lasting about 80-90 minutes, showed improvement in different assessments in STEM inclusive classrooms, thus decreasing the achievement gap between struggling students and regular students.

Students who are STEM proficient prepare the nation to be a global leader in an increasingly global economy (Hughes, 2010). Teaching and learning STEM disciplines are also valuable in enhancing the quality of daily life for students, especially for those with disabilities (Hwang & Taylor, 2016). Students who have advanced knowledge in STEM are more likely to gain greater work-related opportunities (Basham & Marino, 2010). According to the United States Department of Education (2015), up to 62% of the fastest growing careers require proficient knowledge or skills in STEM-related areas (Basham & Marino, 2013; Kaku, 2011). Also, STEM helps an individual to live a better quality of life, since the program may be utilized in every step of a person's daily life. Recent analyses indicate that during the next five years, major American companies will find it

necessary to add a total of nearly 1.6 million employees to their workforce: the positions will call for 945,000 individuals who possess basic STEM literacy, and 635,000 individuals who demonstrate advanced STEM knowledge (Business Roundtable & Change the Equation, 2014).

Self-Efficacy Theory

Teacher beliefs include an important construct of social cognitive theory known as the self-efficacy theory (Bandura, 1997, 2002; Barros, Laburu, & DaSilva, 2010). Self-efficacy is defined as belief in one's ability to successfully accomplish a task under specific conditions (Bandura, 1977, 1997). Perceived self-efficacy is defined as people's beliefs about their capabilities to produce designated levels of performance that exercise influence over events that affect their lives. Self-efficacy beliefs determine how people feel, think, motivate themselves and behave (Bandura, 1977, 1986, 1994). Such beliefs produce these diverse effects through four major processes. They include *cognitive, motivational, affective,* and *selection* processes. The motivational effects are based on goal setting and outcome expectations. The cognitive effects include the scenarios of anticipatory success and failure that people generate, as well as acquiring and deploying strategies for managing environmental demands (Bandura, 1997).

Self-efficacy involves a judgment of one's capability to perform tasks rather than personal qualities, such as one's physical characteristics or psychological traits with multidimensional beliefs; therefore, self-efficacy measures are context-dependent. Self-efficacy is dependent on a mastery criterion of performance, rather than normative or other criteria (Zimmerman, 1995) and is measured before performing relevant activities. Bandura (1986, 1997) listed four sources of self-efficacy information: a) mastery experience, b) vicarious experience, c) social persuasion, and d) physical and emotional arousal.

People with a strong sense of efficacy perceive difficult tasks as challenges to be mastered, rather than threats to be avoided. This helps individuals to set challenging goals and strive hard to attain those goals. Failures do not deter them from achieving such goals, but rather act as a guiding force to work harder in order to achieve the goals. In contrast, a person with weak self-efficacy may tend to avoid challenging tasks and set lower goals to assure that there is no pressure and so may obtain an easy success. Efficacy beliefs play a vital role in the development of self-directed, lifelong learners. Students' beliefs in their abilities to master academic activities importantly affects their aspirations, level of interest in intellectual pursuits, academic accomplishments, and how well they prepare themselves for different occupational careers (Hackett, 1985, 1995;

Holden, Moncher, Schinke, & Barker, 1990; Schunk, 1989; Zimmerman, 1995). A low sense of efficacy to manage academic aspirations also increases vulnerability to scholastic anxiety. Perceived self-efficacy encourages engagement in learning activities that promote the development of educational competencies. Such beliefs affect the student's level of success as well as motivation (Zimmerman, 1995).

Teacher Self-efficacy and its importance

Teacher efficacy is defined as the personal judgment of his or her capabilities to bring about desired outcomes of student engagement and learning, even among those students who may be difficult or unmotivated (Tschannen-Moran & Woolfolk Hoy, 1998). In various literatures, the terms "teacher self-efficacy" or "teacher efficacy" is often used to represent the same concept. The correlates of teacher efficacy increase when using a variety of efficacy scales and measurements. An efficacious teacher will be effective in a classroom, no matter the challenge. Pupils of efficacious teachers generally outperform pupils in other classes (Henson, 2001). Teacher efficacy is also related to the student's own sense of efficacy (Anderson et al., 1988) and student motivation (Midgley, Feldlaufer, & Eccles, 1989). This may be a huge factor for student achievement and advancement in an inclusion classroom. The construct of teacher efficacy is

important in the educational process to promote student success (Bandura, 2006). Teachers with high self-efficacy will lead students to achieve success and show greater work satisfaction (Tschannen-Moran & Hoy, 2001). Studies have investigated how teaching efficacy is shaped by a variety of factors. Among these are teacher preparation, specialized certification, and professional development, which have been shown to correlate positively with teacher efficacy (Chu & Garcia, 2014).

Teacher Self-Efficacy in an Inclusion STEM Classroom

As assured by the Individuals with Disabilities Education Act of 2004 (IDEA), students with disabilities are afforded a free appropriate public education (FAPE). In ensuring a FAPE, provisions are made that ensure the education will be provided in the student's least restrictive environment (LRE). In 1975, Congress passed Public Law 94-142 (Education for All Handicapped Children Act), now codified as IDEA. The thought of LRE was first presented in the Education for All Handicapped Children Act (1975). When IDEA was reauthorized in 2004, LRE became an even more widely debated topic, because the concept relates to inclusion. Inclusion is not defined in IDEA; therefore, various views on inclusion continue to exist (Gal, Schreur, & Engel-Yeger, 2010).

Supporting students with disabilities in a STEM classroom could be challenging. Many students with disabilities entering required general education courses do not possess prerequisite skills for success (Deshler, Schumaker, Bui, & Vernon, 2006). In many cases, students with disabilities enter high school, reading on an average at the fourth-grade level (Deshler et al., 2006). Thus, students reading at the fourth-grade level will struggle in comprehending information from a text written at the ninth-grade level or higher. Regarding mathematical skills, multiple inclusion students have mastered basic facts of addition and subtraction with whole numbers, yet have not mastered multiplication, division, or work with fractions and decimals (Warner, Schumaker, Alley, & Deshler, 1980). Students holding such a deficiency of knowledge find it difficult to successfully complete a math course in a STEM classroom. When teaching students in an inclusion STEM classroom, teacher efficacy becomes an important variable (Brady & Woolfson, 2008).

Teachers' sense of self-efficacy is a construct which can significantly influence teachers' readiness to work in a challenging environment, and as such must be included in considering the implementation of inclusive education (Ilić-Stošović, Nikolić, Popadić, 2015). Self-efficacy greatly influences and controls the motivation to study and performance (Hoy & Davis, 2005). M. Skaalvik and

S. Skaalvik (2007) cited the research by Friedman and Farber (1992) which noted that teachers who assume themselves less competent in classroom management and in maintaining discipline expressed a higher level of burnout syndrome when compared to teachers with a higher level of self-efficacy. For the purposes of teaching within an integrated STEM framework, firmly established as a complicated and intellectually challenging endeavor, teacher self-efficacy may be hypothesized as a significantly important predictor of teacher behavior in regarding both success and failures (Mobley, 2015). The figure below may be used to describe this framework:

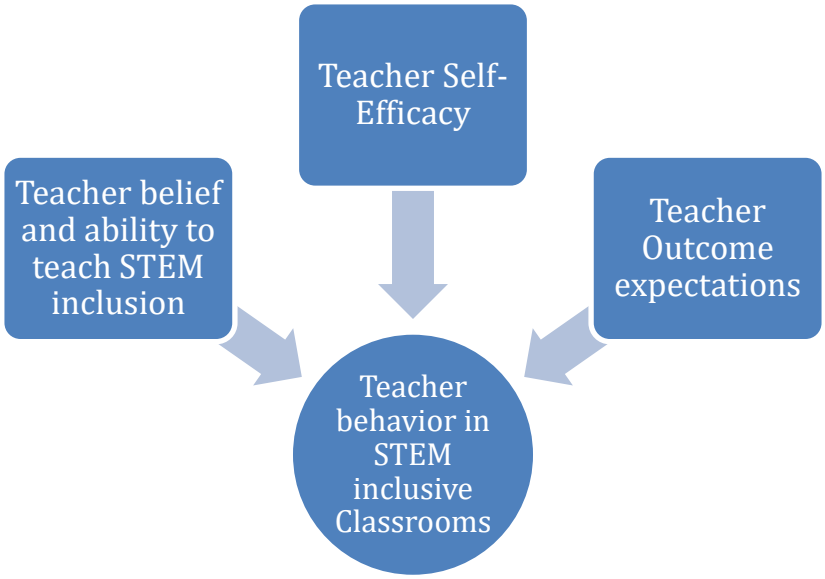


Figure 3: Integrated STEM Framework

Several researches and studies found a positive correlation between the topic of attitude toward inclusive education and teachers' perceived sense of self-efficacy. Brigs et al. (2002) and Gao and Mager (2011) found that teachers' perceptions of the sense of self-efficacy and their beliefs in relation to differences at school might carry a positive effect on each other. It is possible that teachers confident in their teaching skills would be less anxious when teaching students with learning and developmental disabilities. Ozokcu (2017) in researching 1163 preschool and classrooms teachers, reported that a positive significant relationship between teachers' attitudes and self-efficacy existed. This suggests that teachers with a more positive attitude toward inclusion would describe their experiences with inclusive education more positively, which would increase the level of their self-efficacy perceptions as well. In another study, Frizzel (2018) calculated a statistically significant correlation between attitudes toward inclusion and perceptions of self-efficacy for general and special education teachers. Several studies for students with disabilities in inclusive education settings found that high teacher efficacy presents a major factor affecting inclusion implementation (Forlin, Jobling, & Carroll, 2001; Forlin, Loreman, & Sharma, 2014). The higher self-efficacy of teachers in teaching special needs students correlates with the teacher's positive attitudes toward inclusion in the classroom (Sokal & Sharma, 2013). In another study in Israel, Wiesel and Dror (2006) reported that primary

school teachers with a higher perception of self-efficacy demonstrated a more positive attitude toward inclusion practices. Several other researches demonstrated similar view asserting that teachers with higher self-efficacy held more positive attitudes toward inclusion (Brady &, Woolfson 2008; Malinen, Savolainen, & Xu, 2012; Woolfolk Hoy & Spero, 2005).

Teacher Collective Self-Efficacy

Self-efficacy plays a role also in shaping collective self-efficacy, positive attitude toward inclusion, and work attitude. Arslan (2017) conducted a research on collective self-efficacy of pre-school teachers in Turkey, concluding that a significant relationship exists between perceptions of teachers about their profession and collective self-efficacy. Teachers with a high level of professional perceptions were also successful in collective self-efficacy levels, while low levels of perceptions about the profession led to collectively inadequate self-efficacy.

In a research study, Moran (2015) cited that teachers with high efficacy were more inclined to take responsibility for supporting students with learning difficulties and meeting their needs in their own classrooms (Brady & Woolfson, 2008). According to Armor et al. (1976) in the Research and Development (RAND) study, the finding was that teachers' beliefs in their own capabilities

were significantly related to teachers' successfully teaching reading to minority students in an urban context. Encouraged by the success of the RAND study, researchers continued to study teacher efficacy.

By incorporating Bandura's social cognitive theory into their research, Ashton and Webb (1982, 1986) proposed that a teacher's outcome expectations of teaching in general would result in a dimension of teacher efficacy. Ashton and Webb recognized that RAND first measured this dimension with regard to general teacher efficacy (Guskey & Passaro, 1994). Then the second dimension studied by the RAND report further explored personal efficacy (Guskey & Passaro, 1994). Ashton and Webb averred that these two dimensions work independently. Importantly, teachers believe that teaching represents a powerful factor in student learning, yet some teachers may lack the personal ability to affect their own students (Guskey & Passaro, 1994). Other teachers consider that teaching in general has little influence on students, yet exceptions to the rule may exist (Guskey & Passaro, 1994).

The task of creating a learning environment conducive to development of cognitive competencies rests heavily on the talents and self-efficacy of teachers (Bandura, 1997). Bandura (1997) further states that teachers with a high sense of instructional efficacy operate on the belief that difficult students are teachable

through extra effort and appropriate techniques, and that these students can enlist family supports, and thereby may overcome negating community influences through effective teaching. On the other hand, teachers who have a low sense of instructional efficacy may believe that they could do little for unmotivated students, and that teachers alone exert a limited influence on the intellectual development of students, when compared to the influences of the home and neighborhood environments. Yet students in an inclusive STEM classroom would highly benefit from a teacher with a high sense of instructional efficacy.

Gibson and Dembo (1984) carried out a microanalytic observational study of the manner in which teachers of high and low perceived efficacy manage classroom activities. The researchers found that teachers who believe strongly in their ability to promote learning tend to create mastery experiences for their students. Those teachers who carry self-doubt in regard to instructional efficacy tend to construct classroom environments that may undermine students' judgement of their abilities and their cognitive development.

Bandura (1997) also opined that educational systems will increasingly rely on electronically mediated instruction, which would require teachers to upgrade their knowledge and skills in educational technologies. Teachers' belief in their personal efficacy may affect their receptivity and adoption of educational

technologies. Further, teachers of low perceived mathematical efficacy tend to distrust their personal capacity to make good instructional use of computers (Oliver & Shapiro,1993).

The family plays a key role in children's success in school (Bandura, 1997). Then to an extent, teachers' sense of efficacy determines the level of parental participation in children's scholastic activities. Teachers who are secure in their perceived capabilities are most likely to invite and support parental educational efforts. Thus, the higher the teachers' perceived instructional efficacy, the more parents will seek classroom contact with teachers in order to provide parental home instruction on plans devised by the teacher, help children with their homework, and thus support the teacher's efforts in good measure. (Hoover-Dempsey, Bassler & Brissie, 1987, 1992).

Sharma, Loreman, & Forlin (2012) posited in their research study that high teacher efficacy may be viewed as a key ingredient in the creation of successful inclusive classroom environments. Sharma et al. created an 18-item scale to measure the self-efficacy of a sample of 607 pre-service teachers selected from four countries (Canada, Australia, Hong Kong, and India). The Teacher efficacy for Inclusive Practices (TEIP) scale allows teacher educators to measure the perceived efficacy of participants in three areas (1) Efficacy to use Inclusive

Instructions (2) Efficacy in Collaboration (3) Efficacy in Managing Behavior. Thus, it may be used as an evaluation tool to discern whether teachers have obtained a reasonable level of perceived efficacy toward inclusive education. Although there is no fixed score that must be achieved, this scale can provide a general view of teacher efficacy for inclusion classrooms. Also, departments of education or school district leaders might use the scale to achieve an understanding of teacher efficacy in working effectively in an inclusive classroom, especially with new teachers who find STEM inclusion classrooms to be challenging. Targeted professional development programs might then be designed to address areas where teachers perceive that they lack competence. According to Samms (2017), a research study conducted with primary teachers revealed that the teachers, in conducting inclusive practices in the classroom, perceived themselves to be self-efficacious.

Teachers' Attitude Toward Inclusive Education

The most important piece of inclusive education resides in the role of teachers and their attitudes toward inclusive education. An attitude may be defined as a belief, feeling, or behavioral tendency toward a socially significant object or symbol, such as inclusive education (Hogg & Vaughan, 2014). Research indicates that teachers' attitudes are a critical factor in the implementation of

inclusion of students with disabilities (Avramidis & Norwich, 2002; Forlin, Earle, Loremann, & Sharma, 2011). Research suggests that a better understanding of teacher attitude towards inclusion may assist in improving the learning environment (Ross-Hill, 2009). Educators who have apprehensive attitudes may use practices that promote exclusion rather than inclusion in their classrooms (Sharma, Forlin, & Loreman, 2008). On the other hand, educators who hold positive attitudes towards inclusion tend to use teaching strategies to accommodate individual differences (Campbell, Gilmore, & Cuskelly, 2014; Forlin 2010).

Avramidis & Norwich (2002), after conducting a literature review on teachers' attitudes toward inclusive education, concluded that although teachers carry a positive attitude towards inclusive education, the teachers still displayed a difference of attitudes, based on the nature of students' disabilities. The teacher-related variables were very inconsistent as strong predictors of teachers' attitudes. Yet environment-related variables remained very consistent in supporting attitudes of teachers toward being more positive. Other variables were also significant, such as teacher trainings and years of teaching experience in deciding teacher attitudes toward inclusive education. Bhatnagar & Das (2014), in a qualitative study regarding attitudes of secondary regular school teachers toward

inclusive education in India, found that teachers held positive attitudes toward inclusion of students with disabilities. Samms (2017) in a study with Jamaican primary school teachers, concluded that teachers held a slightly positive attitude toward inclusive practices. Similar findings were reported by Abdullah and Abosi (2014), who found that primary teachers highly supported inclusion of students in regular classrooms. Similar results of teachers' positive attitudes toward inclusion were shown in studies (Beacham & Rouse, 2012; Oswald & Swart, 2011; Park & Chitiyo, 2011). Several other researchers reported that teachers' attitudes toward inclusion were negative (Avramidis & Kaylva, 2007; Diken & Sucuoglu, 1999; Gozun & Yikmis, 2004; Rakap & Kaczmarek, 2010).

A better understanding of teacher attitude towards inclusion may assist in an improvement of the learning environment (Ross-Hill, 2009). Effective inclusive education practices played a positive role regarding the nature of disabilities and their perceived roles in supporting students with special education needs (Jordan, Schwartz, & McGhie-Richmond, 2009). Prior experience and knowledge about students with disabilities has a direct link with more positive attitudes by teachers towards inclusion (Burke & Sutherland, 2004). DeBoer et al. (2011) suggested that the successful implementation of being inclusive remains dependent on the teacher's willingness to accept the inclusion model.

The negative attitudes that teachers have toward IE may have a detrimental impact on student learning and may impede the success of the IE model (Cassady, 2011). Teacher attitudes contribute to teaching effectiveness and subsequent student learning (Cassady, 2011). Gal, Schreur, and Engel-Yeger (2010) concluded that teacher attitude is one of the most important aspects of teaching, and that negative attitudes negatively affect the teaching practice in the classroom. Taylor and Ringlaben (2012) highlighted the detrimental impact of negative attitudes toward IE, as such attitudes extend throughout the school culture. These attitudes tend to result in teaching practices that impede student learning. Salem (2013) stressed that a positive attitude towards inclusion of disabled students is a highly valuable requirement for the success of IE. Salem further averred that the teacher is the most influential person in the process of education.

Gal et al. (2012) identified that negative attitudes toward inclusion may lead to a decrease in academic performance and an increase in the isolation of special education students. Gal et al. indicated that teachers with negative attitudes are representative of the most difficult barriers to change in the educational environment. Gal et al. outlined an example of how attitudes and

beliefs that teachers carry toward special education students can affect teaching and learning.

Teacher Concerns about Inclusion

Research indicates that there are common concerns regarding the attitude of regular education toward inclusion (Cook, 2001; Chesley & Calaluce, 1997; Heflin & Bullock, 1999). One of the concerns may be insufficient time to spend teaching the student with disabilities. Another concern may be that the regular education teachers do not have the training necessary for working with students with disabilities (Monahan, Marino & Miller, 2000). At both the pre-service stage and in-service professional development, lack of teacher preparation becomes problematic in the inclusive setting, because it may increase levels of teacher stress (Forlin & Chambers, 2011), as well as impacting the success of general education teachers in that setting (Kosco & Wilkins, 2009). Sharma Forlin and Loreman (2011) conducted a study on inclusive education concerns of pre-service teachers. The researchers took samples from Australia, Canada, Hong Kong, and Singapore participants. The researchers found that teachers showed higher concerns regard to their lack of knowledge and skills, lack of resources, coping with students who lack self-care skills, and lower level of concerns toward a lowering of academic school performance, and increased workloads. The

decline of a school's academic standard was a lowest-ranked concern for participants from all countries, except Singapore. Also, participants from all countries except Hong Kong were least concerned about an increase in work load. Shady, Luther and Richman's (2013) study found that 74% of the teachers expressed concern that they would need extended professional development in order to improve their understanding of inclusion and the inclusive process.

Teacher workload could be another concern that teachers raise when it comes to teaching students with disabilities in inclusive classrooms. A study conducted by Dory, Dion, Wagner, and Brunet (2002), revealed that teachers do not mind including students with disabilities in their classroom, as long as their workload is not increased. Sharma (2001), Bhatnagar (2006), and Sharma,Moore and Sonawane (2009), in regard to concerns of elementary school teachers toward inclusive education, emphasized that in order for inclusive education programs to be successful, it is crucial that the needs and concerns of educators be identified and systematically addressed. In this regard, Bhatnagar and Das (2013) posited in their study that should teachers be largely unprepared and unassisted in implementing inclusion programs, the situation may undermine their self-esteem, causing undue stress; as a result, teachers may be unable to cope with the implementation of such programs due to educational policies.

Sharma and Desai (2002) conducted a study in India with 310 elementary principals and 484 teachers. The researchers concluded that lack of resources was a major concern. Teachers showed a moderate level of concern, involving the acceptance of students with disabilities, declining academic standards of the school, and increased workloads due to implementation of inclusive practices. Participation in a professional development course on implementing inclusive education serves to positively influence the participants, thereby lowering their concerns toward inclusive education. This may also improve the intentions of future teachers toward teaching in inclusive classrooms (Aiello & Sharma, 2018).

Conclusion

Effective inclusive education is most important in order for students with disabilities to make STEM inclusion successful. Although there was a significant amount of literature about attitudes, concerns and self-efficacy toward inclusive education, there was scant research available that was conducted in regard to STEM classrooms. Also, most researches focused on inclusive education solely in elementary classrooms. As a result, a research gap exists in the investigation of teachers' attitudes, concerns, and self-efficacy toward inclusive practices in STEM classrooms. The current research might have addressed the research gap.

This study also provided a useful insight into making successful the STEM inclusion of students, thereby rendering inclusive education more effective.

Chapter III: Research Method

Introduction

This chapter included the information regarding how the sample was selected, a description of the sample, and the instrumentation used for this research study. In addition, data collection and data analysis procedures were discussed. The chapter concluded with a table containing summary of statistical tests conducted for analyzing each research question and rationale behind using each test.

Restatement of Research Questions and Hypotheses

The following research questions were developed for this study through use of the literature and previous inclusive education findings.

1.What are the general attitudes of teachers toward inclusive education in STEM classrooms?

2. What is the level of concerns for teachers toward inclusive education in STEM classrooms?

3. What is the overall self-efficacy of teachers toward inclusive education in STEM classrooms?

4. Are there any significant differences in teachers' attitudes, concerns and self-efficacy toward inclusion in STEM classrooms, based on demographic elements, i.e., gender, grade level, age, education level, subject taught, teaching experience, teacher certification, and the number of higher education courses taken in special education, or attended SPED in-service training?

5. Is there a significant correlation between teachers' attitudes and teachers' self-efficacy toward inclusive education in STEM classrooms?

Hypotheses

Based on the first three objectives, the researcher examined the general attitudes, current state of self-efficacy, and levels of concern toward inclusive education in STEM classrooms for teachers. No Hypothesis was formed, because the researcher applied descriptive statistics methods for the total scores, mean, and percentage.

In the next research questions, two hypotheses were formed and tested in answer to the research questions. Hypotheses were:

$H1_0$: There are no significant differences in teachers' attitudes, concerns, and self-efficacy toward inclusion in STEM classrooms based on demographic elements, i.e., gender, grade level, age, education level, subject taught, teaching experience, teacher certification, and the number of higher education courses taken in special education, or attended SPED in-service training.

$H1_a$: There are significant differences in teachers' attitudes, concerns, and self-efficacy toward inclusion in STEM classrooms based on demographic elements, i.e., gender, grade level, age, education level, subject taught, teaching experience, teacher certification, and the number of higher education courses taken in special education, or attended SPED in-service training.

$H2_0$: There is no significant correlation between teachers' attitudes and teachers' self-efficacy toward inclusive education in STEM classrooms.

$H2_a$: There is a significant correlation between teachers' attitudes and teachers' self-efficacy toward inclusive education in STEM classrooms.

Subject Selection and Description

A quantitative research methodology was utilized within this research study. The subjects for this study were pre-service teachers and in-service teachers from various school districts in the State of Louisiana, United States. The participants were selected from a group of teachers who taught one or more STEM subjects. A simple random sampling method was used to select the research sample.

An *a priori* power analysis (G* Power 3) was conducted to determine the sample size needed to test each research hypothesis at a .05 level of statistical significance and a power of .80, with a medium effect size. According to the results of this *a priori* analysis, a sample size of 128 participants (n=128) sufficiently achieved these parameters. Institutional Review Board (IRB) approval was obtained from the institutional Research Oversight Committee of Southern University and A & M College to conduct research to gain access to participants for data collection vide IRB registration number # 00002445 on March 7, 2019.

Sample and Population

The population of interest in this research study were trainee teachers and

in-service teachers in K-12 public and private schools in the State of Louisiana, Unites States. The study used a simple random sampling method to select the participants. Request emails were sent to principals, assistant principals, head of departments, and consultants, inviting them to forward the survey link and consent forms to the teachers in their respective departments for participation in this research study. Reminder emails were sent at least three to four times to the department heads, assistant principals, and principals of multiple schools to obtain the targeted sample. Paper copies of the questionnaire were distributed at several schools as an alternative to an online survey link. Permission was obtained from the school superintendent's office within the researcher's own district to allow distribution of the survey and consent form to different schools. Individual invitation emails were also sent to department heads and several teachers in various K-12 school districts and schools in Louisiana to invite participation in this research study. It was not possible to count the response rate, because the questionnaire was on-line and therefore free to any teacher with an appropriate link to respond. The data was collected from March 9, 2019 to March 30, 2019 by an online platform, as well as on paper. The final response from teachers numbered 323 of those 304 teachers responded to the online survey via Microsoft forms and 19 teachers responded the survey on paper.

Out of 323 participants, 198 participants were selected for the research study, based on the respondents teaching one or more STEM subjects. One of the participants was not counted toward the sample, due to incomplete information in the survey responses.

Data Collection Methods. This research study requested teachers to participate by means of an anonymous questionnaire survey, with a consent letter attached to the survey. Due to surveys being common, practical tools to obtain information by means of a convenient and economical manner, the study used a survey for the sample population (Cozby & Bates, 2011). The survey method is ideal for collecting information with respect to beliefs, opinions, and attitudes, thereby allowing participants to self-report internal states (Creswell, 2012).

A four-part survey questionnaire was used to collect data. The survey was administered via electronic platform, using both Microsoft forms and paper as well. The survey link was made available through email. The researcher transferred data from the paper questionnaire to a secure Microsoft account that required a username and password. The paper questionnaires were then stored in a locked filing cabinet. The data was coded, reverse coded, cleaned, and represented for reporting and interpretation of results. The analysis of the data was saved to a password protected, personal computer.

Instruments (See Appendix A)

The survey instrument collected data from the participants. The survey contained four parts: Demographic Information, Attitude toward Inclusion Scale (AIS), Concerns toward Inclusive Education Scale (CIES), and a Teacher Efficacy for Inclusive Practices (TEIP) Scale.

Demographic Information. The first part of the survey consisted of demographic information about the participants, in order to collect information about personal factors that might have an impact on teachers' attitudes, concerns, and self-efficacy toward inclusive education in STEM classrooms. The demographic form consisted of questions regarding the participant's a) Grade level taught, b) Gender, c) Age, d) Highest level of education, e) Subject taught, f) Number of years of teaching experience, g) Area of certification level, h) Number of special education courses taken at higher education level, and i) In-service trainings concerning special education.

Attitude toward Inclusion Scale (AIS). Part II of the survey contained the Attitude to Inclusion Scale (AIS) that measures the attitudes of teachers toward inclusive education. Sharma and Jacobs (2015) developed the AIS scale. The scale was tested in Australia (n =314) and India (n=245) with in-service teachers. A total of the ten most frequently appearing themes in the literature were

written as statements to be incorporated into the scale (Avramidis & Norwich, 2002; Sharma, 2012; Sharma & Sokal; 2015; Savolainen et al., 2011), The AIS measures participant attitudes with a focus on changing the environment rather than focusing on the difficulties of a particular student. The AIS scale further yielded two sub-scales measuring two separate constructs:

- One attitude (beliefs) sub-scale contained four items which pertained to measuring teachers' attitudes, based on beliefs about inclusive education;
- The second attitude (feelings) sub-scale contained four items which were based on measuring teachers' attitudes, based on feelings about inclusion.

Scoring. The AIS comprised ten questions having a 7-point Likert-type response scale, ranging from strongly disagree (1) to strongly agree (7) and used an Attitudes towards Inclusion Scale (AIS)**.** A response of 1 indicates "strongly disagree," while a response of 7 indicates "strongly agree." To score this measure, the numbers added are based on the responses bubbled. Summed scores may vary from 10 to 70, with the higher scores being indicative of a more positive attitude toward inclusive education; lower scores indicate less positive, or negative attitudes toward inclusive education. Likert-type or frequency scales

apply fixed choice response formats and are designed to measure attitudes or opinions (Bowling, 1997; Burns & Grove, 1997). Items 5 and 6 were negatively worded, so these were reverse coded while analyzing data.

Reliability and validity. The reliability of the Attitudes toward inclusion scale (AIS) was calculated using Hancock and Mueller's (2001) coefficient H. The reliability resulted in two factor scores for the scale. Both the attitude (beliefs) sub-scale and attitude (feelings) sub-scale showed acceptable levels of reliability (≥ 0.74).

Concerns towards Inclusive Education Scale. Part III of the survey consisted of the 21-item Concerns toward Inclusive Education scale (CIES) developed by Sharma & Desai (2002), which measured the participants' degree of concern about implementing inclusive education. The scale has 21 items, e.g., "I will have to do additional paperwork." The scale was tested with 310 elementary school principals and 484 teachers in India. The factor analysis of data collected from the research study showed the following results: CIES involved four factors: 1) concerns about resources, 2) concerns about acceptance, 3) concerns about academic standards, and 4) concerns about workloads.

Scoring. The scale has 21 items, e.g., "I will have to do additional paperwork." Each item requires a response to a 4-point Likert-type classification,

with response choices ranging from *extremely concerned (4), very concerned (3), a little concerned (2)* to *not at all concerned (1)*. The CIES yields a total score, which is calculated by adding the value of the responses on each item. The total score may range from 21 to 84. A higher CIES score indicates that a respondent is more concerned about his/her ability to implement inclusion.

Reliability and validity. The internal consistency of the total CIE Scale was calculated, using Cronbach's coefficient alpha. Cronbach's coefficient alpha presents a number with possible values ranging from 0 to 1. Internal consistency refers to the interrelatedness of the items in the scale. The closer the coefficient is to 1, the more reliable (internally consistency) there is in the scale. Cronbach's coefficient alpha values, when greater than .7, suggest that the scale is of reasonable reliability, while values greater than .9 are considered to be of excellent reliability (Gliem,& Gliem,2003). The scale was found to have an alpha coefficient of 0.91 (Sharma & Desai, 2002) with use by researchers across different contexts (e.g., Bradshaw & Mundia, 2006; Chhabra et al., 2010). The scale yields four factor scores. Reliability coefficients were calculated to determine the usability of the scales for Manitoba context: lack of resources (α = 0.84), lack of acceptance (α = 0.69), concerns about schools' declining academic

standards ($\alpha = 0.82$), and concerns about increase in workload ($\alpha = 0.76$), as well as the total scale ($\alpha = 0.92$). Alpha coefficients for all factors were adequate.

Teacher Efficacy for Inclusive Practices (TEIP) Scale. Part IV of the survey consisted of Teacher Efficacy for Inclusive Practices (TEIP) scale developed by Sharma, Loreman, and Forlin (2012). This scale is used to measure perceived level of teacher efficacy toward inclusive education practices. Tschannen-Moran and Woolfolk Hoy (2001) proposed that teaching efficacy be measured in relation to specific teaching tasks in context. Sharma et al. (2012) developed the scale to measure self-efficacy, specifically related to inclusion. The 18-item scale was developed by a sample of 607 pre-service teachers selected from four countries (Canada, Australia, Hong Kong, and India). Results in this scale were analyzed, based on three factors: efficacy in using inclusive instruction (6 questions), efficacy in collaboration (6 questions), and efficacy in managing disruptive behaviors (6 questions).

Scoring. The TEIP scale consists of 18 items measured by a 6-point Likert scale in three areas: self-efficacy for inclusive instructions, self-efficacy for collaboration, and self-efficacy for managing behavior. Likert scales measure attitudes (Bowling,1997). A response of 1 indicates “strongly disagree,” while a response of 6 indicates “strongly agree.” To score this measure, numbers are

summed, based on the responses. Summed scores range from 18 to 108, with higher scores being indicative of higher self-efficacy for inclusive practices, and lower scores indicative of low self-efficacy for inclusive practices (Sokal, Woloshyn, & Funk-Unrau, 2013). The 6-point scale was selected so that there could be no neutral answer. This approach compels teachers to make a positive or negative response about personal self-efficacy for each statement (Sharma et al., 2012).

Reliability and validity. Reliability of the scales was computed by calculating the Cronbach's alpha for internal consistency of items. Items too highly intercorrelated were discarded. Three factors were generated for this measure: Efficacy to use Inclusive Instructions, Efficacy in Collaboration, and Efficacy in Managing Behavior (Sharma et al., 2012). The Cronbach's alpha coefficients for these three factors were .93, .85, and .85, respectively. The Cronbach's coefficient alpha for the total scale was 0.89. The reliability analysis for the total scale incorporated factors for each country, which suggested that the scale provides a reliable measure of pre-service teacher perceptions of self-efficacy for inclusion across different countries. Higher TEIP-scale scores showed greater teacher self-efficacy (Savolainen et al., 2012; Malinen et al., 2013).

Overall, the entire survey of all four parts took participants about ten minutes to complete. Data was entered into the IBM SPSS statistical software program for analysis. The data will be password protected. Both original questionnaires and data will be secured and stored in a cabinet for the next seven years.

Data Analysis

The data obtained from the survey was analyzed using the Statistical Package for the Social Sciences (SPSS) software (version26), in accordance with each research question and with a corresponding null hypothesis. The Missing data analysis indicated less than 5% missing data. An analysis of missing data totaling less than 5% strongly indicates that various methods for dealing with missing data may be expected to produce essentially the same results (Tabachnick & Fidell, 2012). Case mean substitution was applied for two or less missing items on computed subscales. Boxplots identified the presence of outlier. Those outliers which did not contribute to a significant difference between the mean and the 5% trimmed mean of each scale item were kept in the data set. Frequency and percentages were calculated for the demographics of the respondents, such as a) grade level, b) gender, c) age, d) highest level of education, e) subject, f) years of experience, g) certification level, h) number of higher education courses in special education, and i) attended in-service training for special education. Descriptive statistics

were calculated for the overall scores for teachers' attitudes, concerns, and self-efficacy. The demographic factors were independent variables, while teachers' attitudes, concerns, and self-efficacy toward inclusive education were dependent variables. T-tests and a series of One-way ANOVA were accomplished to analyze the effect of demographic factors on teachers' attitudes, concerns and self-efficacy toward inclusive education. Pearson's correlation was used to investigate whether a relationship existed between teachers' attitudes and self-efficacy. A Significance level for the statistical tests was set at $p = .05$. If a p-value was below .05, the p-value was considered to be significant, and null hypothesis was rejected. A detailed summary table for the analysis of each research question is given below in Table1:

Table1

Plan of Analysis

Research Questions	Survey Questions	Statistical Tests	Rationale
1.What are the general attitudes of teachers toward inclusive education in STEM classrooms?	Q10 (AIS Scale)	Descriptive Statistics	These tests provided summary of statistics, such as Mean, SD, 95% CI of each item & overall Scale.
2. What is the level of concerns of teachers toward inclusive education in STEM classrooms?	Q11-Q13 (CIE Scale)	Descriptive Statistics	These tests provided summary of statistics, such as Mean, SD, 95% CI of each item & overall Scale.

3. What is the overall self-efficacy of teachers toward inclusive education in STEM classrooms?	Q14-Q15 (TEIP Scale)	Descriptive Statistics	These tests provided summary of statistics, such as Mean, SD, 95% CI of each item & overall Scale.
4**.** Are there any significant differences in teachers' attitudes, concerns, and self-efficacy toward inclusion in STEM classrooms based on demographic elements i.e. gender, grade level, age, education level, subject taught, teaching experience, certification, SPED courses & SPED in-service?	Q1-Q15	T-test, One-way ANOVA	These tests analyzed whether there existed a significant difference in overall mean scores of attitudes, concerns, & self-efficacy based on demographic elements.
5. Is there a significant correlation between teachers' attitudes and teachers' self-efficacy toward inclusive education in STEM classrooms?	Q10, Q14, Q15	Pearson's Correlation	These tests explored whether there was a relationship between teachers' attitudes & teachers' self-efficacy toward inclusion.

Note. CI = Confidence Interval, *SD* = Standard Deviation

Chapter IV: Results

This research study investigated attitudes, concerns, and the self-efficacy of teachers regarding inclusion in STEM classrooms. The impact of demographic elements over attitudes, concerns, and self-efficacy was also examined. The study also investigated an overarching focus of the relationship between attitudes and self-efficacy of teachers toward inclusive education in STEM classrooms. This chapter addresses each research question through quantitative data analysis. Descriptive statistics of the demographic data is first presented. Also, data analysis for each research question consists of descriptive statistics of the mean and standard deviation to provide an overview of the data summary. The data obtained from the survey was analyzed using the Statistical Package for the Social Sciences (SPSS) software (version 26). The reliability analysis for each instrument scale i.e. Attitude toward inclusion scale (AIS), Concerns toward inclusive education Scale (CIES), and Teachers Efficacy for Inclusive Practices (TEIP) Scale and their corresponding sub-scales were also conducted.

Restatement of Research Questions and Hypotheses

The research questions and corresponding hypothesis for this study were as follows:

1. What are the general attitudes of teachers toward inclusive education in STEM classrooms?

2. What is the level of concern of teachers toward inclusive education in STEM classrooms?

3. What is the overall self-efficacy of teachers toward inclusive education in STEM classrooms?

4. Are there any significant differences in teachers' attitudes, concerns, and self-efficacy toward inclusion in STEM classrooms, based on demographic elements i.e., gender, grade level, age, education level, subject taught, teaching experience, teacher certification, number of higher education courses taken in special education, and SPED in-service training attended?

5. Is there a significant correlation between teachers' attitudes and teachers' self-efficacy toward inclusive education in STEM classrooms?

Hypotheses

Based on the first three objectives, the researcher examined the current attitudes, current state of self-efficacy, and level of concerns of teachers toward inclusive education in STEM classrooms. No hypothesis was formed, because the researcher used a descriptive method for the total scores, mean, and percentages.

In the next research questions, two hypotheses were formed and tested in answer to the research questions. The Hypotheses were:

$H1_0$: There are no significant differences in teachers' attitudes, concerns, and self-efficacy toward inclusion in STEM classrooms, based on demographic elements, i.e., gender, grade level, age, education level, subject taught, teaching experience, teacher certification, and the number of higher education courses taken in special education, or attended SPED in-service training.

$H1_a$: There are significant differences in teachers' attitudes, concerns, and self-efficacy toward inclusion in STEM classrooms, based on demographic elements, i.e., gender, grade level, age, education level, subject taught, teaching experience, teacher certification, and the number of higher education courses taken in special education, or attended SPED in-service training.

$H2_0$: There is no significant correlation between teachers' attitudes and self-efficacy of teachers toward inclusive education in STEM classrooms.

$H2_a$: There is a significant correlation between teachers' attitudes and self-efficacy of teachers toward inclusive education in STEM classrooms.

Demographic Information of Participants

A total of 198 teachers taught at least one of STEM subjects participated in this research study. One hundred and thirty-three of these participants were female, and sixty-five were male. There were diverse groups within grade levels. Thirty-one teachers taught the elementary grades (K-5), fifty-three teachers taught the middle grades (6-8), eight-nine teachers taught the secondary grades (9-12) and twenty-five were special education teachers (K-12). Participants were at age 21 and older, with the largest age group at the 45 and older range (Refer to Table 2 below).

Table 2
Summary of Demographic Data for Questionnaire Respondents (N=198) (Gender, Grade Level taught, Age)

Category	Frequency(n)	Percent (%)
Gender		
Male	65	32.8
Female	133	67.2

Grade Level		
Elementary Grades(K-5)	31	15.7
Middle Grades (6-8)	53	26.8
Secondary Grades (9-12)	89	44.9
Special Education	25	12.6
Age (years)		
21-25	19	9.6
26-35	64	32.3
36-45	56	28.3
Over 45	59	29.8

All participants had earned a bachelor's degree, with seventy-four having earned a master's degree. Nine teachers obtained bachelor's degree in special education and 18 had obtained master's degree in special education. Nine teachers had earned a doctorate. There were 114 science teachers, 59 math teachers, 7 computer science/ robotics, and 18 were teachers of both science and math. The experience range of teachers very broadly ranged from 0-5 to over 21 years. Teachers having experienced between 11-15 years represented the largest group with 23.2 %, while teachers having experienced between 16-20 years presented 22.7 % of the total participants. Refer to Table 3 below.

Table 3

Summary of Demographic Data for Questionnaire Respondents (N=198) (Education Level, Subjects Taught, Teaching Experience)

Category	Frequency(n)	Percent (%)
Highest Education		
Bachelor's Degree or Equivalent	88	44.4
Master's Degree	74	37.4
Bachelor's degree (Special Education)	9	4.5
Master's Degree (Special Education)	18	9.1
Ed. D / Ph. D.	9	4.5
Subjects Taught		
Science	114	57.6
Math	59	29.6
Computer Sc/ Robotics	7	3.5
Science and Math	18	9.1
Teaching Experience (Years)		
0-5	32	16.2
6-10	36	18.2
11-15	46	23.2
16-20	45	22.7
Over 21	39	19.7

Certification levels as per grade level contained 53 elementary, 55 middle ,65 secondary, and 11 special education teachers. Another 14 teachers chose "other" as their certification grade level, indicating they are either not certified currently, or may be in the process of getting certified. Some 114 teachers mentioned that they studied no special education courses at a higher education level, 33 teachers studied between 1-3 special education courses, and 51 stated that they had taken 4 or more special education courses at a higher education level. In regard to training, 85 teachers received in-service training on special education, while 113 reported that they received no in-service training in special education. Refer to Table 4 below.

Table 4
Summary of Demographic Data for Questionnaire Respondents (N=198) (Certification Level, Higher Education SPED courses, SPED In-service)

Category	Frequency (n)	Percent (%)
Certification Level		
Other	14	7.1
Elementary Level (K-5)	53	26.8
Middle Level (6-8)	55	27.8
Secondary Level (9-12)	65	32.8
Special Education	11	5.6
SPED Higher Education Courses		

None	114	57.6
1- 3 Courses	33	16.7
4 or more	51	25.8
SPED In-service		
Attended		
Yes	85	42.9
No	113	57.1

Note. SPED = Special Education

Results by each research Question

Research Question 1. What are the general attitudes of teachers toward inclusive education in STEM classrooms?

Scale Reliability Analysis for AIS

The Attitude toward Inclusion Scale (AIS) (Sharma & Jacobs, 2015) was used to measure attitudes of teachers toward inclusion and for answering Research Question 1. The AIS scale consists of 10 items measured by a 7-point Likert scale, where a response of 1 indicates “strongly disagree,” while a response of 7 indicates “strongly agree.” The first step in the analysis determined the reliability of the scale and sub-scales. Cronbach’s alpha was calculated by this means. Cronbach’s alpha is a measure used to assess the reliability or internal consistency of a set of scale or test items. Cronbach’s Alpha for the overall

attitude to inclusion scale was .810, showing that the scale presented a good reliability. Cronbach's Alpha for the attitude subscales, attitudes (beliefs), and attitude (feelings) were .896 and .914 respectively, showing that both the subscales presented a very good reliability for the current study sample. These results indicate that individual items for each attitude toward inclusion scale (AIS) as well as for AIS sub-scales are highly correlated. The summary for results regarding Cronbach 's alpha is shown in Table 5 below.

Table 5

Cronbach's alpha results for the Attitude toward Inclusion Scale (AIS)

AIS Scale	Cronbach's alpha	Interpretation
Overall Attitudes Scores	.810	Good
AIS Factors		
Attitudes (Beliefs)	.896	Good
Attitudes (Beliefs)	.914	Excellent

Descriptive Statistics for the AIS scale

The attitude toward inclusion scale total scores could range from 10 to 70. The higher the score, the more positive the attitude is toward inclusion. The calculated mean score for the scale could be between 1 and 7. A mean score of 4 would represent a neutral attitude toward inclusion, while a score below 3.5 may be considered as negative attitude, and a score higher than 3.5 may be considered a positive attitude toward inclusion. In the present sample, results revealed a mean score of 4.7(*SD* = 1.08) for the total attitude toward inclusion scale, which indicates that teachers in this study hold slightly positive attitudes toward inclusive education in STEM classrooms. The AIS consisted of two sub-scales, attitudes (beliefs) sub-scale and attitude (feelings) sub-scale. Findings revealed that Attitudes (beliefs) sub-scale consisted of Q1-Q4 on the scale, while Attitudes (feelings) sub-scale consisted of Q7-Q10 on the scale. The subscale mean score for Attitude (belief) was 4.51 (*SD* =1.58), while Attitude (feelings) was 5.14 (*SD* = 1.48). These results showed that teachers held more positive attitude (feelings) scores, compared to attitude (beliefs) scores. Refer to Table 6, Figure 4, and Figure 5 below.

Table 6

Descriptive statistics for Attitude toward Inclusion Scale (AIS)

Attitude Scales	*M*	*SD*	95 % *CI*
Overall Scores	4.70	1.08	[4.55, 4.85]
Attitude (Beliefs)	4.51	1.58	[4.29, 4.74]
Attitude (Feelings)	5.14	1.48	[4.93, 5.34]

Note. M= Mean, *SD* = Standard Deviation, *CI* = Confidence Interval

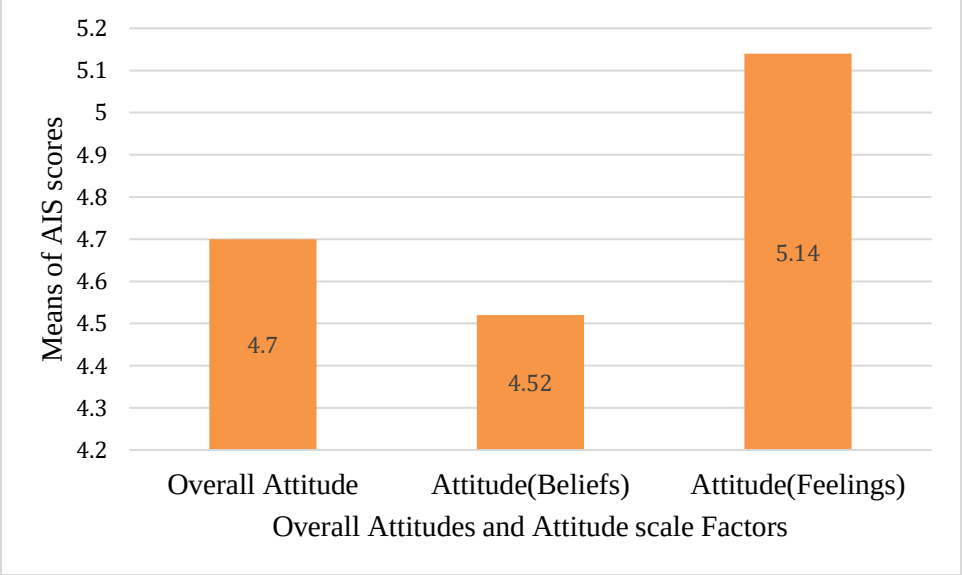


Figure 4. Overall Attitude scores and Attitude (sub-scales) scores

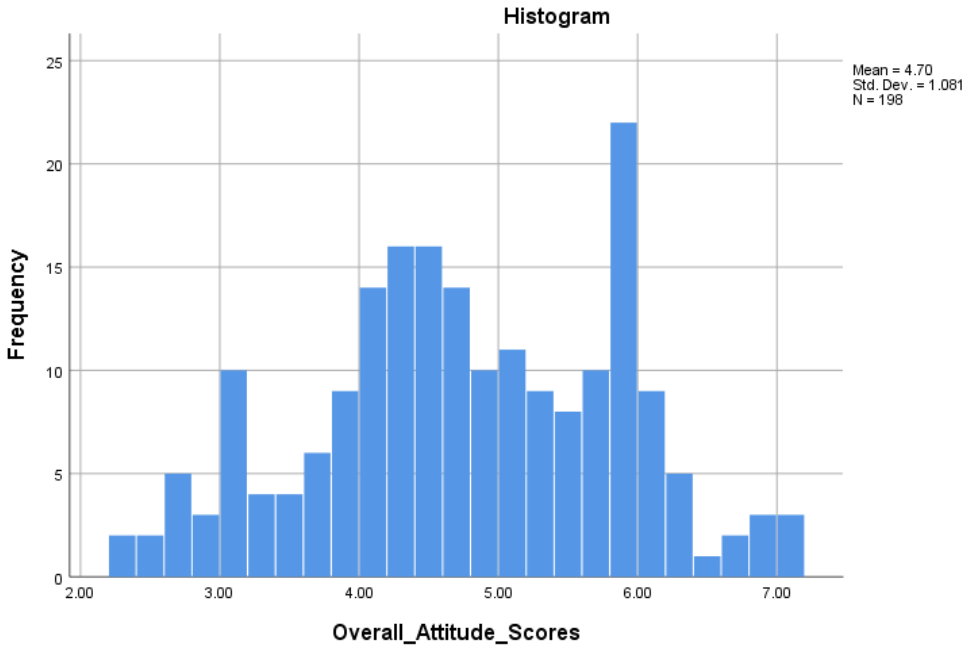


Figure 5. Histogram of overall Attitudes mean scores

Research question 2. What is the level of concerns of teachers toward inclusive education in STEM classrooms?

Scale Reliability analysis

Concerns towards Inclusive Education Scale (CIES). The 21-item Concerns about Inclusive Education Scale (Sharma & Desai, 2002) measures participants' levels of concern about practical aspects of implementing inclusive education by using a 4-point Likert's scale where a response of 1 indicates "not at

all concerned" and a response of 4 indicates "extremely concerned." Higher scores indicate greater concern about teacher's ability to implement inclusion. The Cronbach's Alpha for the total scale was .959, which shows a very good reliability. The Cronbach's Alpha scores for four factors of CIES, i.e., Factor I (concerns about lack of resources), Factor II (concerns about lack of acceptance), Factor III (concerns about poor academic standards), factor IV (concerns about increased workload) were .900, .866, .919, and .831, respectively. The four factors of CIES scale showed overall very good reliability for the current sample. Refer to Table 7 below.

Table 7

Cronbach's alpha results for the Concerns about Inclusive Education Scale (CIES)

CIE Scale	Cronbach's alpha	Interpretation
Overall Scale	.959	Excellent
CIES Factors		
Factor I (lack of resources)	.900	Excellent
Factor II (lack of acceptance)	.866	Good
Factor II (poor academic standard)	.919	Excellent
Factor IV (increased workload)	.831	Good

Descriptive statistics for CIES

The total scores for the CIES could range from 21 to 84. The mean scores for the overall CIES scale could range between 1 and 4. A score of 2, indicates "a little concerned" about implementing inclusive practices in STEM classrooms. The overall mean score for the current sample was calculated to be 2.10 (*SD* = 0.70) which falls between 2 and 3. Therefore, the conclusion may be that participants had a moderate degree of concern toward implementation of inclusive practices in STEM classrooms. Descriptive analysis of four factors of the CIES were also conducted (See Table 8). It was found that participants held higher concerns about lack of resources (*M* = 2.12) and poor academic standard of the school (*M* = 2.12), compared to lack of acceptance by non-disabled students and their parents (*M* = 2.07) and increased workload (*M* = 2.06). These results somewhat agreed with the results found by (Aiello & Sharma, 2018; Sharma & Desai, 2002; Sharma, Moore, & Sonawane, 2009) as mentioned in the literature review. Table and figure below show the overall mean concerns scores and mean scores for four factors of CIES scale. Refer to table 8 and figures 6 &7 below.

Table 8

Descriptive Statistics results for Concerns about Inclusive Education Scale (CIES)

CIES Scores	*M*	*SD*	95 % *CI*
Overall CIES Scores	2.10	0.70	[2.00, 2.20]
Factors of CIES			
Factor I (lack of resources)	2.12	0.77	[2.02,2.23]
Factor II (lack of acceptance)	2.07	0.75	[1.97, 2.18]
Factor III (academic standards)	2.12	0.79	[2.00,2.23]
Factor IV (increased workload)	2.06	0.77	[1.95, 2.16]

Note. M= Mean, *SD* = Standard Deviation, *CI* = Confidence Interval

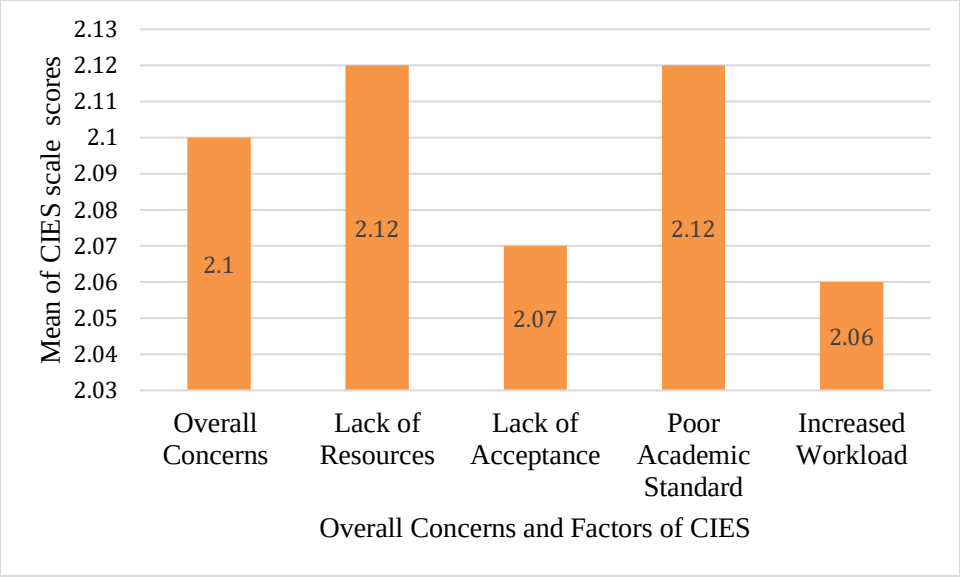


Figure 6. Overall Concerns and Concerns (factors) means scores

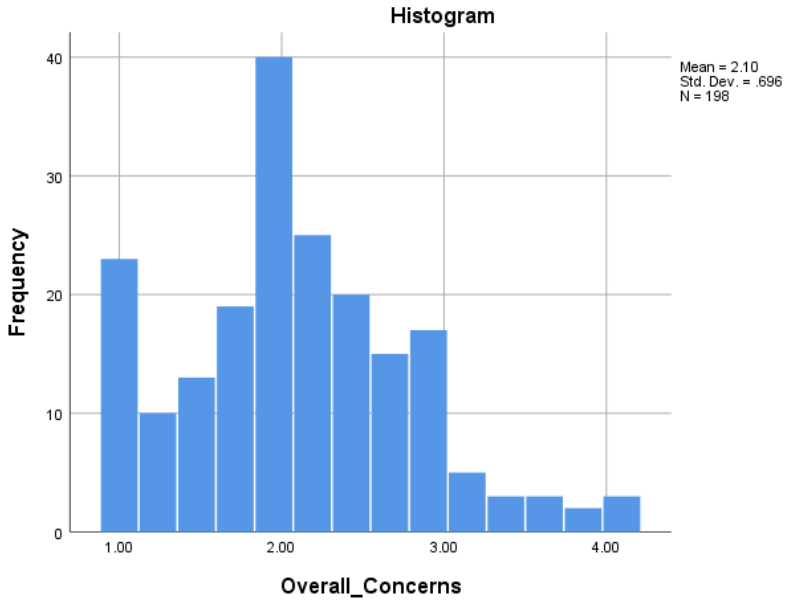


Figure 7: Histogram of overall concerns means scores

Research Question 3. What is the overall self-efficacy of teachers toward inclusive education in STEM classrooms?

TEIP scale reliability analysis

Teacher efficacy for inclusive practices scale (TEIP). The TEIP scale consists of 18 items measured by a 6-point Likert scale in three areas: Self-efficacy for Inclusive Instructions, Self-efficacy for Collaboration, and Self-efficacy for Managing Behavior. Higher scores are indicative of higher self-efficacy. The overall scale consists of 18 items, with each subscale consisting of 6 items. A response of 1 indicates "strongly disagree" while a response of 6 indicates "strongly agree." The Cronbach's Alpha for the total scale was .951, which shows a good reliability for the scale. The Cronbach's alpha for the efficacy sub-scales (inclusive instructions, collaboration and managing behavior) were .896, .874, and .856 respectively. These results indicate overall good reliability for the TEIP scale, with sub-scales for the current sample. Refer to Table 9 below.

Table 9

Cronbach's alpha results for Teacher Efficacy toward Inclusive Practices (TEIP) Scale

TEIP Scale	Cronbach's alpha	Interpretation
Overall Scale	.951	Excellent
TEIP Factors		
Inclusive Instructions	.896	Good
Collaboration	.874	Good
Managing Behavior	.856	Good

Descriptive Statistics for TEIP Scale

The total scores for TEIP scale could range from 18 to 108. The total mean for the overall TEIP scale could be calculated between 1 and 6. A mean score greater than 3 would indicate that a teacher is self-efficacious while a score less than 3 would imply that teachers are not self-efficacious in implementing inclusive practices in STEM classrooms. The overall mean for the TEIP scale in the present sample was 4.88 (SD = 0.85) which shows that teachers in this research study have reported higher self-efficacy in implementing inclusive education practices in STEM classrooms.

The subscale mean score for self-efficacy for Instruction, self-efficacy for Collaboration, and self-efficacy for Managing Behavior were 4.96 (*SD* = 0.88), 4.86 (*SD* = 0.91), and 4.80 (*SD* = 0.90), respectively. A comparison of the three sub-scales revealed that scores for the self-efficacy in inclusive instruction were reported highest and scores for self-efficacy in managing behavior were reported to be the lowest, but these differences were not statistically significant, as shown by the confidence intervals. The table, figure and histogram below show the overall scores for TEIP scale.

Table 10

Descriptive Statistics results for Teacher Efficacy toward Inclusive Practices (TEIP) Scale

TEIP Scale Scores	*M*	*SD*	95 % *CI*
Overall TEIP Scores	4.87	0.85	[4.75, 4.99]
Factors of TEIP Scale			
Inclusive Instructions	4.96	0.88	[4.83, 5.08]
Collaboration	4.85	0.91	[4.73, 4.98]
Managing Behavior	4.80	0.90	[4.68, 4.94]

Note. M= Mean, *SD* = Standard Deviation, *CI* = Confidence Interval

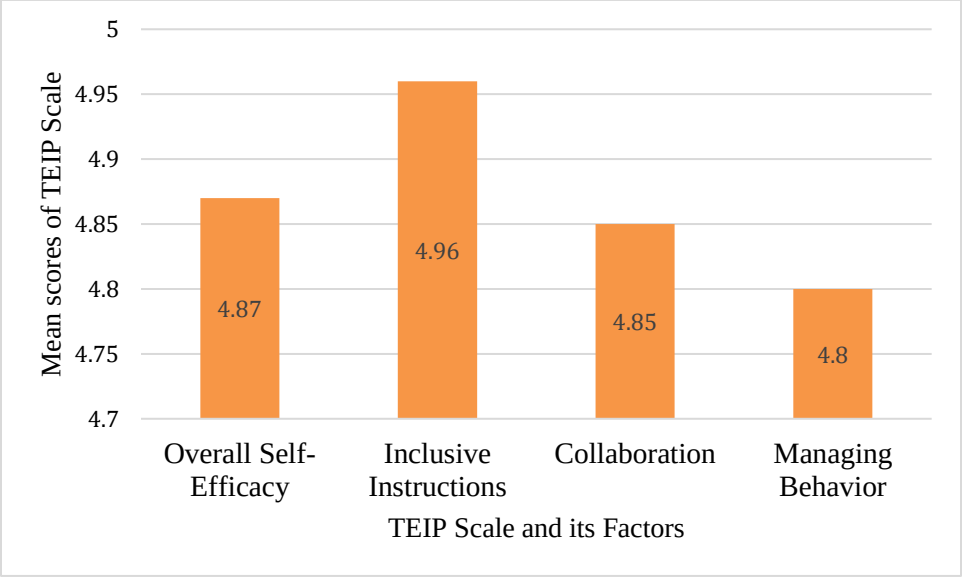


Figure 8. Overall self-efficacy and self-efficacy(sub-scales) means scores

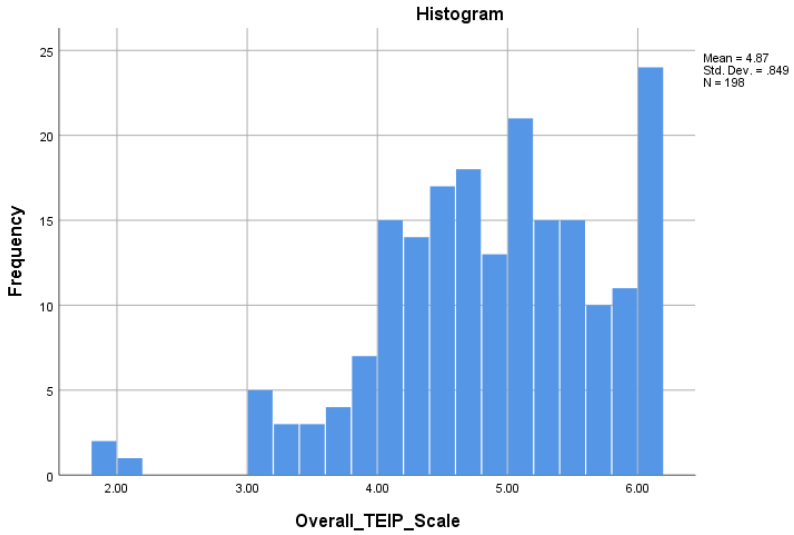


Figure 9. Histogram of overall self-efficacy means scores

Research Question 4. Are there any significant differences in teachers' attitudes, concerns and self-efficacy toward inclusion in STEM classrooms, based on demographic elements, i.e., gender, grade level, age, education level, subject taught, teaching experience, teacher certification, number of higher education courses taken in special education, or attended SPED in-service training?

Significant differences in attitudes, concerns, and self-efficacy based on demographic elements were investigated. The researcher calculated total attitudes scores as measured by AIS scale, total concerns scores as measured by CIE scale and total self-efficacy scores as measured by TEIP scale for each respondent. Descriptive statistics were used to calculate the mean, standard deviation for each scale. Independent-sample t-tests were conducted to compare the total scores with single categorical variables, inclusive of gender and attended special education in-service. One-way between-groups ANOVA was conducted to explore the impact of demographic elements with more than two distinct categories per independent variable. The significant level was set at $p < .05$.

Overall Attitudes and demographics

Within the t-tests and ANOVAs conducted to examine the effect of demographic factors on teacher attitudes toward inclusion, only three statistically significant relationships were found.

Table 11

T-test analysis for overall attitudes means score (AIS Means) by gender

Gender	*n*	*M*	*SD*	*t*	*p*
Male	65	4.66	1.00	-0. 34	.738
Female	133	4.71	1.12		

Note. *M* = Mean, *SD* = Standard Deviation

A t-test comparing overall attitude means score as dependent variable by gender revealed no significant difference between teachers' attitudes [t (196) = - 0.34, p = 0.738] at 0.05 level of significance. This meant that attitudes mean scores for male and female teachers could not create a significant difference. Therefore, the present study results proved that gender did not affect teachers' attitudes toward inclusion as measured by the Attitudes to Inclusion Scale. Both genders held a moderately positive attitude toward inclusive education. These results conformed with many other literature researches on the subject, which found no significant difference in teacher attitudes toward inclusion, based on gender (Avramidis, Chhabra et al., 2010; Beachman & Rouse, 2012; Samms, 2017;Wood, 2017). Refer to Table 11 above.

Table 12

ANOVA analysis for overall attitudes means (AIS Means) by grade level

Grade Level	*n*	*M*	*SD*	*F*	*p*
Elementary	31	4.97	0.91	3.00	.032*
Middle	53	4.86	1.11		
Secondary	89	4.45	1.07		
SPED	25	4.90	1.09		

Note. *$p < .05$, *M* = Mean, *SD* = Standard Deviation

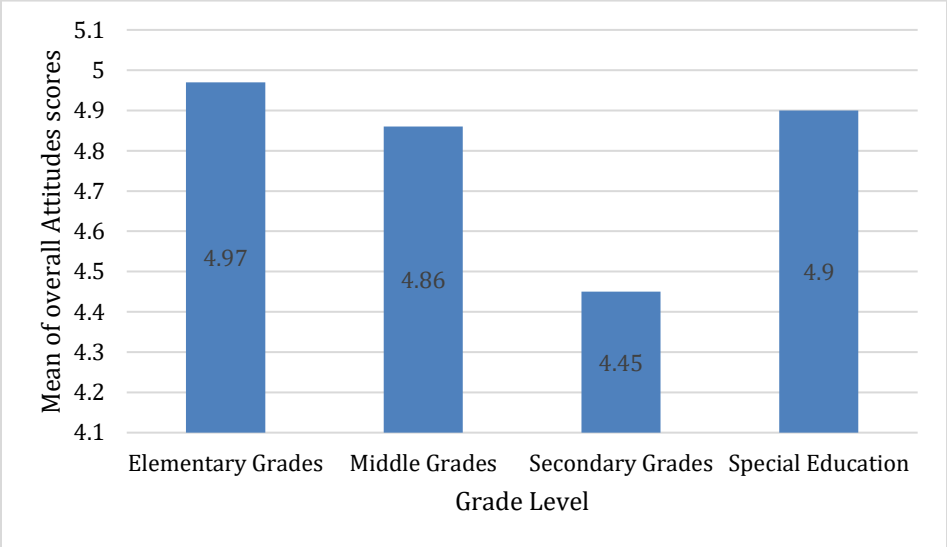


Figure 10. Overall attitudes means scores by Grade Level

A one -way ANOVA was conducted to compare overall attitude means score as dependent variable by grade level taught. There was a significant

difference [F (3,194) = 3, p = .032*] in the means score of teachers' attitudes. Post hoc comparisons using the Tukey Honestly Significant Difference (HSD) test were conducted and showed no significant differences between groups. However, the elementary grades group (M = 4.97, SD =0.91) scored slightly higher than the secondary grades group (M = 4.45, SD = 1.07, p = .093) with a small effect size (eta squared = .044) (Cohen, 1988). This result agreed with the findings in the research discussed in the literature review (Samms, 2017; Abdullah & Pelosi, 2014). Refer to Table 12 and Figure 10 above.

Table 13

ANOVA analysis for overall attitudes means (AIS Means) by Age

Age (years)	*n*	*M*	*SD*	*F*	*p*
21-25	19	4.46	0.93	1.145	.332
26-35	64	4.77	0.95		
36-45	56	4.85	0.95		
Over 45	59	4.55	1.34		

Note. M = Mean, SD = Standard Deviation

A one-way ANOVA was conducted to compare overall attitude means score as dependent variable by age. There was no statistically significant

difference [F (3,194) = 1.145, p = .332] in the overall attitudes means of teachers based on age. This result is aligned with the results obtained by (Chhabra et al., 2010; Saliviita, 2018). Refer to Table 13 above.

Table 14

ANOVA analysis for overall attitudes means (AIS Means) by Higher Education Degree

Degree	*n*	*M*	*SD*	*F*	*p*
Bachelor's	88	4.72	0.91	2.158	.075
Master's	74	4.48	1.14		
SPED Bachelor's	9	5.06	0.90		
SPED Master's	18	5.01	1.35		
Doctorate	9	5.31	1.38		

Note. M = Mean, *SD* = Standard Deviation

The results of the one-way ANOVA, conducted to compare overall attitudes means score as dependent variable based on the highest degree earned, showed no significant difference [F (4,193) = 2.158, p =.075] at $p < .05$ significance level. Refer to Table 14 above.

Table 15

ANOVA analysis for overall attitudes means (AIS Means) by Subjects Taught

Subject	*n*	*M*	*SD*	*F*	*p*
Science	114	4.67	1.04	0.391	.76
Math	59	4.73	1.20		
Computer Sc./ Robotics	7	5.07	0.51		
Science & Math	18	4.56	1.09		

Note. M = Mean, *SD* = Standard Deviation

The results of the one-way ANOVA, conducted to compare overall attitudes means score as dependent variable based on subjects taught, showed no significant difference [F (3,194) = .391, p = .760]. Refer to Table 15 above.

Table 16

ANOVA analysis for overall attitudes means (AIS Means) by Teaching Experience

Teaching Experience	*n*	*M*	*SD*	*F*	*p*
0-5	32	4.48	0.96	2.365	.054
6-10	36	4.63	1.03		

11-15	46	4.77	0.85
16-20	45	5.07	1.16
21 & over	39	4.44	1.33

Note. *M* = Mean, *SD* = Standard Deviation

The results of the one-way ANOVA, conducted to compare overall attitudes means score as dependent variable based on teaching experience, showed no significant difference [F (4,193) = 2.365, p = .054]. However, teachers with the most years of teaching experience held the least positive scores toward inclusive education. This was a finding similar to that obtained by Forlin (1995), which showed that teachers with more years of teaching experience were found to have more negative inclusion attitudes. Refer to Table 16 above.

Table 17

ANOVA analysis for overall attitudes means (AIS Means) by Teacher Certification

Teacher Certification	*n*	*M*	*SD*	*F*	*p*
Elementary	53	5.06	0.97	3.058	.018*
Middle	55	4.79	1.14		

Secondary	65	4.42	0.94
SPED	11	4.50	1.37
Other	14	4.45	1.28

Note. *$p < .05$, *M* = Mean, *SD* = Standard Deviation

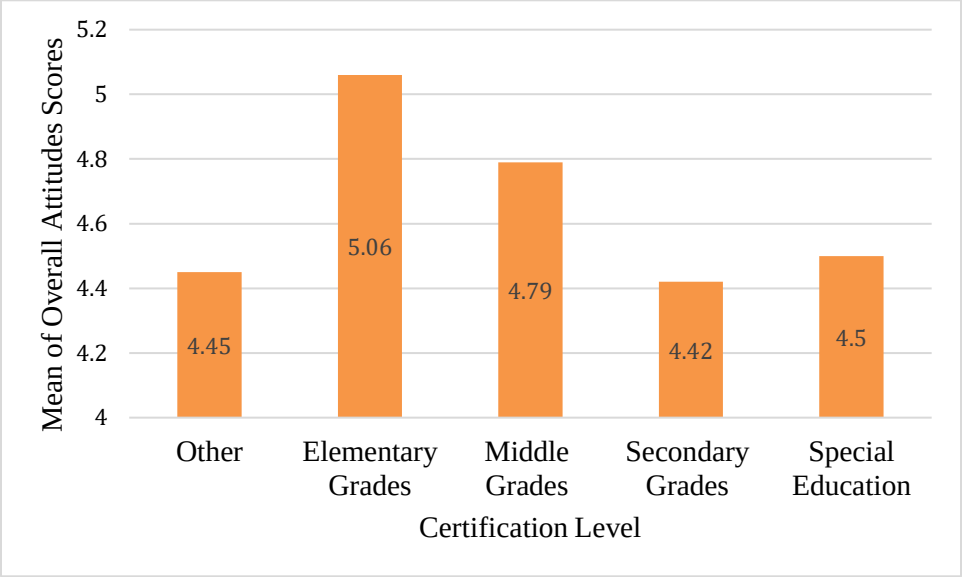


Figure 11. Overall attitudes scores by Certification Level

The results of one-way ANOVA, conducted to compare overall attitudes means score as dependent variable based on the teacher certification level, showed a significant difference [F (4, 193) = 3.058, p = .018]. Post-hoc comparisons conducted using the Tukey HSD test showed that elementary grades certified (M =5.06, SD = 0.97) teachers scored significantly more than secondary grades certified (M = 4.42, SD = 0.94, p =.012) teachers with a medium effect size

(eta squared =.060). This result showed that Elementary certified teacher held more positive attitudes as compared to Secondary certified teachers. This result supported an earlier result of elementary grade teachers scoring higher than secondary grade teachers. The difference between other teacher certification groups reached no significance (p >.05). Refer to Table 17 and Figure 11 above.

Table 18

ANOVA analysis for overall attitudes means (AIS Means) by SPED Higher Education Courses

SPED Higher Education Courses	*n*	*M*	*SD*	*F*	*p*
None	114	4.54	1.06	3.714	.026*
1-3	33	4.75	1.19		
4 or more	51	5.02	0.98		

Note. *p < .05, *M* = Mean, *SD* = Standard Deviation

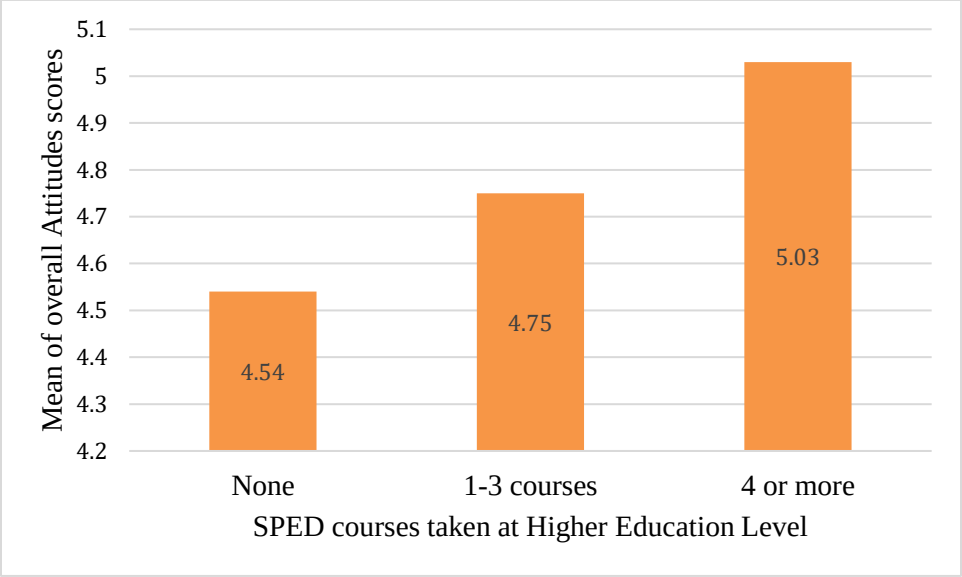


Figure 12. Overall attitudes scores by SPED Higher Education Courses

The one-way between-group analysis of variance, conducted to explore the impact of special education courses taken at a higher education level on overall attitudes means score as dependent variable, revealed a statistically significant difference [F (2,195) = 3.714, p = .026*]. Post-hoc comparisons conducted using the Tukey HSD test showed that teachers who studied four or more special education courses at higher education level demonstrated more positive (M = 5.02, SD = 0.98) attitude than teachers with no special education courses (M = 4.54, SD = 1.06, p = .020). This difference was at the $p < .05$ level with a small effect size of .037, calculated using eta squared. The difference

between other groups based on SPED courses taken at the higher education level did not reach significance ($p > .05$). Refer to Table 18 and Figure 12 above.

Table 19

T-test analysis for overall attitudes means (AIS Means) by SPED In-service attended

SPED In-service attended	*n*	*M*	*SD*	*t*	*p*
Yes	85	4.79	1.12	.957	.340
No	113	4.63	0.985		

Note. M = Mean, *SD* = Standard Deviation

The results of t-test, conducted to compare overall attitudes means score as dependent variable based on SPED in-service trainings attended, showed no significant difference [t (160.44) = .957, p = .340]. Refer to Table 19 above.

Overall Concerns (CIES) and Demographics

Within t-tests and one-way ANOVAs conducted to investigate the impact of demographic elements on teachers' concerns toward inclusive education in STEM classrooms, only the grade level taught exhibited a statistically significant difference.

Table 20

T-test analysis for overall concerns means (CIES Means) by Gender

Gender	*n*	*M*	*SD*	*t*	*p*
Male	65	2.11	0.67	- 0.135	.893
Female	133	2.09	0.710		

Note. M = Mean, *SD* = Standard Deviation

The results of t-test conducted to compare overall concerns means score as dependent variable based on gender showed no significant difference [*t* (196) = - 0.135, *p* =.893]. Refer to Table 20 above.

Table 21

ANOVA analysis for overall concerns means (CIES Means) by grade level

Grade Level	*n*	*M*	*SD*	*F*	*p*
Elementary	31	2.11	0.75	3.496	.017*
Middle	53	1.87	0.68		
Secondary	89	2.25	0.67		
SPED	25	2.02	0.63		

*Note. *p < .05, M* = Mean, *SD* = Standard Deviation

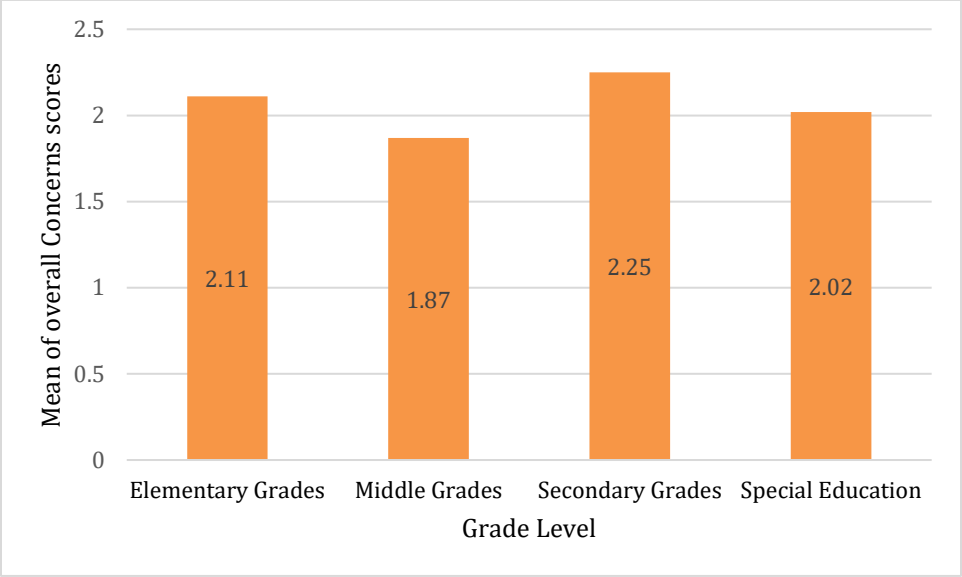


Figure 13. Overall concerns score by grade level

The one-way between-group analysis of variance, conducted to explore the impact of grade level taught on overall concerns means score as dependent variable, revealed a statistically significant difference [F (3,194) = 3.496, p =.017*]. Post-hoc comparisons conducted using the Tukey HSD test showed that teachers who taught middle grades showed less in concerns scores (M = 1.87, SD = 0.68) than teachers teaching secondary grades (M = 2.25, SD = 0.67, p =.009). This difference was at the p <.05 level, with a small effect size of .051, calculated using eta squared. The difference between other groups based on grade level taught did not reach significance (p >.05). Refer to Table 21 and Figure 13 above.

Table 22

ANOVA analysis for overall concerns means (CIES Means) by Age

Age	*n*	*M*	*SD*	*F*	*p*
21-25	19	2.30	0.79	.723	. 539
26-35	64	2.10	0.59		
36-45	56	2.01	0.63		
Over 45	59	2.03	0.83		

Note. M = Mean, *SD* = Standard Deviation

A one -way ANOVA was conducted to compare overall concerns means score as dependent variable by age groups. There was no statistically significant difference [F (3,194) = .723, p = .539] in overall concerns of teachers, based on age. However, the youngest group of teachers, aged 21-25, showed more concerns about inclusive education. Refer to Table 22 above.

Table 23

ANOVA analysis for overall concerns means (CIES Means) by Higher Education Degree

Degree	*n*	*M*	*SD*	*F*	*p*
Bachelor's	88	2.18	0.63	2.381	.053
Master's	74	2.15	0.66		
SPED Bachelor's	9	1.83	0.73		
SPED Master's	18	1.70	0.87		
Doctorate	9	1.92	0.93		

Note. M = Mean, *SD* = Standard Deviation

The results of one-way ANOVA, conducted to compare overall concerns means score as dependent variable based on the highest degree earned, showed no significant difference [F (4,193) = 2.381, p =.053]. However, teachers with a bachelor's degree in SPED, as well as teachers with a master's degree or higher showed lower levels of concern. Refer to Table 23 above.

Table 24

ANOVA analysis for overall concerns means (CIES Means) by Subjects Taught

Subject	*n*	*M*	*SD*	*F*	*p*
Science	114	2.13	0.69	0.329	.804
Math	59	2.08	0.75		
Computer Sc./ Robotics	7	1.94	0.52		
Science & Math	18	1.99	0.70		

Note. M = Mean, *SD* = Standard Deviation

The results of one-way ANOVA, conducted to compare overall concerns means score as dependent variable based on subjects taught, showed no significant difference [F (3,194) =.329, p = .804]. Refer to Table 24 above.

Table 25

ANOVA analysis for overall concerns means (CIES Means) by Teaching Experience

Teaching Experience	*n*	*M*	*SD*	*F*	*p*
0-5	32	2.25	0.81	1.118	.349
6-10	36	2.13	0.60		

11-15	46	1.93	0.63
16-20	45	2.09	0.63
21 & over	39	2.13	0.82

Note. *M* = Mean, *SD* = Standard Deviation

The results of one-way ANOVA conducted to compare overall concerns means score as dependent variable based on teaching experience showed no significant difference [F (4,193) =1.118, p = .349]. However, teachers with the least amount of teaching experience in the range of 0-5 years showed the highest levels of concern. Refer to Table 25 above.

Table 26

ANOVA analysis for overall concerns means (CIES Means) by Teacher Certification

Teacher Certification	*n*	*M*	*SD*	*F*	*p*
Elementary	53	2.05	0.73	0.725	.576
Middle	55	2.01	0.69		
Secondary	65	2.21	0.63		
SPED	11	2.03	0.95		

Other	14	2.11	0.70

Note. M = Mean, *SD* = Standard Deviation

The results of one-way ANOVA, conducted to compare overall concerns means score as dependent variable based on teacher certification level, showed no significant difference [*F* (4,193) =.725, *p* =.576]. However, secondary level certified teachers had the highest level of concerns. Refer to Table 26 above.

Table 27

ANOVA analysis for overall concerns means (CIES Means) by SPED Higher Education Courses

SPED Higher Education Courses	*n*	*M*	*SD*	*F*	*p*
None	114	2.12	0.66	1.163	.315
1-3	33	2.19	0.59		
4 or more	51	1.98	0.82		

Note. M = Mean, *SD* = Standard Deviation

The results of one-way ANOVA, conducted to compare overall concerns means score as dependent variable based on SPED higher education courses taken, showed no significant difference [*F* (2,195) =1.163, *p* =.315]. However,

teachers who studied four or more SPED courses at the higher education level showed the lowest levels of concern. Refer to Table 27 above.

Table 28

T-test analysis for overall concerns means (CIES Means) by SPED In-service attended

SPED In-service attended	*n*	*M*	*SD*	*t*	*p*
Yes	85	2.14	0.78	.690	.491
No	113	2.07	0.63		

Note. M = Mean, *SD* = Standard Deviation

The results of t-tests, conducted to compare overall concerns means score as dependent variable based on SPED in-service attended, showed no significant difference [t (157.60) = .690, p = .491]. Refer to Table 28 above.

Teacher Self-Efficacy (TEIP Scale) and Demographics

Within t-tests and one-way ANOVAs conducted to investigate the impact of demographic elements on TEIP scale in STEM classrooms, only the grade level, age, highest education degree, and teacher certification exhibited a statistically significant difference.

Table 29

T-test analysis for overall Self-Efficacy means (TEIP Means) by Gender

Gender	*n*	*M*	*SD*	*t*	*p*
Male	65	4.76	0.96	- 1.282	.201
Female	133	4.92	0.79		

Note. M = Mean, *SD* = Standard Deviation

The results of t-test conducted to compare overall self-efficacy means score as dependent variable based on gender showed no significant difference [$t(196) = -1.282$, $p = .201$]. However, female teachers showed higher level of self-efficacy as compared to male teachers. Refer to Table 29 above.

Table 30

ANOVA analysis for overall Self-Efficacy means (TEIP Means) by grade level

Grade Level	*n*	*M*	*SD*	*F*	*p*
Elementary	31	5.14	0.63	4.141	.007*
Middle	53	5.05	0.87		
Secondary	89	4.65	0.85		
SPED	25	4.92	0.86		

*Note. *p < .05, M* = Mean, *SD* = Standard Deviation

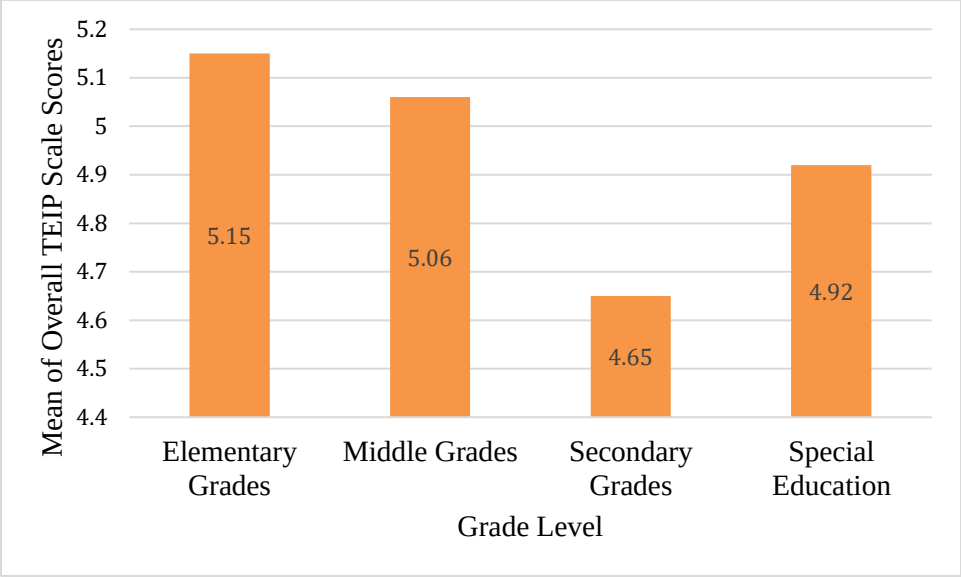


Figure 14. Overall self-efficacy means score by Grade Level

The one-way ANOVA, conducted to explore the impact of the overall self-efficacy of teachers toward inclusive education in STEM classrooms within the scope of grade level-taught, revealed a statistically significant difference [$F(3,194) = 4.141$, $p = .007$]. Post-hoc comparisons conducted using the Tukey Honestly Significant Difference (HSD) test showed that secondary grades teachers (M= 4.65, SD = 0.85) scored significantly lower than both elementary grade teachers (M = 5.14, SD = 0.63, p =.024) and middle grade teachers (M = 5.05, SD = 0.87, p = .027). This difference was at the p <.05 level with a small effect size of .060, calculated using eta squared. The difference between other

groups based on the level of grade teaching reached no significance (p >.05). Refer to Table 30 and Figure 14 above.

Table 31

ANOVA analysis for overall Self-Efficacy means (TEIP Means) by Age

Age (years)	*n*	*M*	*SD*	*F*	*p*
21-25	19	4.34	0.78	2.974	. 033*
26-35	64	4.91	0.68		
36-45	56	4.88	0.75		
Over 45	59	4.99	1.07		

*Note. *p < .05, M = Mean, SD = Standard Deviation*

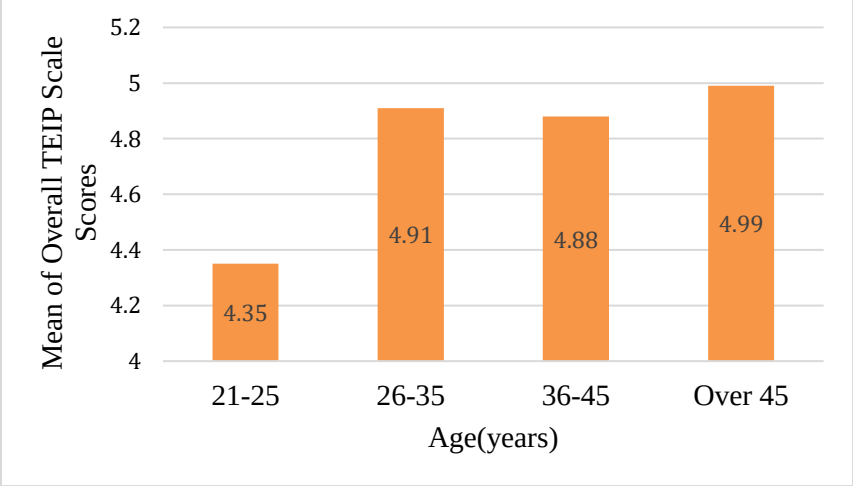


Figure 15. Overall self-efficacy means score by Age

The one-way ANOVA, conducted to explore the impact of age groups on the overall self-efficacy of teachers toward inclusive education in STEM classrooms, revealed a statistically significant difference [F (3,194) =2.974, p =.033]. Post-hoc comparisons conducted using the Tukey HSD test showed that teachers in the age group of "21-25" (M = 4.34, SD = 0.78) scored significantly lower than both teachers in the age group of "26-35" (M = 4.91, SD = 0.68, p = .049) and teachers in the age group of "over 45" (M = 4.99, SD =1.07, p = .019). This difference was at the $p < .05$ level with a small effect size of .044, calculated using eta squared. The difference between age group of "36-45" did not reach significance ($p > .05$). Refer to Table 31and Figure 15 above.

Table 32

ANOVA analysis for overall Self-efficacy means (TEIP Means) by Higher Education Degree

Degree	*n*	*M*	*SD*	*F*	*p*
Bachelor's	88	4.73	0.75	3.996	.004*
Master's	74	4.84	0.77		
Bachelor's (Special Education)	9	5.55	0.38		

Master's (Special Education)	18	4.98	1.44
Doctorate	9	5.59	0.47

Note. *$p < .05$, *M* = Mean, *SD* = Standard Deviation

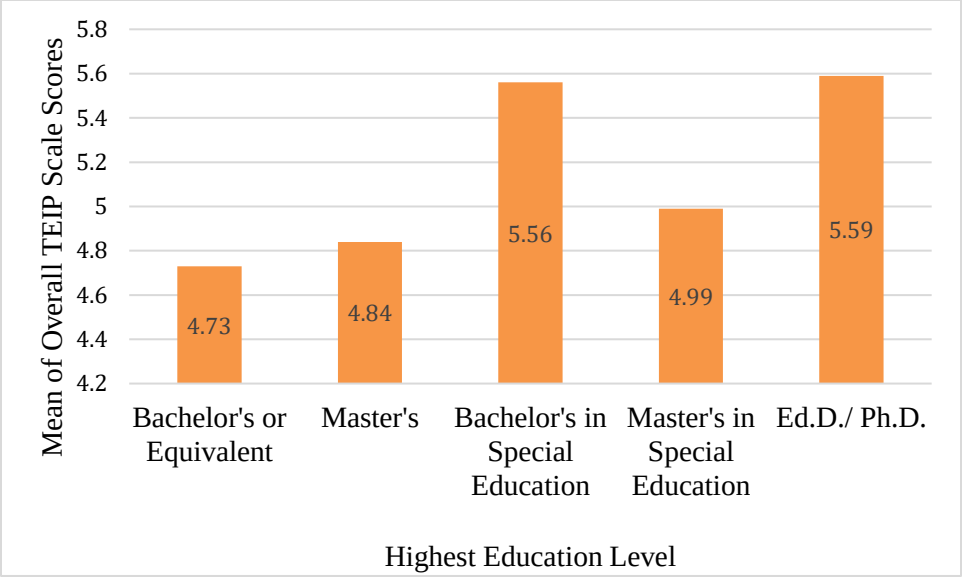


Figure 16. Overall self-efficacy scores by Highest education degree

The one-way ANOVA, conducted to explore the impact of the highest education degree on overall self-efficacy of teachers toward inclusive education in STEM classrooms revealed a statistically significant difference [F (4,193) = 3.996, p = .004]. Assumptions of homogeneity of variances were not met , so post-hoc comparisons conducted using the Games-Howell test showed that

teachers with a Bachelor's degree or equivalent (M = 4.73, SD = 0.75) scored significantly lower than both teachers with Bachelor's degrees in SPED (M = 5.55, SD = 0.38, p = .000) and teachers with doctorate degrees (M = 5.59, SD = 0.47, p = .002).This difference was at the $p < .05$ level with a moderate effect size of .076, calculated using eta squared. The differences between other remaining groups did not reach significance ($p > .05$). Refer to Table 32 and Figure 16 above.

Table 33

ANOVA analysis for overall Self-Efficacy means (TEIP Means) by Subjects Taught

Subject	*n*	*M*	*SD*	*F*	*p*
Science	114	4.86	0.82	1.192	.314
Math	59	4.83	0.93		
Computer Sc./ Robotics	7	4.54	0.80		
Science & Math	18	5.18	0.18		

Note. M = Mean, *SD* = Standard Deviation

The results of one-way ANOVA, conducted to compare overall self-efficacy means score as dependent vriable based on subjects taught, showed no significant difference [F (3,194) =1.192, p = .314]. Refer to Table 33 above.

Table 34

ANOVA analysis for overall Self-Efficacy means (TEIP Means) by Teaching Experience (years)

Teaching Experience	*n*	*M*	*SD*	*F*	*p*
0-5	32	4.72	0.67	0.861	.489
6-10	36	5.00	0.74		
11-15	46	4.75	0.79		
16-20	45	4.96	0.87		
21 & over	39	4.91	1.09		

Note. *M* = Mean, *SD* = Standard Deviation

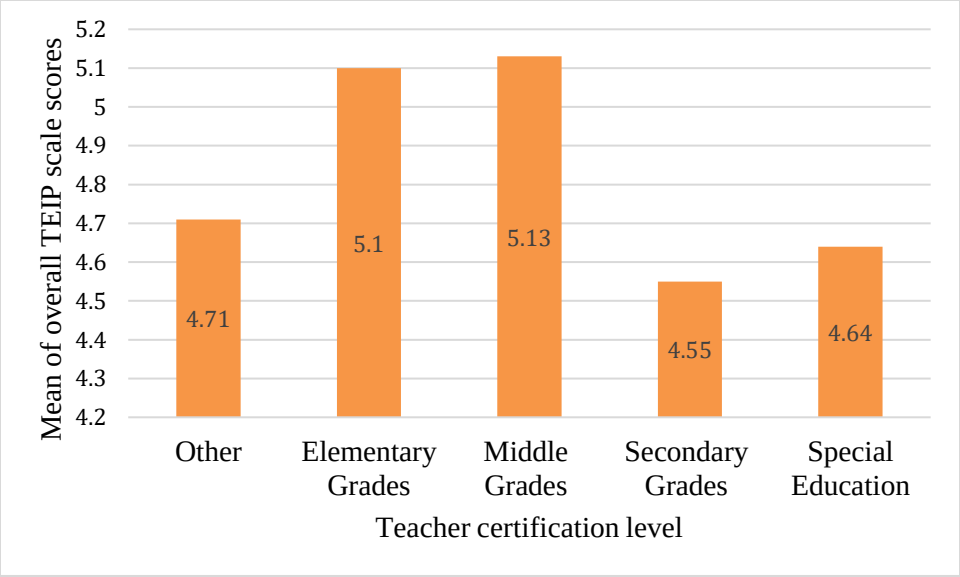
The results of one-way ANOVA, conducted to compare overall self-efficacy means score as dependent variable based on teaching experience, showed no significant difference [F (4,193) =.861, p = .489]. However, teachers with the least number of years of teaching experience between 0-5 years showed the lowest level of self-efficacy. Refer to Table 34 above.

Table 35

ANOVA analysis for overall Self-Efficacy means (TEIP Means) by Teacher Certification

Teacher Certification	*n*	*M*	*SD*	*F*	*p*
Elementary	53	5.09	0.77	5.273	.000*
Middle	55	5.12	0.81		
Secondary	65	4.54	0.63		
SPED	11	4.63	1.25		
Other	14	4.71	0.88		

Note. *$p < .05$, *M* = Mean, *SD* = Standard Deviation



`*Figure 17*. Overall self-efficacy score by Teacher Certification

The one-way ANOVA, conducted to explore the impact of highest education degree on the overall self-efficacy of teachers, revealed a statistically significant difference [F (4,193) = 5.273, p = .000]. Post-hoc comparisons conducted using the Tukey HSD test showed that secondary certified teachers (M = 4.54, SD = 0.63) scored significantly lower than both elementary certified teachers (M = 5.09, SD = 0.77, p =.003) and middle grades certified teachers (M = 5.12, SD = 0.81, p =.001). This difference was at the $p < .05$ level with a moderate effect size of .099, calculated using eta squared. The difference between other remaining groups did not reach significance (p >.05). Refer to Table 35 and Figure 17 above.

Table 36

ANOVA analysis for overall Self-Efficacy means (TEIP Means) by SPED Higher Education Courses

SPED Higher Education Courses	*n*	*M*	*SD*	*F*	*p*
None	114	4.87	0.77	1.485	.229
1-3	33	4.67	0.84		
4 or more	51	4.99	1.01		

Note. M = Mean, SD = Standard Deviation

The results of one-way ANOVA, conducted to compare overall self-efficacy means score as dependent variable based on SPED higher education courses taken, showed no significant difference [F (2,195) = 1.485, p =.229]. However, teachers with four or more SPED courses taken at higher education level showed the highest level of self-efficacy. Refer to Table 36 above.

Table 37

T-test analysis for overall Self-Efficacy means (TEIP Means) by SPED In-service attended

SPED In-service attended	*n*	*M*	*SD*	*t*	*p*
Yes	85	4.99	0.96	1.657	.099
No	113	4.78	0.75		

Note. M = Mean, *SD* = Standard Deviation, SPED = Special Education

The results of t-tests, conducted to compare overall self-efficacy means score as dependent variable based on SPED in-service attended, showed no significant difference [t (196) = 1.657, p = .099]. However, teachers who attended in-service training in SPED showed a higher self-efficacy. Refer to Table 37 above.

Research Question 5. Is there a significant correlation between teachers' attitudes and teachers' self-efficacy toward inclusive education in STEM classrooms?

Table 38

Pearson's correlation between overall attitude and overall self-efficacy means score (N =198)

Variables	1	2
1.Overall Attitude Means	-	
2. Overall Self-Efficacy Means	.343*	-

*Note. *p < .01*

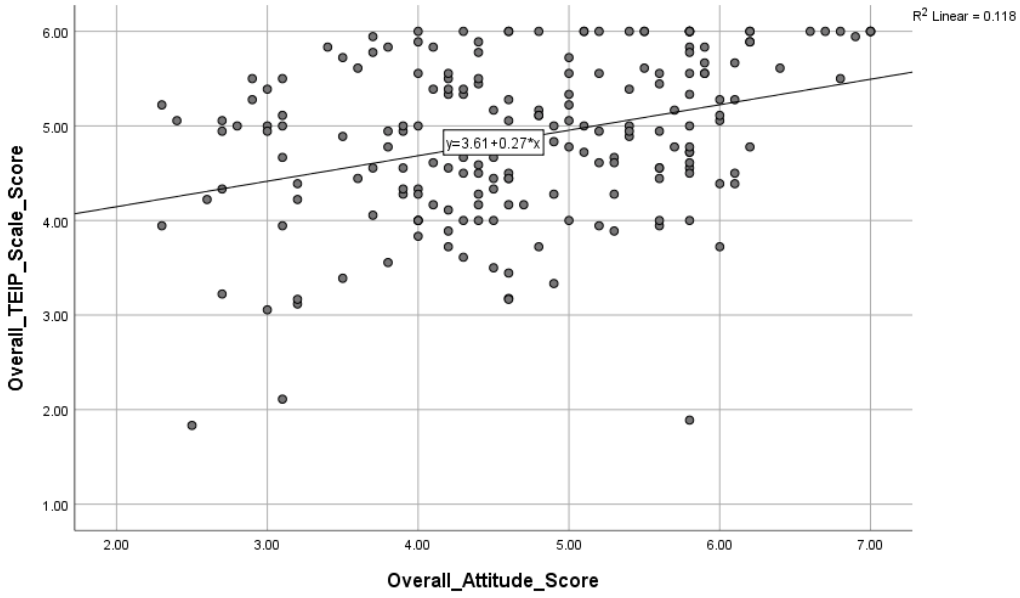


Figure 18. Pearson's Correlation between overall Attitudes means score & overall Self-Efficacy means score

To investigate any significant differences between overall attitudes and the self-efficacy of teachers toward inclusive education in STEM classrooms, the Pearson Correlation coefficient was conducted. A statistically significant medium strength positive correlation was found between teachers' overall attitudes means score and overall self-efficacy means score toward inclusion in STEM classrooms [r (198) = .343, p =.01). The null hypothesis was rejected. Results suggested that more positive attitudes toward inclusion were associated with higher self-efficacy toward inclusion in STEM classrooms. These results were in agreement with the

literature review (Gao & Mager, 2011; Frizzle, 2018; Ozokcu, 2017; Sokal & Sharma, 2013; Wiesel & Dror, 2006). Refer to Table 38 and Figure 18 above.

Table 39

Pearson's Correlations between AIS sub-scales and TEIP sub-scales (N=198)

Variables	1	2	3	4	5
AIS Sub-Scales					
1.AIS (Beliefs)	-				
2. AIS (Feelings)	.546**	-			
TEIP Sub-scales					
3. Inclusive Instructions	.174*	.422**	-		
4. Collaboration	.213**	.455**	.851**	-	
5. Managing Behavior	.161*	.414**	.858**	.824**	-

*Note. *p < .05, **p < .01,* AIS = Attitude toward inclusion scale, TEIP = Teacher Efficacy toward Inclusive Practices

Pearson's correlations between attitude toward inclusion (AIS) sub-scales and teacher efficacy toward inclusive practices (TEIP) sub-scales were also conducted. There were small positive correlations between attitude (beliefs) sub-scales and self-efficacy sub-scales of instruction, collaboration, and management of student behavior. The correlation between attitude (beliefs) and self-efficacy

(inclusive instruction) was .174 at $p < .05$ significance level, while the correlation was .213 at $p < .01$ level between attitudes (beliefs) and self-efficacy (collaboration). The correlation between attitudes (beliefs) and self-efficacy (managing student behavior) was .161 at $p < .05$ level.

The correlation between attitude (feelings) sub-scale and self-efficacy (inclusive instruction), self-efficacy (collaboration), and self-efficacy (managing student behavior) were .422, .455, and .414 at $p < .01$ level respectively, which showed medium positive relationships. These results proved that attitude (feelings) on a sub-scale demonstrate a stronger positive correlation with self-efficacy sub-scales, as compared to attitude (beliefs) sub-scale. Refer to Table 39 above.

Chapter V: Discussion

The purpose of this research study was to examine current overall attitudes, levels of concern, and self-efficacy of teachers toward inclusion. The study also examined whether there were differences in attitudes, concerns and self-efficacy toward STEM inclusion, based on demographic elements. Further, the study investigated whether there was a significant correlation between teachers' attitudes and self-efficacy toward inclusive education in STEM classrooms.

A quantitative research methodology was chosen for this study. Survey instruments were used to collect data indicators, which were reduced to numeric data using Likert's scales. The data from this research revealed several key indicators of how teachers' attitudes, concerns, and self-efficacy can affect inclusive education in STEM classroom. A detailed discussion is done in this chapter, based on each research question.

Summary of Findings

Data was collected through a survey questionnaire distributed via Microsoft forms and on paper to the participants. The following three scales were used in the questionnaire: Attitude to Inclusion Scale (AIS), The Concerns about Inclusive Education Scale (CIES), and Teacher Efficacy for Inclusive Practices (TEIP) Scale. Besides scales, demographic information was also collected.

The sample size after cleaning the data was 198. Participants were teachers from Louisiana who teach at least one or more STEM subjects in K-12 schools. The participants were mostly female (67%). A majority of the participants (58 %) were 36 years of age or older. Most teachers were educated at the bachelor's level (44 %), with 11-15 years of teaching experience. Most teachers taught science (58%), followed by math (30%). Many of the participants (33%) were certified to teach secondary level grades (9-12). Most of the participants (58%) never studied a special education course at higher education level, and most (57%) did not receive in-service training in special education.

Discussion by Research Questions

Research Question 1. What are the general attitudes of teachers toward inclusive education in STEM classrooms?

Overall, the teachers' attitudes (M = 4.7, SD =1.08) were slightly positive toward inclusive education in STEM classrooms. These results were in agreement with several researches mentioned in the literature review and related to the attitudes of teachers toward inclusive education (Beacham & Rouse, 2012; Bhatnagar & Das, 2014; Oswald & Swart, 2011). This result becomes a very crucial factor in determining the success of inclusion of students. The data revealed that 72% of the participants reported an attitude score of 4.10 or more, which shows a slightly positive attitude toward inclusion, while 28% reported an attitude score of four or lower, thereby reflecting neutral to negative attitudes toward inclusion in STEM classrooms. By comparing these results with findings of Stauble (2009), where 57% of general education teachers reported negative attitudes toward inclusion, it may be asserted that there a decrease in the overall negative attitudes of teachers toward inclusion is shown over time. This becomes very encouraging, since negative attitudes of teachers toward inclusion could be detrimental to student success (Cassady, 2011).

Another positive aspect of overall attitudes was the mean score for the sub-scale for attitudes (feelings). The overall mean score of attitudes (feelings) was 5.14, showing that all four items present an attitude mean score of 5 or more. This strongly proves that teachers' attitudes based on their feelings are more positive than their attitudes based on their beliefs. This in turn may predict a higher self-efficacy toward inclusion, since many researches tend to support the positive relationship between teachers' attitudes and their self-efficacy toward inclusive education. (Ozokcu, 2017; Frizzel, 2018). This result is of paramount importance for the success of inclusion students in STEM classrooms.

Research Question2. What is the level of concern of teachers toward inclusive education in STEM classrooms?

The overall concerns score using CIES on a 4-point Likert type classification was 2.10, with a score of 1 indicating "Not concerned at all," and a score of 4 indicating "Extremely concerned" in regard to implementing inclusive education. This score indicated that teachers were moderately concerned about the implementation of inclusive education in STEM classrooms. CIES yielded four factors: Factor I (concerns about lack of resources), Factor II (concerns about lack of acceptance), Factor III (concerns about poor academic performance, and Factor IV (concerns about increased workload). The concern scores for each

factor are as follows: Factor I (*M* = 2.12, *SD* = 0.77), Factor II (M = 2.07, *SD* = 0.75), Factor III (*M* = 2.12, *SD* = 0.79), and Factor IV (*M* = 2.06, *SD* = 0.77), which showed that the teachers expressed moderate levels of concern for implementing inclusive practices with respect to each factor. Subban and Sharma (2006) found similar results: teachers showed overall CIES scores of slightly above 2, indicating a moderate level of concern about including students with disabilities into mainstream settings. Sharma and Desai (2002) in their study found similar results for Factor II (lack of acceptance) and Factor III (poor academic standards), showing that teachers were moderately concerned about inclusive education. Factor I (lack of resources) and Factor IV (increased workload) scores were relatively lower in the current study, compared to results found by Sharma and Desai (2002). This finding shows that teachers in the current study do not have high levels of concern regarding lack of resources and increased workloads, due to implementation of inclusive education.

Some of the items received higher scores than others. The item "There will be inadequate resources/special teacher staff available to support inclusion," "It will be difficult to give equal attention to all students in an inclusive classroom," and "I will not have enough time to plan educational programs for students with disabilities," scored highest on the CIES scale with 2.29, 2.28, and

2.27, respectively. These results may be utilized by various school district leaders to help design training modules that address these concerns for current and incoming teachers.

Research Question 3. What is the overall self-efficacy of teachers toward inclusive education in STEM classrooms?

Teachers reported a higher self-efficacy with a mean score of 4.87 (*SD* = 0.85), as measured by TEIP scale on a six-point Likert's scale, ranging from a score of 1 indicating "strongly disagree" and a score of 6 indicating "Strongly Agree." Refer to Table 10. A score of 3.5 would be at neutral level. This research study proved that STEM teachers were self-efficacious about implementing inclusion practices in their classrooms. This finding was a crucial result leading to better achievements for inclusion students studying STEM subjects, to spark more interest among these students in regard to STEM education, which may in turn lead the students to pursue higher education in STEM related fields. According to Woolfolk (2007), teachers' self-efficacy can carry a positive impact on academic achievements of students. Savolainen et al. (2012) found similar results with Finnish and South African teachers. As mentioned in the literature review, Samms (2017) found similar results with the positive self-efficacy of primary teachers toward inclusion. Teacher self-efficacy

is a huge factor in making STEM inclusion successful. STEM inclusion may be challenging for teachers. As a result, a sense of higher self-efficacy may help teachers to make STEM inclusion successful. Brady and Woolfson (2008) emphasized that teacher efficacy represents an important variable for teaching students in a STEM classroom.

Within the domains contained in the TEIP scale, teachers reported the highest sense of self-efficacy in the area of self-efficacy in inclusive instructions with the mean score of 4.96 (*SD* = 0.88). Refer to Table 10. Teachers felt confident in designing learning tasks for the students of varied learning needs, as well as providing alternate examples for students needing more support to understand the difficult concepts in STEM classrooms. These positive findings were in agreement with Wood's (2017) findings.

The second highest area for self-efficacy for STEM teachers in this study was Efficacy with Collaboration (*M* = 4.85, *SD* = .91). Refer to Table 10. Teachers reported themselves as highly self-efficacious in making parents feel comfortable while coming to school. This was a huge result for success in inclusion of students, because parents assume a very important role in making students successful. However, teachers reported relatively lower self-efficacy in the domain of TEIP when it came inform others who knew little about laws and

policies related to the inclusion of students with disabilities. One possible reason for this result could be having insufficient knowledge about inclusive practices. Yet STEM teachers in this study reported higher self-efficacy in working jointly with other professionals and with collaboration in the school with regard to teaching inclusion students. This could prove a boon for students with disabilities, as teachers could feel more empowered in serving these students when the teachers could work jointly with other school professionals. Wood (2017) also had similar results in the research study with secondary special educators.

Finally, teachers in this study reported relatively lower self-efficacy in the domain of Efficacy with Managing Behavior (M = 4.80, SD = 0.90), as compared to other domains of the TEIP scale. Refer to Table 10. Teachers presented the highest score when it came to persuading children to follow classroom rules. This outcome is importantly necessary in order to keep a safe learning environment for all the students. Teachers also had high self-efficacy scores in making their expectations clear in regard to student behavior. The lowest score of self-efficacy in this domain was in dealing with students who were physically aggressive. This was expected, as teachers might not have appropriate training to deal with physically aggressive students.

Research Question 4. Are there any significant differences in teachers' attitudes, concerns, and self-efficacy toward inclusion in STEM classrooms, based on demographic elements i.e. gender, grade level, age, education level, subject taught, teaching experience, teacher certification, number of higher education courses taken in special education, SPED in-service training attended?

When investigating whether there were any significant differences based on demographics, the overall attitude of teachers toward inclusion showed significance differences, based on grade levels taught, certification levels, and SPED courses taken at the higher education level. Elementary grade level teachers reported the highest attitudes scores, while secondary grade level teachers reported the lowest attitude scores. This could be because secondary school teachers work with a larger number of students throughout the day, when compared to elementary teachers, who usually teach fewer students. Also, secondary school teachers teach in a didactic manner by delivering whole group instructions, rather than to individual students (Van Reusen, Soho, & Baker, 2001). Similarly, teachers certified to teach elementary grades reported the highest attitude scores, when compared to secondary level certified teachers, who reported the lowest attitude scores. These results were

consistent with the extant research, mentioned in the literature (DeSimone & Parmar, 2006; Lopes, Monteiro, Sil, Rutherford, & Quinn, 2004; Smith, 2000). There was a significant difference in the attitude scores of teachers who had taken four or more SPED courses at a higher education level, as compared to those teachers who studied none. Teachers who studied between 1-3 SPED courses at a higher education level also reported higher attitude scores than those who had taken none. Although there was no significant difference in teachers' attitudes scores based on gender, female teachers reported higher scores as compared to male teachers. Based on age also, no significant difference was reported; however, teachers between the age range of 36-45 years reported the highest attitude scores as compared to other age groups. There was no significant difference in teachers' attitudes based on the highest level of education degree. However, teachers with bachelor's degrees and master's degrees in special education held the higher attitudes scores, together with teachers holding a doctorate degree. These results support Sharma et al. (2009) as mentioned in the literature review. The subject taught also resulted in no significant difference in attitudes of teachers. Computer science/robotics teachers held the most positive attitudes, while teachers teaching both science and math showed the lowest results in attitude scores. Also, teachers having teaching experience in the range of 16-20 years of age reported the highest attitude scores, as compared to teachers in other

teaching experience ranges. Teacher trainings in SPED showed no significant difference in teachers' attitudes. These results were in contrast to a number of studies that reported a significant impact that stemmed from teacher trainings on teacher attitudes (Avramidis & Kalyva, 2007; Brownell & Pajares, 1999). Stauble (2009) reported similar results in research findings of no significant impact of teacher trainings on teacher attitudes toward inclusion.

Concerns of teachers based on demographic elements showed a significant difference, yet only with regard to the grade level taught. Teachers teaching middle grades reported a significantly lower level of concern toward inclusion in STEM classrooms, as compared to teachers who taught secondary grades. No significant difference in teachers' concerns was reported, based on gender. However, male and female teachers both scored almost the same in the concern scores. In addition, based on age, there was no significant difference. However, teachers in the youngest age range showed the highest level of concern, as compared to other age groups. Teachers with the highest education degree being a Bachelor's degree reported the highest level of concern, while teachers having a Master's degree in SPED reported the lowest level of concern in that category. Based on teaching experience, teachers having teaching experience from 0-5 years reported the highest level of concern, while teachers with 11-15 years of

teaching experience had the lowest concern scores. This result was not unexpected, since inexperienced teachers tend to show higher levels of concern due to experiential non-exposure to various inclusive practices. Based on the teacher certification level, although not significantly different, certified teachers in the elementary, middle, and SPED grades expressed a lower level of concern as compared to certified teachers in the secondary grade. Although there was no significant difference in concerns based on SPED courses taken at a higher education level, teachers who studied four or more SPED courses reported a lower level in concern scores. Lastly, no significant difference was reported in teacher concerns, based on SPED in-service attended.

Scores of teachers revealed significant differences while investigating the demographic element effects on self-efficacy in regard to the inclusion grade level taught. Elementary grades teachers showed the highest self-efficacy scores, and middle grades teachers scored the second highest, while secondary grade level teachers reported the lowest self-efficacy scores. Significant differences were obtained in self-efficacy scores based on age as well. Teachers in an older aged group of over 45 exhibited the highest self-efficacy scores, while teachers in the younger aged group of 21-25 reported the lowest self-efficacy scores. Wood (2017) reported similar results in comparing secondary special educators'

attitudes and sense of self-efficacy toward inclusive education. The highest education degree obtained carried a great impact on teacher-self-efficacy: teachers with a doctorate degree reported the highest self-efficacy, while teachers with regular bachelor's degree expressed the lowest self-efficacy scores. Yet teachers with a bachelor's degree in special education reported higher self-efficacy scores, in comparison to teachers with a master's degree in general subjects, as well as teachers with master's degree in special education. Although the subject taught did not result in a significant difference in self-efficacy scores, teachers who taught both science and math reported the highest scores, while computer science/robotics teachers reported the lowest scores. Teaching experience resulted in no significant differences in self-efficacy scores. Teacher certification, however, amounted to significant differences in teachers' self-efficacy toward inclusion. Teachers certified in elementary and middle grades reported the highest self-efficacy, while teachers with secondary grades certification showed the lowest self-efficacy scores. This may be due to the challenges faced by secondary grade teachers in the implementation of inclusive practices, since this group teaches a larger group of students in different classes all day. Based on SPED higher education courses also, no significant difference was found in the self-efficacy scores. However, teachers who studied four or more courses at the higher education level had the highest self-efficacy scores. This may be due to the

teachers' awareness and knowledge regarding special education and inclusion, learned while studying SPED courses at a higher education level. Although there was no significant difference based on gender, female participants reported higher self-efficacy scores, compared to male participants. Wood (2017) also reported similar findings based on gender in regard to teachers' attitudes and self-efficacy.

Trainings in SPED in-services yielded no significant difference in either attitude or self-efficacy of teachers toward an inclusive education in STEM classrooms. This result was in agreement with Hofman and Kilimo's (2014) findings in their study conducted in Tanzanian schools on teachers' attitudes and self-efficacy toward the inclusion of pupils with disabilities. These findings were not in line with several other studies (Avramidis & Norwich, 2002; MacFarlane & Marks Woolfson, 2013; Malinen et al., 2013) perhaps due to scant variation in the current sample.

Research Question 5. Is there a significant correlation between teachers' attitudes and teachers' self-efficacy toward inclusive education in STEM classrooms?

A medium, positive correlation was found between teachers' overall attitudes and overall self-efficacy. This indicates that the higher the teachers' attitude toward inclusion in STEM classrooms, the higher teachers' self-efficacy

becomes. These findings indicated that a sense of self-efficacy attributed to experienced teachers may positively influence teachers' attitudes toward inclusion; the findings were consistent with studies mentioned in the literature review (Meijer & Foster, 1988; Sharma, Loreman, & Forlin, 2011; Soodak et al., 1998; Weisel & Dror, 2006; Sokal & Sharma, 2013; Mobley, 2015).

A significant medium positive correlation was found between overall attitudes and three sub-scales of TEIP scale, self-efficacy (Inclusive Instruction), self-efficacy (collaboration), and self-efficacy (managing behavior). This means that teachers with higher attitudes scores toward inclusive education would be efficacious in implementing inclusive instruction, collaboration, and managing student behavior in STEM classrooms. The items "I am excited to teach students with a range of abilities in my class" and "I am pleased that including students with a range of abilities will make me a better teacher," drawn from the Attitude to Inclusion scale, showed the higher positive correlations with items from the TEIP scale. This indicates that the teachers in this study felt efficacious in facing challenges that arose when teaching students with diverse learning needs.

The results of the current study offered a new addition to extant literature, since this research was conducted with teachers who taught at least one course in science, math, engineering, and technology (STEM) subjects. Also, the samplings

of participants included teachers from diverse grade levels of elementary, middle and secondary school classes.

Implications

The results from this study present valuable information and recommendations at various levels for STEM inclusion. These results may provide various school districts with targeted areas of professional development such SPED in-service trainings, courses in SPED, trainings to improve secondary grade teachers' attitudes and self-efficacy toward inclusion of students in STEM classrooms. Providing support for teacher certification and opportunities to pursue higher education degrees may also be considered for improving teacher attitudes and self-efficacy toward inclusion in STEM classrooms. Providing teachers opportunities to complete one or more SPED courses could make the inclusion program successful, since teachers will become aware of skills and knowledge about inclusive practices. Creating training programs to improve teacher attitudes toward inclusion could boost self-efficacies, which in turn are shown to improve student achievement. Bandura (1997) supports the fact that teachers with a high sense of self-efficacy believe in their students and therefore exert extra effort to teach them. Professional development programs designed to enhance trainee

teachers' sense of efficacy and competence to teach students with disabilities may improve inclusive education in K-12 schools. Additionally, this motivation has the strength to reduce teachers' concerns about inclusive education. If the majority of teachers' concerns are addressed early in scholastic training, they will be more willing to teach students with disabilities in their classrooms. A decrease in concerns toward inclusive education serves to support an increase in the overall attitudes of educators toward implementing inclusive practices (Sharma, 2001; Sharma, Ee, & Desai, 2003).

As mentioned in the results, the secondary grade educators reflected lower attitude scores and self-efficacy toward inclusive practices in STEM classrooms. The next steps for the school districts may include the development of training programs and in-service days, filled with ideas that can help improve secondary educators' attitudes and self-efficacies toward inclusion. Also, teachers with four or more courses taken at the higher education level reported the highest positive attitudes, together with lower concerns and higher self-efficacy toward inclusion in STEM classrooms. Teacher education programs filled with ideas addressing the concerns raised in the current study and hands on trainings to improve teacher attitudes and hence self-efficacy toward inclusion may be designed to make inclusion education more successful.

This study is an addition to the existing literature on inclusive education, specifically, STEM inclusion. STEM inclusion represents a potential to be of critical importance in the improvement of achievement levels for inclusion students, empowering them to eventually become part of the STEM workforce.

Conclusions

The implementation of effective inclusive education in STEM classrooms is notably crucial for student achievement. Attitude concerns and self- efficacy of both general and special education teachers are fundamental to the academic and social success of students with disabilities in an inclusive classroom. (Sharma & Jacobs, 2015; Sharma & Desai, 2002; Sharma, Loreman, & Forlin, 2011). The outcome of this research study might contribute to a determination in finding a positive impact of several variables on the levels of efficacy beliefs and teachers' attitudes toward inclusive classrooms, thereby adding to the literature on teachers' accruing a sense of efficacy in STEM classrooms. In order to meet the gap in the representation of inclusion students in STEM related fields of education and workforce, the use of effective inclusion strategies is imperative for inclusive classrooms.

Inclusion of students with disabilities in general education classroom provides favorable results (Bui Quirk, Almazon & Valenti, 2010). Currently, only

5% of students with disabilities culminate their education as part of the STEM workforce (Leddy, 2010). Therefore, the teachers' role is found to be of prime importance toward making inclusive education successful in STEM classrooms. This research study is of paramount importance for suggesting ways to incorporate success into an inclusive education in STEM classroom by improving teacher attitudes and self-efficacies. Strategies such as the Universal Design of Learning, Flipped Classroom, Assistive Technologies, online learning programs, and use of technologies such as iPads, may act in tandem with other critical variables to make STEM inclusion effectively successful.

Self-efficacy (Bandura, 1977, 1982) was incorporated into this research study, as research has shown that positive teacher and student outcomes are linked to high self-efficacy (Tschannen-Moran & McMaster, 2009). According to Bandura (1993), self-efficacy, found to be task specific, can predict success in a better manner than actual ability.

Notwithstanding the lack of sufficient research on STEM inclusion, this research study provided insight into the attitudes, concerns, and self-efficacy of teachers toward inclusive education for STEM subjects. A survey research study examined overall attitudes, concerns, and self-efficacy of teachers toward inclusion in STEM classrooms. The effect of demographic elements on teachers'

attitudes, concerns, and self-efficacy were also examined. In addition, the study examined whether there was a relationship between attitudes and self-efficacy of teachers about inclusion.

Descriptive statistics revealed overall attitudes to be slightly positive. The overall level of concerns of the participants were reported to be at moderate level. Teachers responded that they were self-efficacious in implementing inclusive practices. The t-test and one-way ANOVA revealed a few significant differences between attitudes, concerns, and self-efficacy-based demographic elements. Teachers' overall attitudes toward inclusion revealed significant differences, based on grade levels taught, teacher certification levels, and SPED courses taken at the higher education level. Overall concerns revealed a significant difference based solely on grade levels taught. Teacher self-efficacy revealed the most significant differences, based on demographics. Grade levels taught, age groups, highest education degrees, and teacher certification levels revealed significant differences when comparing teacher self-efficacy. Pearson's product-moment correlation coefficient revealed a medium strength, positive correlation between teachers' attitudes and teachers' self-efficacy toward inclusion.

Results of this study were mostly in agreement with the literature review. Study results indicated that elementary grade teachers had the most positive

attitudes, and the highest self-efficacy toward inclusion in STEM classrooms. Secondary grade teachers had lower attitude scores, higher level of concerns, and the lowest self-efficacy. Female teachers reported higher positive attitudes, lower level of concerns, and higher self-efficacy, when compared to male teachers. Teachers with higher degrees had more positive attitudes, lower concerns, and the highest self-efficacy. Teachers who studied four or more SPED courses at a higher education level had the most positive attitudes, lowest concerns, and revealed higher self-efficacy. Teachers with in-service training in special education showed to have more positive attitudes, and a higher self-efficacy toward STEM inclusion. The moderate, positive correlation between teachers' attitudes and teachers' self-efficacy indicates that the more positive the attitude is, the higher self-efficacy toward inclusion becomes.

This research is significant, as the implications for social change can adapt the study results from this research toward innovative training programs, professional development classes, opportunities for higher education courses, and further research. This research study contributes to relevant literature in regard to teacher's attitudes, concerns, and self-efficacy toward STEM inclusion. This will permit students with disabilities in STEM inclusion to become successful in contributions to the STEM workforce.

Limitations

This research study had the following major limitations:

1. Response rate of the participants was hard to calculate, as the survey was made available on online platform using Microsoft forms. As a result, participants in this study are not a representative sample of the lager population. Therefore, the researcher is not able to generalize these results to the State of Louisiana and other schools in the United States.

2. This research study used a quantitative research methodology only. Future research may be conducted by integrating qualitative research methodology to complement the statistical inquiry and allow in-depth reflective thinking of teachers toward inclusive practices.

3. Participation in this research study was limited to teachers' teaching one or more STEM subjects only. Future researches may be conducted by including teachers from other core subjects, such as English and Social Studies.

4. The data collected was self-reported by the participants and may have included some biased reporting in order to proffer socially acceptable views, despite the survey being anonymous and voluntary.

5. The data for this study were collected using random sampling techniques from various K-12 schools in Louisiana and provided only a single snapshot, rather than an extended examination of teachers' attitudes, concerns, and self-efficacy over time. Consequently, the results of this study are not generalizable to all teachers in Louisiana.

6. A possible last limitation of this study could be teachers' understanding and awareness about inclusive education. All teachers may have had various ideas of the meaning of 'inclusive education' which could affect the way they respond to statements. Also, validity of the results of this study was dependent on teachers' awareness about their attitudes, concerns, and self-efficacy toward inclusive education.

Future Recommendations

Results of this study provided important information which could be used to make future recommendations. The following recommendations were made for further research.

1. The population sample in this research study included STEM teachers only. Additional research could focus on more subject areas including STEM teachers to get a broader sense of teachers' attitudes, concerns, and self-efficacy toward inclusive education.
2. Additional research study could also be conducted to address the limitations mentioned in this research study.
3. Further research may be done to examine the impacts of professional developments and in-service trainings provided to teachers to improve their attitudes and self-efficacy toward inclusion in STEM classrooms.
4. Qualitative research approaches such as classroom observations could be used in future researches to strengthen the validity of the data.
5. This study investigated the correlation between teachers' attitudes and their self-efficacy toward inclusion in STEM classrooms. Future research may be conducted to examine whether there is a significant correlation between teachers' concerns and their self-efficacy toward inclusion.

REFERENCES

Abdullah, N., & Abosi, O. (2014). Attitudes and Concerns of Regular Teachers towards Inclusive Education in Brunei Darussalam. *Asian Journal of Education and e-Learning* (ISSN: 2321 – 2454). Volume 02– Issue 01, February 2014.

Aiello, P., Sharma, U. (2018). Improving intentions to teach in inclusive classrooms: the impact of teacher education courses on future Learning Support Teachers. Form @ re - Open Journal for online training. *ISSN 1825-7321, vol. 18, n. 1, pp. 207-219 DOI: http://dx.doi.org/10.13128/formare-22605*

Ainscow, Mel & Sandill, Abha (2010). Developing inclusive education systems: the role of organisational cultures and leadership, *International Journal of Inclusive Education*, 14:4, 401-416, DOI: 10.1080/13603110802504903

Altemueller, L., & Lindquist, C. (2017). Flipped classroom instruction for inclusive learning. *British Journal of Special Education*, 44(3), 341–358. https://doi.org/10.1111/1467-8578.12177

Arslan, E. (2017). Self-efficacy as predictor of collective self-efficacy among preschool teachers in Turkey. *Educational Research and Reviews*, *12*(8), 513-517. doi:10.5897/ERR2017.3222.

Aronin, S., & Floyd, K. K. (2013). Using an iPad in Inclusive Preschool Classrooms to Introduce STEM Concepts. Teaching Exceptional Children, 45(4), 34–39. Retrieved from http://search.ebscohost.com/login.aspx?direct=true&db=a9h&AN=85691772&site=ehost-live

Avery, S. Y. (2017). Teachers' Stage of Concern and Self-Efficacy Regarding Teaching Students in an Inclusive Classroom. Retrieved from http://scholarworks.waldenu.edu/dissertations

Avramidis, E., & Kalyva, E. (2007). The influence of teaching experience and professional development on Greek teachers' attitudes towards inclusion. *European Journal of Special Needs Education*, 22(4), 367–389. https://doi.org/10.1080/08856250701649989

Avramidis, E., & Norwich, B. (2002). Teachers' attitudes towards integration/inclusion: A review of the literature. *European Journal of Special Needs Education*, 17(2), 129-147. https://doi.org/10.1080/08856250210129056

Avramidis, E., Bayliss, P., & Burden, R. (2000). A survey into mainstream teachers' attitudes towards the inclusion of children with special educational needs in the

ordinary school one local education authority. *Educational Psychology*, 20 (2), 191-211. https://doi.org/10.1080/713663717

Baker, Edward T., Wang, Margaret C. & Walberg, Herbert J. "The Effects of Inclusion on Learning" *Educational Leadership.* Vol. 52 Iss. 4 (1994) Available at: http://works.bepress.com/ed_baker/10/

Ballone, Lena & Czerniak, Charlene (2001). Teachers' Beliefs About Accommodating Students' Learning Styles in Science Classes. *Electronic Journal of Science Education*. 6.

Bandura, A. (1977). Self-efficacy: Towards a unifying theory of behavioral change. *Psychological Review*, 84(2), 191-215.

Bandura, A. (1994). Self-efficacy. *Encyclopedia of human behavior* (Vol. 4, pp. 71-81). New York: Academic Press. Retrieved from: https://www.uky.edu/~eushe2/Bandura/BanEncy.html

Bandura, A. (1994). Self-efficacy. In V. S. Ramachaudran (Ed.), *Encyclopedia of human behavior* (Vol. 4, pp. 71-81). New York: Academic Press. (Reprinted in Friedman [Ed.], Encyclopedia of mental health. San Diego: Academic Press, 1998).

Bandura, A. (Ed.). (1995). *Self-efficacy in changing societies*. New York, NY, US: Cambridge University Press.

Bandura, A. (2006). Guide for constructing self-efficacy scales. In. Pajares, F. & Urdan, T. (Eds.). *Self-efficacy beliefs of adolescents*. Greenwich, CT: Information Age Publishing

Bandura, A. (1997). Self-efficacy: The exercise of control. Macmillian

Barros, M.; Laburu, C. et da Silva, F. (2010). An instrument for measuring self-efficacy beliefs of secondary school physics teachers, *Pocedia Social and Behavioral Sciences*, 2, 3127-3133

Beacham, N., & Rouse, M. (2012). Student teachers' attitudes and beliefs about inclusion and inclusive practice. *Journal of Research in Special Educational Needs, 12(1), 3-11. doi:10.1111/j.1471-3802.2010.01194.x*

Bergmann, J., & Sams, A. (2012a). *Flip your classroom: Reach every student in every class every day*, International Society for Technology in Education, Washington, D.C.

Bhatnagar, N., & Das, A. (2014) Attitudes of Secondary Regular School Teachers Toward Inclusive Education in New Delhi, India: A Qualitative Study. *Exceptionality Education International*, *24*, 17-30. Retrieved from http://ir.lib.uwo.ca/eei/vol24/iss2/2

Bowling, A. (1997). *Research Methods in Health*. Buckingham: Open University Press.

Bowerman, S. (2007). Least Restrictive Environment (LRE), Inclusion and Mainstreaming.*Texas Woman's University.* Retrieved from http://www.twu.edu/inspire/leastrestrictive.asp

Bradshaw, L., & Mundia, L. (2006). Attitudes and concerns about inclusive education: Bruneian inservice and preservice teachers. *International Journal of Special Education*, *21* (1), 35-41.

Bui, X. Quirk, C., Almazan, S., & Valenti, M. (2010*). Inclusive education research and practice: Inclusion works.* Hanover, MD: Coalition for Inclusive Education. Retrieved from http://www.mcie.org/usermedia/application/11/inclusion-works-(2010).pdf

Brady, K., & Woolfson, L. (2008). What teacher factors influence their attributions for children's difficulties in learning? British Journal of Educational Psychology, 78, 527-544.

Burns, N., & Grove, S. K. (1997). *The Practice of Nursing Research Conduct, Critique, & Utilization*. Philadelphia: W.B. Saunders and Co.

Campbell, J., & Gilmore, L., & Cuskelly, M.. (2014). Changing Student Teachers Attitudes Towards Disability and Inclusion. Journal of Intellectual and Developmental Disability. 28. 10.1080/13668250310001616407.

Carlile, A., Kelly & Reeve, Sharon & Reeve, Kenneth & DeBar, Ruth (2013). Using Activity Schedules on the iPod touch to Teach Leisure Skills to Children with Autism. Education and Treatment of Children. 36. 33-57. 10.1353/etc.2013.0015.

Chang, W.-L., Yuan, Y., Lee, C.-Y., Chen, M.-H., & Huang, W.-G. (2013). Using Magic Board as a teaching aid in third grader learning of area concepts. *Educational Technology & Society, 16(2),* 163-173.

Charley, Y. Carmen (2015). General Education and special education teachers' attitudes toward inclusion. http://scholarworks.waldenu.edu/dissertations

Chhabra, Simmi & Srivastava, Rama & Srivastava, Ishaan (2010). Inclusive Education in Botswana: The Perceptions of School Teachers. *Journal of Disability Policy Studies.* 20. 219-228. 10.1177/1044207309344690.

Chesley, G., & Calaluce, P. (1997, December). The deception of inclusion. Mental Retardation, 35 (6), 488-490.

Christensen, C., Johnson, J., & Horn, M. (2008). Disrupting class: How disruptive innovation will change the way the world learns. New York, NY: McGrawHill.

Conderman, G., & Hedin, L. (2012). Purposeful assessment practices for co-teachers. *Teaching Exceptional Children*, *44*(4), 18-27. Retrieved from doi:10.1177/004005991204400402

Cook, B. (2001, Winter). A comparison of teachers' attitudes toward their included students with mild and severe disabilities. The Journal of Special Education, 34 (4), 203-213. Retreived February 6, 2003, from: http://vnweb.hwilsonweb.com/hww/results/results_singles.jhtml?nn=22

Cotabish, A., Dailey, D., Hughes, A., Robinson, A. (2011). The effects of a STEM professional development intervention on elementary teachers' science process skills. *Research in the Schools*, 18(2), 16-25. doi:10.1111/ssm.12023

Cozby, P. C., & Bates, S. (2012). Methods in behavioral research. New York, NY: McGraw-Hill

Cohen, J. (1988). *Statistical power analysis for the behavioral sciences* (2nd ed.). Hillsdale, NJ: Lawrence Earlbaum Associates.

Creswell, J. W. (2012). Educational research: Planning, conducting, and evaluating quantitative and qualitative research (4th ed.). Upper Saddle River, NJ: Pearson Education.

Cummings, A. L. (2003). An analysis of New Mexico family and consumer sciences teachers' preparation, challenges, and needs relating to special education (Unpublished master's thesis). New Mexico State University, Las Cruces, NM.

De Boer, A., Pijl, S.P., & Minnaert, A. (2011). Regular primary schoolteachers' attitudes towards inclusive education: a review of the literature. International Journal of Inclusive Education, 15(3), 331-353

Dellinger, Amy & Bobbett, J., Jacquline & Olivier, Dianne & D. Ellett, Chad. (2008). Measuring teachers' self-efficacy beliefs: Development and use of the TEBS-Self. *Teaching and Teacher Education*. 24. 751-766. 10.1016/j.tate.2007.02.010.

DeSimone, J. R. & Parmar, R. S. (2006) Issues and challenges for Middle School Mathematics Teachers in inclusion classrooms, *School Science and Mathematics*, 106 (8), 338-346.

Diken, H. İ., & Sucuoglu, B. (1999). Teachers' attitudes towards inclusion of children with intellectual disability. Special Education Journal, 2(3), 25-39.

Dory, R., Dion, Y., Wagner, S., & Brunet, J. (2002, Spring). High school inclusion of adolescents with mental retardation: A multiple case study. Education and Training in Mental Retardation and Developmental Disabilities, 37(3), 253-261. Retrieved February 25, 2003, from: http://vnweb.hwwilsonweb.com/hww/results/results_single.jhtml?nn=12

Edyburn, D. L. (2010). Would you recognize universal design learning if you saw it? Ten

propositions for new directions for the second decade of UDL. *Learning Disability Quarterly*, 3(3), 33-41.

Eriks-Brophy, A., Durieux-Smith, A., Olds, J., Fitzpatrick, E., Duquette, C., & Whittingham, J. (2006). Facilitators and barriers to the inclusion of orally educated children and youth with hearing loss in schools: Promoting partnerships to support inclusion. *Volta Review*, 106, 53–88.

Faul, F., Erdfelder, E., Lang, A.-G., & Buchner, A. (2007). G*Power 3: A flexible statistical power analysis program for the social, behavioral, and biomedical sciences. *Behavior Research Methods*, *39*, 175-191.

Frizzell, Allecia, "The Inclusive Classroom: Perceptions of General and Special Educators' Preparedness to Meet the Needs of Students with Disabilities" (2018). *Electronic Theses and Dissertations.* Paper 3370. https://dc.etsu.edu/etd/3370

Forbes, L., & S. Billet. 2012. Successful co-teaching in the science classroom. *Science Scope* 36 (1): 61-64.

Forlin, C. (2010). Teacher education reform for enhancing teachers' preparedness for inclusion. International Journal of Inclusive Education, 14 (7), 649-653.

Forlin, C., Earle, C., Loreman, T., & Sharma, U. (2011). The Sentiments, Attitudes , and Concerns about Inclusive Education Revised (SACIE-R) Scale for Measuring Pre-Service Teachers ' Perceptions about Inclusion. Exceptionality Education International, 21(3), 50–65.

Friend, M. & Bursuck, W.D. *Including Students with Special Needs: A Practical Guide for Classroom Teachers.* 5th edition. Upper Saddle River, NJ: Pearson Education Inc. 2009.

Gal, E., Schreur, N., & Engel-Yeger, B. (2010). Inclusion of children with disabilities: Teachers' attitudes and requirements for environmental accommodations. *International Journal of Special Education*, *25*(2), 89-99. Retrieved from https://files.eric.ed.gov/fulltext/EJ890588.pdf

Gliem, J. and Gliem, R. (2003). Calculating, interpreting, and reporting Cronbach's alpha reliability coefficient for Likert-type scales. Retrieved from https://scholarworks.iupui.edu/bitstream/handle/1805/344/Gliem+&+Gliem.pdf?sequence=1.

Greene, B. L. (2017). Teachers' Attitudes toward Inclusive Classrooms. (Doctoral Dissertation) Retrieved from

https://scholarworks.waldenu.edu/cgi/viewcontent.cgi?article=4548&context=dissertations

Gokdere, M. (2012). A Comparative Study of the Attitude, Concern, and Interaction Levels of Elementary School Teachers and Teacher Candidates towards Inclusive Education. *Educational Sciences: Theory and Practice,* 12, 1303-0485. Retrieved from http://files.eric.ed.gov/fulltext/EJ1002876.pdf

Gozun, O., & Yikmis, A. (2004). The effectiveness of teacher candidates' knowledge of inclusion in changing attitudes towards inclusion. *Special Education Journal*, 5, 65-77.

Guskey, T., & Passaro, P. (1994). Teacher Efficacy: A Study of Construct Dimensions. *American Educational Research Journal*, *31*(3), 627-643. Retrieved from http://www.jstor.org/stable/1163230.

Hamdan, N., McKnight, P., McKnight, K., & Arfstrom, K. M. (2013). A Review of Flipped Learning. http://www.flippedlearning.org/review

Heflin, J., & Bullock, L. (1999, Spring). Inclusion of students with emotional/behaviorial disorders: A survey of teachers in general and special education. Preventing School Failure, 43(3), 103-111. Retreived February 25, 2003, from: http://vnweb.hwwilsonweb.com/hww/results/results_single.jhtml?nn=12

Hoover-Dempsey, K. V., Bassler, O. C., & Brissie, J. S. (1992). Explorations in parent-school relations. Journal of Educational Research, 85(5), 287–294.

Hunt, P., Alwell, M., Farron-Davis, F., & Goetz, L. (1996). Creating socially supportive environments for fully included students who experience multiple disabilities. *Journal of the Association for Persons with Severe Handicaps*, 21(2), 53-71.

Hughes, R. M. (R. M.). (2010). The Process of Choosing Science, Technology, Engineering, and Mathematics Careers by Undergraduate Women: A Narrative Life History Analysis. Retrieved from http://purl.flvc.org/fsu/fd/FSU_migr_etd-3668

Hwang, Jiwon., & Taylor, Jonte, C. Stemming on STEM: A STEM Education Framework for Students with Disabilities. *Journal of Science Education for Students with Disabilities*, Vol. 19, Iss. 1 [2016], Art. 4.

Havice, W. (2009). The power and promise of a STEM education: Thriving in a complex technological world. *In ITEEA (Ed.), The Overlooked STEM Imperatives: Technology and Engineering* (pp. 10-17). Reston, VA: ITEEA.

Henson, R. K. (2001). Teacher self-efficacy: Substantive implication and measurement dilemmas. Retrieved from https://www.uky.edu/~eushe2/Pajares/EREkeynote.PDF

Hofman, R. H., & Kilimo, J. S. (2014). Teachers' Attitudes and Self-Efficacy Towards Inclusion of Pupils with Disabilities in Tanzanian Schools. *Journal of Education and Training*, 1(2), 177-198. https://doi.org/10.5296/jet.v1i2.5760

Hoy, A. W. (2000) Changes in teacher efficacy during the early years of teaching. Paper presented at the Annual Meeting of the American Educational Research Association, New Orleans

Ilić-Stošović, D., Nikolić, S., Popadić, M.: Teachers' sense of efficacy and implications for implementation of inclusive education. *Special education and rehabilitation (Beograd)*, Vol. 14, br. 3. 345-365, 2015.

Individuals with Disabilities Education Act, Pub. L. 108-446 (2004). Retrieved from http://idea.ed.gov/explore/view/p/%2Croot%2Cstatute%2C

Jordan, A., Schwartz, E., & McGhie-Richmond, D. (2009). Preparing teachers for ınclusive classrooms. *Teaching and Teacher Education, 25,* 535–542. https://doi.org/10.1016/j.tate.2009.02.010

Kagohara, D. M., van der Meer, L., Ramdoss, S., O'Reilly, M. F., Lancioni, G. E., Davis, T. N., et al. (2013). Using iPods® and iPads® in teaching programs for individuals with developmental disabilities: A systematic review. *Research in Developmental Disabilities, 34*(1), 147–156. doi: 10.1016/j.ridd.2012.07.027.

King-Sears, M. (2009). Universal design for learning: Technology and pedagogy. *Learning Disability Quarterly*, 32, 199-201.

King-Sears, M & Bowman-Kruhm, Mary. (2011). Specialized Reading Instruction for Adolescents with Learning Disabilities: What Special Education Co-Teachers Say. *Learning Disabilities Research & Practice*. 26. 172 - 184. 10.1111/j.1540-5826.2011.00336.x.

Kosko, K. W., & Wilkins, J. L. M. (2009). General eductors' in-service training and their self perceived ability to adapt instruction for students with IEPs. The Professional Educator, 33(2), 1–10.

Leddy, M.H. (2010). Technology to advance high school and undergraduate students in science, technology, engineering, and mathematics. *Journal of Special Education Technology, 25(3),*3-8

Lewis, R. B., & Doorlag, H. D. (2006). Teaching special students in general education classrooms. New Jersey, Prentice Hall.

Leyser, Y., Zeiger, T., & Romi, S. (2011). Changes in self-efficacy of prospective special and general education teachers: implications for inclusive education. International Journal of Disability, development & Education, 58(3), 241-255.

Likert, R. (1932). A Technique for the Measurement of Attitudes. *Archives of Psychology*, 140, 1–55.

Lorah, Elizabeth & Parnell, Ashley & Whitby, Peggy & Hantula, Donald. (2015). A Systematic Review of Tablet Computers and Portable Media Players as Speech Generating Devices for Individuals with Autism Spectrum Disorder. *Journal of autism and developmental disorders*. 45. 3792-3804. 10.1007/s10803-014-2314-4.

Loreman, Tim; Sharma, Umesh; and Forlin, Chris (2013) "Do Pre-service Teachers Feel Ready to Teach in Inclusive Classrooms? A Four Country Study of Teaching Self-efficacy," *Australian Journal of Teacher Education*: Vol. 38: Iss. 1, Article 3. Available at: http://ro.ecu.edu.au/ajte/vol38/iss1/

Lopes, J., Monteiro, I., Sil, V., Rutherford, R., & Quinn, M. (2004). Teachers' perceptions about teaching problem students in regular classrooms. *Education and Treatment of Children, 27*(4), 394-419. Retrieved from http://www.jstor.org/stable/42899814

Malinen, O. P., Savolainen, H., Engelbrecht, P., Xu, J., Nel, M., Nel, N., & Tlale, D. (2013). Exploring teacher self-efficacy for inclusive practices in three diverse countries. Teaching and Teacher Education, 33, 34-44.

Mamlin, N. (2008). Despite best intentions: When inclusion fails. *Journal of Special Education*, 33, 36–49.

Marino, M. T., Basham, J. D., & Beecher, C. C. (2011). Using video games as an alternative science assessment for students with disabilities and at-risk learners. Science Scope, 34(5), 36-41.

McFarland, J., Hussar, B., Wang, X., Zhang, J., Wang, K., Rathbun, A., Barmer, A., Forrest Cataldi, E., and Bullock Mann, F. (2018). *The Condition of Education 2018* (NCES 2018-144). U.S. Department of Education. Washington, DC: National Center for Education Statistics. Retrieved [date] from https://nces.ed.gov/pubsearch/pubsinfo. asp?pubid=2018144.

McCormick, L., Frome Loeb, D., & Schiefelbusch, R. (2003). Supporting children with communication difficulties in inclusive settings: School-based language intervention (2nd ed.). Needham Heights, MA: Allyn & Bacon.

McDonnell, J., Thorson, N., McQuivey, C., & Kiefer-O'Donnell, R. (1997). Academic engaged time of students with low-incidence disabilities in general education classes. Mental Retardation, 35(1), 18-26.

Meijer, C., & Foster, S. (1988). The effect of teacher self-efficacy on referral chance. Journal of Special Education, 22, 378–385.

Mobley, M. C.(2015). "Development of the SETIS Instrument to Measure Teachers' Self-Efficacy to Teach Science in an Integrated STEM Framework. " PhD diss., University of Tennessee. http://trace.tennessee.edu/utk_graddiss/3354

Moon, N. W., Todd, R. L., Morton, D. L., & Ivey, E. (2012). Accommodating students with disabilities in science, technology, engineering, and mathematics (STEM): Findings from research and practice for middle grades through university education. Atlanta: Center for Assistive Technology and Environmental Access, Georgia Institute of Technology.

Moorehead, T., & Grillo, K. (2013). Celebrating the Reality of Inclusive STEM Education. Teaching Exceptional Children, 45(4), 50–57. Retrieved from http://search.ebscohost.com/login.aspx?direct=true&db=a9h&AN=85691774&site=ehost-live

Monahan, R., Marino, S., & Miller, R. (1996, Winter). Teacher attitudes toward inclusion: Implications for teacher education in schools 2000. Education, 117, 316-320. Retreived March 2, 2003, from: http//vn.hwwilsonweb.com/hww/results/results_single.jhtml?nn=16

Montgomery, A & Mirenda, P. (2014). Teachers' self-efficacy, sentiments, attitudes, and concerns about the inclusion of students with developmental disabilities. Exceptionality Education International. 24. 18-32.

Moran, Laura C.(2015). Teacher Efficacy for Secondary General Education Teachers Supporting Students With Specific Learning Disabilities (SLD) in Inclusive Classrooms.*Theses and Dissertations (All)*. 1325. http://knowledge.library.iup.edu/etd/1325

National Science Board, National Science Foundation. (2010). Preparing the next generation of STEM innovators: Identifying and developing our nation's human capital. Accessed January 3, 2012, from http://www.nsf.gov/nsb/ publications/2010/nsb1033.pdf

National science board report (2015). *Revisiting the STEM workforce.* https://www.nsf.gov/nsb/publications/2015/nsb201510.pdf

Nepo, K. (2017). The Use of Technology to Improve Education. Child & Youth Care Forum, 46(2), 207–221. https://doi.org/10.1007/s10566-016-9386-6

Oliver. T, & Shapiro, F. (1993). Self-efficacy and computer-Based Interactions. 20: 81-85.

Oswald, M., & Swart, E. (2011). Addressing South African pre-service teachers'

sentiments, attitudes and concerns regarding inclusive education. *International Journal of Disability, Development and Education*, *58*(4), 389-403. doi:10.1080/1034912X.2011.626665

Ozokcu, Osman (2017). The Relationship Between Teacher Attitude and Self-Efficacy for Inclusive Practices in Turkey. Journal of Education and Training Studies. doi:10.11114/jets.v6i3.3034 URL: https://doi.org/10.11114/jets.v6i3.3034

Park, M., & Chitiyo, M. (2011). An examination of teacher attitudes towards children with autism. Journal of Research in Special Educational Needs, 11, 70-78.

Patkin, D., & Timor, T. (2010). Attitudes of Mathematics Teachers Towards the Inclusion of Students with Learning Disabilities and Special Needs in Mainstream Classrooms, Electronic Journal for Inclusive Education, 2 (6)

Parette, Phil & Scherer, Marcia. (2004). Assistive technology use and stigma. Education and Training in Developmental Disabilities. 39. 217-226.

Pentimonti, J.M., Zucker, T.A., Justice, L.M., & Kaderavek, J.N. Informational text use in preschool classroom read-alouds. The Reading Teacher 63: 656–665, 2010.

Rakap, S., & Kaczmarek, L. (2010). Teachers' attitudes towards inclusion in Turkey. European Journal of Special Needs Education, 25, 59–75. https://doi.org/10.1080/08856250903450848

Rathouz, M. M. (2011). Making sense of decimal multiplication. *Mathematics Teaching in the Middle School, 16(7),* 430-437.

Rittmayer, A. D., & Beier, M. E. (2008). Overview: self-efficacy in STEM. Retrieved from http://www.engr. psu.edu/awe/misc/ARPs/ARP_SelfEfficacy_Overview_122208.pdf

Ross-Hill, R. (2009). Teacher attitude towards inclusion practices and special needs students. *Journal of Research in Special Educational Needs*, *9*(3), 188–198.

Salend, S. J., & Garrick Duhaney, L. M. (1999). The Impact of Inclusion on Students With and Without Disabilities and Their Educators. Remedial and Special Education, 20(2), 114–126. https://doi.org/10.1177/074193259902000209

Savolainen, H., Engelbrecht, P., Nel, M., & Malinen, O. P. (2012). Understanding teachers' attitudes and self-efficacy in inclusive education: implications for pre-service and in-service teacher education. European Journal of Special Needs Education, 27(1), 51–68. https://doi.org/10.1080/08856257.2011.613603

Samms, J. S. (2017). Inclusion in Jamaican primary schools: Teachers' self-efficacy, attitudes, and concerns (Doctoral dissertation, Walden University).

Scruggs, T. E., & Mastropieri, M.A. (1996). Teacher perceptions of mainstreaming-inclusion, 1958-1995: A research synthesis. Exceptional Children, 63, 59-74.

Shady, S., Luther, V., & Richman, L. (2013). Teaching the teachers: A study of perceived professional development needs of educators to enhance positive attitudes toward inclusive practices.. Education Research and Perspectives. 40. 169.

Sharma, U.,Loreman, T., & Forlin, C. (2011). Measuring teacher efficacy to implement inclusive practices. Journal of Research in Special Educational Needs. *12*(1). 12 - 21. DOI : 10.1111/j.1471-3802.2011.01200.x.

Sharma, U. (2012). Changing Pre-Service Teachers' Beliefs to Teach in Inclusive Classrooms in Victoria, Australia. Australian Journal of Teacher Education, 37(10). http://dx.doi.org/10.14221/ajte.2012v37n10.6.

Sharma, U., & Das, A. (2015). Inclusive education in India: past, present and future. Support for Learning, 30, 55e68. http://dx.doi.org/10.1111/1467-9604.12079.

Sharma, U., Forlin, C., Deppeler, J., & Yang, G. (2013). Reforming teacher education for inclusion in developing countries in the Asia Pacific region. Asian Journal of Inclusive Education, 1(1), 3e16.

Sharma, U., & Desai, I. (2002). Measuring concerns about integrated education in India. Asia and Pacific Journal on Disability, 5(1), 2–14.

Sharma, U., Ee, J. & Desai, I. (2003). A comparison of Australian and Singaporean preservice teachers' attitudes and concerns about inclusive education, *Teaching and Learning*, 24 (2) 207-217.

Sharma, U., Forlin, C., & Loreman, T. (2008). Impact of training on pre-service teachers' attitudes and concerns about inclusive education and sentiments about persons with disabilities. *Disability & Society, 23(7),* 773-785.

Sharma, U., & Jacobs, K. (2015). Predicting in-service educators' intentions to teach in inclusive classrooms in India and Australia. Teaching and Teacher Education, *55, 13–23*

Sharma,U., Moore, D., & Sonawane, S. (2009) Attitudes and concerns of pre-service teachers regarding inclusion of students with disabilities into regular schools in Pune, India, Asia-Pacific Journal of Teacher Education, 37:3, 319-331, DOI: 10.1080/13598660903050328

Skaalvik, E. M., & Skaalvik, S. (2007). Dimensions of teacher self-efficacy and relations with strain factors, perceived collective teacher efficacy, and teacher burnout. *Journal of Educational Psychology, 99*(3), 611-625.

http://dx.doi.org/10.1037/0022-0663.99.3.611

Smith, S. J., & Basham, J. D. (2014). Designing Online Learning Opportunities for Students with Disabilities. Teaching Exceptional Children, *46(5), 127–137. https://doi.org/10.1177/0040059914530102*

Sokal, L., & Sharma, U. (2014) Canadian In-service Teachers' Concerns, Efficacy, and Attitudes about Inclusive Teaching.*Exceptionality Education International, 23*, 59-71. Retrieved from http://ir.lib.uwo.ca/eei/vol23/iss1/5

Sokal, Laura & Woloshyn, D & Funk-Unrau, S. (2013). How important is practicum to pre-service teacher development for inclusive teaching? Effects on efficacy in classroom management. Alberta Journal of Educational Research. 59. 285-298.

Stainback, S. B., & Stainback, W. C. (Eds.). (1996). Inclusion: A guide for educators. Baltimore, MD, US: Paul H Brookes Publishing.

Stauble, Karla R., "Teacher attitudes toward inclusion and the impact of teacher and school variables." (2009). *Electronic Theses and Dissertations.* Paper 1375. https://doi.org/10.18297/etd/1375

STEM 2026. A Vision for Innovation in STEM Education. Retrieved from: https://innovation.ed.gov/files/2016/09/AIR-STEM2026_Report_2016.pdf

STEM Education in the U.S. Where We Are and What We Can Do. 2017. Retrieved from:https://www.act.org/content/dam/act/unsecured/documents/STEM/2017/STEM-Education-in-the-US-2017.pdf

Subban, P., & Sharma, U. (2005). Understanding educator attitudes toward the implementation of inclusive education. *Disability Studies Quarterly, 25*(2), p.N.PAG. Retrieved from Education Research Complete database.

Tabachnick, B.G. and Fidell, L.S. (2012) Using Multivariate Statistics. 6h Edition, Person Education, Boston.

Taylor, R. W. & Ringlaben, R. P. (2012). Impacting pre-service teachers' attitudes toward inclusion. *Higher Education Studies, 2(3),* 16-23.

Tomlinson, C. (2004). Differentiation in diverse settings: A consultant's experience in diverse settings. The School Administrator, *7(61), 28-35.*

Torreno, S. (2012). The History of Inclusion: Educating Students with Disabilities. Bright Hub Education. Retrieved from http://www.brighthubeducation.com/special-ed-inclusion strategies/66803-brief-legal-history-of-inclusion-in-special-education/

Travers, J., & Ring, E. (2005). Barriers to inclusion: A case study of a pupil with severe

learning difficulties in Ireland. *European Journal of Special Needs Education*, 20, 41–56

Tschannen-Moran, M., Woolfolk Hoy, A., & Hoy, W. K. (1998). Teacher efficacy: Its meaning and measure. Review of Educational Research, 68, 202-248.

Tschannen-Moran, M., & Woolfolk, H. A. (2001). Teacher efficacy: Capturing and elusive construct. *Teaching and Teacher Education*, 17, 783-805. https://doi.org/10.1016/S0742-051X(01)00036-1

UNESCO. (2009). Policy guidelines on inclusion in education. Paris, France: UNESCO. Retrieved from http://unesdoc.unesco.org/images/0017/001778/177849e.pdf

U.S. Department of Education, Office of Special Education Programs, Individuals with Disabilities Education Act (IDEA) database, retrieved December 27, 2018, from https://www2.ed.gov/programs/osepidea/618-data/state-level-data-files/index.html#bcc; and National Center for Education Statistics, National Elementary and Secondary Enrollment Projection Model, 1972 through 2028. See *Digest of Education Statistics 2018*, table 204.50.

U.S. Department of Education, National Center for Education Statistics. (2019). *Public high school 4-year adjusted cohort graduation rate (ACGR), by race/ethnicity and selected demographic characteristics for the United States, the 50 states, and the District of Columbia: School year 2016–17*.

U.S. Department of Education, Office of Special Education and Rehabilitative Services, Office of Special Education Programs, *40th Annual Report to Congress on the Implementation of the Individuals with Disabilities Education Act, 2018,* Washington, D.C. 2018.

Van Reusen, A., Soho, A., & Barker, K. (2001). High school teacher attitudes toward inclusion. High School Journal, 84(2), 7-21.

Waldron, N., Cole, C., & Majd, M. (2001). The academic progress of students across inclusive and traditional settings: A two-year study Indiana inclusion study. Bloomington, IN: Indiana Institute on Disability & Community.

Waldron, N. L., McLeskey, J., & Redd, L. (2011). Setting the direction: The role of the principal in developing an effective, inclusive school. *Journal of Special Education Leadership,* 24(2), 51-60.

Watson, S., & Johnston, L. (2007). Assistive Technology in the Inclusive Science Classroom. *Science Teacher, 74*(3), 34–38. Retrieved from http://search.ebscohost.com/login.aspx?direct=true&db=a9h&AN=24285848&site=ehost-live

Watson, J.; Murin, A.; Vashaw, L.; Gemin, B.; Rapp, C. (2013). Keeping Pace with K-12 Online & Blended Learning: An Annual Review of Policy and Practice. 10 Year Anniversary Issue

Watt, S. J., Therrien, W. J., Kaldenberg, E., & Taylor, J. (2013). Promoting Inclusive Practices in Inquiry-Based Science Classrooms. *TEACHING Exceptional Children*, *45*(4), 40–48. https://doi.org/10.1177/004005991304500405

Weisel, A., & Dror, O. (2006). School climate, sense of efficacy and Israeli teachers' attitudes toward inclusion of student with special needs' Education, Citizenship and Social Justice, 1(2), 157-174. https://doi.org/10.1177/1746197906064677

Woodward, J., & Rieth, H. (1997). A Historical Review of Technology Research in Special Education. Review of Educational Research, 67(4), 503–536. https://doi.org/10.3102/00346543067004503

Woolfolk Hoy, A., & Spero, R. (2005). Changes in teacher efficacy during the early years of teaching: a comparison of four measures. Teaching and Teacher Education, 21, 343-356

Woolfolk Hoy, A., & Davis, H. (2005). Teachers' sense of efficacy and adolescent achievement. Adolescence and education: Vol. 5: Self-efficacy beliefs during adolescence. 117-137.

Zimmerman, B. J. (1995). Self-efficacy and educational development. In A. Bandura (Ed.), *Self-efficacy in changing societies* (pp. 202-231). New York: Cambridge University Press.

Zhang, M., Trussell, R., Gallegos, B., & Asam, R. (2015). Using Math Apps for Improving Student Learning: An Exploratory Study in an Inclusive Fourth Grade Classroom. TechTrends: Linking Research & Practice to Improve Learning, *59*(2), 32–39. https://doi.org/10.1007/s11528-015-0837-y

APPENDICES

Appendix A: Survey Questionnaire

Teachers' Attitudes, Concerns and Self-Efficacy Toward Inclusive Education

1. Demographic Information: I am teaching / training to teach in:

- Early Childhood
- Elementary (Grades K-5)
- Middle (Grades 6-8)
- Secondary (Grades 9-12)
- Special Education

2. I am

- Male
- Female

2. What is your age?

- 25 years or below
- 26-35 years
- 36-45 years
- 46 years and above

4. My highest level of education completed is:

- ○ Secondary School or its equivalent
- ○ Bachelor’s Degree or its equivalent
- ○ Master’s Degree
- ○ Bachelor's Degree in Special Education
- ○ Master's degree in Special Education
- ○ Ed.D/Ph.D

5. Currently, I teach/ intend to teach the following subject / subjects:

- ☐ English
- ☐ Math
- ☐ Science
- ☐ Social Studies
- ☐ Computer science/ Robotics/Engineering
- ☐ Other

6. Total years of Teaching Experience (The number of years you have been employed under contract as a teacher including current year)

- ○ 0-5
- ○ 6-10
- ○ 11-15
- ○ 16-20
- ○ 21 and more

7. Areas of Certification you hold, select all that apply:

- ☐ Elementary Education (K-5)
- ☐ Middle Level Education (6-8)

- ☐ Secondary Level Education (9-12)
- ☐ Math
- ☐ Science
- ☐ Social Studies
- ☐ Language Arts
- ☐ Special Education
- ☐ Other

8. How many higher education courses have you completed in special education?

- ○ None
- ○ 1-3
- ○ 4 or more

9. Have you attended in-service training in special education?

- ○ Yes
- ○ No

10. Attitudes to Inclusion Scale (AIS) measures educators' attitudes to the inclusion of students with diversities in regular schools. Please rate your degree of agreement by choosing one of the 7 anchors that best reflects your agreement with each statement. Please note that there are no right or wrong answers.

	Strongly Disagree	Moderately Disagree	Slightly Disagree	Undecided	Slightly Agree	Moderately agree	Strongly Agree
"I believe that all students regardless of their ability should be	○	○	○	○	○	○	○

	Strongly Disagree	Moderately Disagree	Slightly Disagree	Undecided	Slightly Agree	Moderately agree	Strongly Agree
taught in regular classrooms."							
"I believe that inclusion is beneficial to all students socially."	○	○	○	○	○	○	○
"I believe that inclusion benefits all students academically."	○	○	○	○	○	○	○
"I believe that all student can learn in inclusive classrooms if their teachers are willing to adapt the curriculum."	○	○	○	○	○	○	○
"I believe that placement of students with severe disabilities in special schools is the best option for	○	○	○	○	○	○	○

	Strongly Disagree	Moderately Disagree	Slightly Disagree	Undecided	Slightly Agree	Moderately agree	Strongly Agree
education of such students."							
"I believe that students with social emotional behaviors should be taught in special schools."	○	○	○	○	○	○	○
"I am pleased that I have the opportunity to teach students with lower academic ability alongside other students in my class."	○	○	○	○	○	○	○
"I am excited to teach students with a range of abilities in my class."	○	○	○	○	○	○	○
"I am pleased that including students with a range of	○	○	○	○	○	○	○

	Strongly Disagree	Moderately Disagree	Slightly Disagree	Undecided	Slightly Agree	Moderately agree	Strongly Agree
abilities will make me a better teacher."							
"I am happy to have students who need assistance with their daily activities included in my classrooms."	○	○	○	○	○	○	○

11. Part I: In the context of your school situation and/or your personal experiences indicate whether any of the following items will be a concern to you if a student with a disability was placed in your class/school. Choose one of the 4 anchors that best reflect your agreement with each statement.

	Extremely Concerned	Very Concerned	A little concerned	Not concerned at All
I will not have enough time to plan educational programs for students with disabilities.	○	○	○	○
It will be difficult to maintain discipline in class.	○	○	○	○
I do not have knowledge and skills required to teach students with disabilities.	○	○	○	○

	Extremely Concerned	Very Concerned	A little concerned	Not concerned at All
I will have to do additional paperwork.	○	○	○	○
Students with disabilities will not be accepted by non-disabled students.	○	○	○	○
Parents of children without disabilities may not like the idea of placing their children in the same classroom where there are students with disabilities.	○	○	○	○
My school will not have enough funds for implementing inclusion successfully.	○	○	○	○
There will be inadequate para-professional staff available to support students with disabilities (for e.g., speech pathologist, physiotherapist, occupational therapist).	○	○	○	○
I will not receive enough incentives (for e.g., additional remuneration or allowance) to teach students with disabilities.	○	○	○	○
My workload will increase.	○	○	○	○

12. Part II: In the context of your school situation and/or your personal experiences indicate whether any of the following items will be a concern to you if a student with a disability was placed in your class/school.

	Extremely Concerned	Very Concerned	A little concerned	Not concerned at All
Other school staff members will be stressed.	○	○	○	○
My school will have difficulty in accommodating students with various types of disabilities because of inappropriate infrastructure (for e.g., architectural barriers).	○	○	○	○
There will be inadequate resources/special teacher staff available to support inclusion.	○	○	○	○
My school will not have adequate special education instructional materials and teaching aids.	○	○	○	○
The overall academic standards of the school will suffer.	○	○	○	○
My performance as a classroom teacher or school principal will decline.	○	○	○	○
The academic achievement of students without disabilities will be affected.	○	○	○	○
It will be difficult to give equal attention to all students in an inclusive classroom.	○	○	○	○

	Extremely Concerned	Very Concerned	A little concerned	Not concerned at All
I will not be able to cope with disabled students who do not have adequate self-care skills.	○	○	○	○
There will be inadequate administrative support to implement the inclusive education program.	○	○	○	○

13. Part III

	Extremely Concerned	Very Concerned	A little concerned	Not concerned at All
The inclusion of a student with a disability in my class will lead to a higher degree of anxiety and stress in me.	○	○	○	○

14.Part I-Teacher Efficacy for Inclusive Practice (TEIP) Scale- This part of the survey is designed to help understand the nature of factors influencing the success of routine classroom activities in creating an inclusive classroom environment. Please rate your degree of agreement by choosing one of the 6 anchors that best reflects your agreement with each statement

	Strongly Disagree	Disagree	Somewhat disagree	Somewhat agree	Agree	Strongly agree
I can make my expectations clear about student behavior.	○	○	○	○	○	○

	Strongly Disagree	Disagree	Somewhat disagree	Somewhat agree	Agree	Strongly agree
I am able to calm a student who is disruptive/noisy.	○	○	○	○	○	○
I can make parents feel comfortable coming to school.	○	○	○	○	○	○
I can assist families in helping their children do well in school.	○	○	○	○	○	○
I can accurately gauge student comprehension of what I have taught.	○	○	○	○	○	○
I can provide appropriate challenges for very capable students.	○	○	○	○	○	○
I am confident in my ability to prevent disruptive behavior in the classroom before it occurs.	○	○	○	○	○	○
I can control disruptive behavior in the classroom.	○	○	○	○	○	○
I am confident in my ability to get parents involved in school activities of their children with disabilities.	○	○	○	○	○	○
I am confident in designing learning tasks so that the individual needs of students	○	○	○	○	○	○

	Strongly Disagree	Disagree	Somewhat disagree	Somewhat agree	Agree	Strongly agree
with disabilities are accommodated.						

15.Part II-Teacher Efficacy for Inclusive Practice (TEIP) Scale- This part of the survey is designed to help understand the of factors influencing the success of routine classroom activities in creating an inclusive classroom environment. Please rate your degree of agreement by choosing one of the 6 anchors that best reflects your agreement with each statement.

	Strongly Disagree	Disagree	Somewhat disagree	Somewhat agree	Agree	Strongly agree
I am able to get children to follow classroom rules.	○	○	○	○	○	○
I can collaborate with other professionals (e.g. itinerant teachers/speech pathologists) in designing educational plans for students with disabilities.	○	○	○	○	○	○
I am able to work jointly with other professionals and staff (e.g. aides, other teachers) to teach students with disabilities in the classroom.	○	○	○	○	○	○
I am confident in my ability to get students to work together in pairs/in small groups.	○	○	○	○	○	○

	Strongly Disagree	Disagree	Somewhat disagree	Somewhat agree	Agree	Strongly agree
I can use a variety of assessment strategies (e.g. portfolio assessment, modified tests, performance-based assessment, etc.).	○	○	○	○	○	○
I am confident in informing others who know little about laws and policies related to the inclusion of students with disabilities.	○	○	○	○	○	○
I am confident when dealing with students who are physically aggressive.	○	○	○	○	○	○
I am able to provide an alternate explanation/example when students are confused.	○	○	○	○	○	○

APPENDIX B

CONSENT FORM

You are invited to be in a research study related to attitudes, concerns and self-efficacy of teachers toward inclusive education in STEM classrooms. Please read this form and ask any questions you may have before agreeing to be in the study.

What is the title of Research Project?

Attitudes, Concerns and Self-Efficacy of Teachers' toward Inclusive Education in STEM Classrooms.

Who is/are the principal investigator(s) or researcher(s)?

Name of the Principal Investigator: Shiv Kumar

Address: 5707 W Dietrich Loop, Lake Charles ,LA 70605 Ph. No. 337-263-9800

Email address: shiv_kumar_00@subr.edu

Shiv Kumar is a doctoral student in Science and mathematics Education Department at Southern University and A&M College, Baton Rouge, LA.

Where is the study being conducted?

The study is being conducted with teachers teaching in various K-12 public and private schools and with Pre-service education teachers at various universities in Louisiana.

What is the purpose of this study?

The purpose of this study is to investigate the attitudes, concerns and self -efficacy of teachers toward inclusion students in STEM classrooms. The outcome of this study will help develop programs and strategies to support current and incoming teachers and prepare them better to teach inclusion students in STEM classrooms.

Who is eligible to participate in the study? Who is ineligible? How were the subjects/participants selected to ensure equality and eliminate biases?

There will be about 128 participants in the study. The participants would be the in-service teachers who teach one or more STEM subjects in inclusion classrooms and Pre-service teachers who intend to teach in STEM inclusion classrooms. The selection of participants will be done by simple random selection procedure.

What will the subjects/participants do if they take part in the study?

If you agree to be in this study, I would ask you to complete the following online anonymous survey:

https://forms.office.com/Pages/ResponsePage.aspx?id=3tJI6fe-CEuFnWyvK5o8p_MVvLGOvnpElhT2Bf6AS-VUQlVIUURKV0xWRUEwTDhRMTkwMlM4OU0wUS4u

What are the possible risks and discomforts for participating in the study?

The risks involved in this study are minimal, which means they are equal to the risks you would encounter in everyday life.

What are the possible benefits for participating in the study or that could occur from study results?

Participants should not expect to receive a direct benefit from taking part in this study.

Benefits to society include better recruitment strategies to attract and retain teachers by preparing them to teach inclusion students.

Are there alternative procedures that can be used to conduct the study? If subjects/participants do not want to take part in the study, are there other choices?

Participants can opt to complete the survey questionnaire on paper. Participation is voluntary; refusal to participate involves no penalty or loss of benefits that the subject is otherwise entitled; Subjects may discontinue participation without penalty or loss of benefits that the subjects are otherwise entitled.

If subjects/participants have any questions or problems, whom can you call?

The researcher conducting this study is Shiv Kumar. You may ask any questions you have now. If you have questions later, you are encouraged to contact Shiv Kumar at shiv_kumar_00@subr.edu. You may also contact the researcher's faculty advisor Dr. Albertha Lawson at albertha.lawson@subr.edu.

If you have questions or concerns about your rights as a participant in this research study or to report a research-related injury contact Dr. Patrick Carriere, Ph.D., Chairperson, Institutional Research Oversight Committee, P. O. Box 11241, Southern University -Baton Rouge, Baton Rouge, LA 70813-1241; Voice - 225-771-5290 Ext 183; Facsimile – 225-771-5721; E-mail – patrick_carriere@subr.edu .

What subject/participant information will be kept private?

The records of this study will be kept private. In any sort of report, I might publish, I will not include any information that will make it possible to identify a subject. Research records will be stored securely, and only the researcher will have access to the records.

The survey will be completed online, and participants will remain anonymous. Data will be stored on a password locked computer and may be used in future presentations.

Can subject/participant participation in the study end early?

If you choose to withdraw from the study, please exit the survey and close your internet browser. Your responses will not be recorded or included in the study.

What charges will the subjects/participants have to pay?

None

What payment will the subjects/participants receive?

Participants will not be compensated for participating in this study.

If the research involves greater than minimal risk, is medical treatment available for adverse experiences?

Minimal risk is involved.

Does the research involve the collection and use of medical information?

No.

The study has been discussed with me and all my questions have been answered. I understand that additional questions regarding the study should be directed to the study researcher(s)/investigator(s). I agree with the terms above and acknowledge that I have been given a copy of the consent form. I understand that I have not waived any of my legal rights by signing this form.

_____ _____

Signature of Volunteer (or mark, if unable to sign) Date

_____ _____

Signature of Person Administering Informed Consent Date

_____ _____

Signature of Principal Investigator/Researcher Date

APPENDIX C

Certificate of Completion

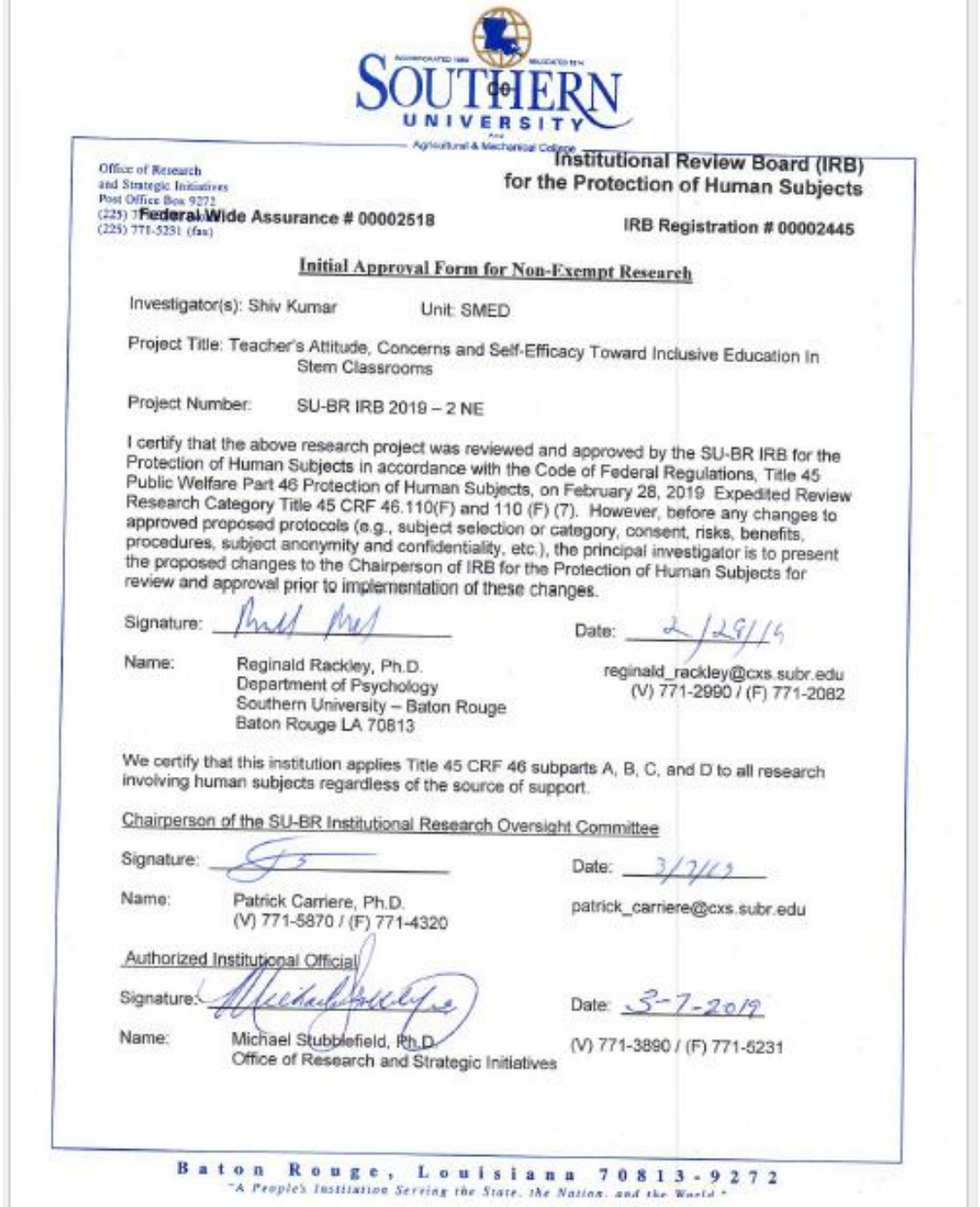
The National Institutes of Health (NIH) Office of Extramural Research certifies that **Shiv Kumar** successfully completed the NIH Web-based training course "Protecting Human Research Participants."

Date of Completion: 05/02/2018

Certification Number: 2810637

NIH National Institutes of Health
Office of Extramural Research

APPENDIX D



SOUTHERN UNIVERSITY
Agricultural & Mechanical College

Office of Research
and Strategic Initiatives
Post Office Box 9272
(225) 771-3990
(225) 771-5231 (fax)

Institutional Review Board (IRB)
for the Protection of Human Subjects

Federal Wide Assurance # 00002518

IRB Registration # 00002445

Initial Approval Form for Non-Exempt Research

Investigator(s): Shiv Kumar Unit: SMED

Project Title: Teacher's Attitude, Concerns and Self-Efficacy Toward Inclusive Education In Stem Classrooms

Project Number: SU-BR IRB 2019 – 2 NE

I certify that the above research project was reviewed and approved by the SU-BR IRB for the Protection of Human Subjects in accordance with the Code of Federal Regulations, Title 45 Public Welfare Part 46 Protection of Human Subjects, on February 28, 2019 Expedited Review Research Category Title 45 CRF 46.110(F) and 110 (F) (7). However, before any changes to approved proposed protocols (e.g., subject selection or category, consent, risks, benefits, procedures, subject anonymity and confidentiality, etc.), the principal investigator is to present the proposed changes to the Chairperson of IRB for the Protection of Human Subjects for review and approval prior to implementation of these changes.

Signature: _____ Date: 2/29/19

Name: Reginald Rackley, Ph.D.
Department of Psychology
Southern University – Baton Rouge
Baton Rouge LA 70813

reginald_rackley@cxs.subr.edu
(V) 771-2990 / (F) 771-2082

We certify that this institution applies Title 45 CRF 46 subparts A, B, C, and D to all research involving human subjects regardless of the source of support.

Chairperson of the SU-BR Institutional Research Oversight Committee

Signature: _____ Date: 3/7/19

Name: Patrick Carriere, Ph.D.
(V) 771-5870 / (F) 771-4320

patrick_carriere@cxs.subr.edu

Authorized Institutional Official

Signature: _____ Date: 3-7-2019

Name: Michael Stubblefield, Ph.D.
Office of Research and Strategic Initiatives

(V) 771-3890 / (F) 771-5231

Baton Rouge, Louisiana 70813-9272
"A People's Institution Serving the State, the Nation, and the World"

APPENDIX E

Permission to use Research Instruments for survey questionnaire

Dear Dr. Sharma,

Greetings!

My name is Shiv Kumar. Currently I am working as public school teacher in Louisiana Public University System in the United States. I am also pursuing my PhD from a state university in Louisiana. I am planning to use your assessment tool which you developed for Inclusive Education. May I get your approval to use your tool for my doctoral research?

Please let me know if you have any questions. I am looking forward to it.

Regards,

Shiv Kumar

Umesh Sharma <umesh.sharma@monash.edu>
to me

Hi Shiv,

I do not recommend SACIE as we have developed much improved attitude scale that was published in TATE (see attached paper). I have also attached papers where the other two scale were published.

Good luck with your research.

Cheers!

Umesh

Professor Umesh Sharma, Ph.D, MAPS

Academic Head (Educational Psychology and Inclusive Education)

Faculty of Education
Room 1.67D
Monash University,

19 Ancora Imparo Way,
Victoria 3800, Australia
Telephone: +61 3 9905 4388 Facsimile: +61 3 9905 5127
Website: http://monash.edu/research/explore/en/persons/umesh-sharma(8ee3f1a1-1b9d-492d-bac7-7149bbe45e54).html

http://orcid.org/0000-0002-5198-9379

Chief Co-Editor: *Australasian Journal of Special Education*

http://journals.cambridge.org/action/displayJournal?jid=JSE

Chief Co-Editor: *The Oxford Encyclopedia of Inclusive and Special Education*

http://education.oxfordre.com/page/inclusive-special/

APPENDIX F

Curriculum Vitae

SHIV KUMAR

E-mail: kumar.k12.shiv@gmail.com

EDUCATION

Southern University and A & M College, Baton Rouge, LA

Ph. D. **(Science and Math Education)** (July 2019)

- Dissertation Title**:** An Investigation of Teachers' Attitudes, Concerns, and Self-Efficacy Toward Inclusive Education in STEM classrooms
- Research Interests: Math Education, STEM Education, Inclusive STEM Education

McNeese State University, Lake Charles, LA

M.Sc. (Master of Mathematical Sciences—Math) (July 2012)

University of Delhi, New Delhi, India

M.A. (Master of Arts—Math) (August 1999)

University of Delhi, New Delhi, India

B.A. (Bachelor of Arts—Honors Math) (July 1993)

Annamalai University, Annamalai Nagar, Tamil Nadu, India

B.Ed. (Bachelor of Education—Math and English) (August 1995)

OTHER EDUCATIONAL TRAINING

Northwestern State University, Natchitoches, LA

Academically Gifted Education Add-On Certification (Math) (May 2014)

Harvard Graduate School of Education

Improving Math Instruction Through Feedback (2019**)**

TEACHING EXPERIENCE

MATH INSTRUCTOR (08-2009 to Present)

LaGrange High School—Calcasieu Parish School Board

Lake Charles, LA

Roles:

- **TAP Mentor Teacher**: Supported principal and master teachers in overall TAP implementation. Assess student achievement results/ teacher evaluation results and maintain inter-rater reliability.
- **LaGrange University Program (LGU) Instructor** (August 2015-May 2018): Provided technology enriched lessons to meet the academic needs of high achieving students who aspired to pursue four-year degree college path.
- **Algebra I Advance Instruction**: 2015-2018
- **Geometry Advance Instruction**: 2015-2018
- **Algebra II Advance Instruction**: 2016-2018
- **ACT Preparation Instruction**: Spring 2016
- **Robotics Instruction**: 2015-2016
- **Advance Math Functions Instruction**: 2013-2015
- **Math Department Head**: Served as Math Department Head at LaGrange High School (2017-Present)
- **Leadership Committee Member**: 2016-2019

MATH INSTRUCTOR (08-2008 to 06-2009)

Crestwood High School—Sumter County School District 2

Sumter, SC

Roles:

- **Algebra II Instruction (Grade 11):** 2008-2009
- **Geometry Instruction (Grade 10):** 2008-2009
- **Probability and Statistics Instruction (Grade 12):** 2008-2009

MATH INSTRUCTOR (08-2006 to 06-2008)

Furman Middle School—Sumter County School District 2

Sumter, SC

Roles:

- **Gifted Program Instructor (*Algebra I)***: 2006-2008
- **Math Instruction (8th grade):** 2006-2008

MATH INSTRUCTOR (06-2003 to 07-2006)

RPVV B Block Yamuna VIHAR—Department of Education

Delhi, New Delhi, India

Roles:

- **Calculus Instruction (*Grade 12*)**: 2003-2006
- **Algebra and Geometry Instruction (*Grade 10*)**: 2003-2006
- **Algebra Instruction (*Grade 9*)**: 2003-2006

MATH INSTRUCTOR (01-1998 to 06-2003)

Government Boys Senior Secondary School #2—Department of Education

Delhi, New Delhi, India

Roles:

- **Algebra Instruction (*Grade 9*)**: 1998-2003
- **Algebra & Geometry Instruction (*Grade 10*)**: 1998-2003

Postsecondary Teaching

- Visiting Lecturer at McNeese State University, Lake Charles LA (2012-2014)
- **Fall 2012:** College Algebra (Math 113)
- **Fall 2013**: Elementary Probability & Statistics (Math 231)
- **Fall 2014**: Finite Mathematics (Math 130)

PRESENTATIONS

- **Top Tech Tools for Formative Assessment (**2019): Presentation at 2019 teaching and Technology Conference (TNT), the annual fall Region V Louisiana Computer Using Educators (LACUE) Conference.
- **Active Learning Tech Tools.** (2018). Presentation at 2018 teaching and Technology Conference (TNT), the annual fall Region V Louisiana Computer Using Educators (LACUE) Conference.
- **Comparative Analysis of K-12 Educational System between the United States and Others.** Presentation at *Journal of Research Initiatives Inaugural Symposium* at Fayetteville State University. Fayetteville, NC (2017).
- **Teachers Teaching Teachers (T3) Series—Assessing Students Using Technology** (Webinar) (2017): Presented webinar for assessing students using Plickers.com, Google docs, Zipgrade.com, etc.
- **Creating Interactive Lessons with Nearpod**. Presentation at *Southwest Louisiana Teachers of Mathematics Annual Conference* (2017).
- **Is Common Assesment New Norm?** Presentation at *Calcasieu Parish School Board's Annual District Math Inservice* (2017).

- **Blackboard Tips and Tricks**. (2017). Presentation at *2017* teaching and Technology Conference (TNT), the annual fall Region V Louisiana Computer Using Educators (LACUE) Conference.
- **Amaze Your Students with Nearpod**. Presentation at *Teaching and Technology (TNT) Conference* organized by Calcasieu Parish School Board, Lake Charles, LA (2016).
- **Use of Nearpod and Curriculum.** Presentation at *District Math In-Service* (2016).
- **Use of Assessment Tools in Blackboard.** Webinar presentation in collaboration with Calcasieu Parish Schools' Technology Department (2016).
- **Play, Engage, Learn.** (2015). Presentation at *Teaching and Technology (TNT) Conference* organized by Calcasieu Parish School Board, Lake Charles, LA (2015).
- **Differentiated Instruction in Math Classroom.** Presentation at *Math In-Service for Calcasieu Parish* (2014).
- **How to Use Livescribe Pen.** Presentation at *Teaching and Technology (TNT) Conference* organized by Calcasieu Parish School Board, Lake Charles, LA (2014).
- **Online Blackboard Testing**. Presentation at *4th Annual Bayou Bug Mini- Conference* at Sulphur, LA (2014).
- **Education Tools on iPads**. Presentation at *Teaching and Technology (TNT) Conference* organized by Calcasieu Parish School Board, Lake Charles, LA (2013).
- **Mathnology for All**. Presentation on use of technology at *3rd Annual Bayou Bug (Blackboard Using Group) Mini-Conference* at Mandeville, LA (2013).
- **Presentation Apps Smack Down!** Webinar presentation for Calcasieu Parish School Board (CPSB) teachers (2013).
- **Using Blackboard with Learning Centers**. Presentation at *2nd Annual Bayou Bug(Blackboard Using Group) Mini-Conference*, Baton Rouge, Louisiana (2012).
- **Using Technology with Learning Centers**. Presentation at *Teaching and Technology (TNT) Conference* organized by Calcasieu Parish School Board, Lake Charles, LA (2012).
- **Using Learning Centers in a Math classroom.** Presentation at *Annual Louisiana Science Teachers Association (LSTA) & Louisiana Association of Teachers of Mathematics (LATM) Conference*. Shreveport, LA (2012).
- **Welcome to the World of iPod and iPad Apps.** Presentation at *Teaching and Technology (TNT) Conference* organized by Calcasieu Parish School Board (2011).
- **Uses of a Document Camera in Classroom**. Presentation at *Teaching and Technology (TNT) Conference* organized by Calcasieu Parish School Board, LA (2010).

LICENSURE/ CERTIFICATION /TRAINING

- **Teaching Certificate of Louisiana**:(2009- 2020) Certified to teach Math Grades 6-12

- **Teaching Certificate of Louisiana**: (2014-2020) Certified to teach mathematics to academically gifted students.
- **Certified TAP teacher Evaluator** (2018-2020): Earned certification to evaluate career teachers under TAP program from NIET.
- **IMPACT High School Mathematics Training Day 1 & 2** (2015, 2019). IMPACT (*Integrating Meaningful Practices Aligned with Curriculum and Technology*) professional development provided essential technology tools to enhance the instruction and supplement with the curriculum by creating interactive lessons.
- **Socratic Seminar Training**: 2017
- **CPSB Summer STEM Institute** (2017): Attended a two-day training program at the Curriculum & Instruction Department of CPSB
- **Whole Brain Teaching for Challenging Kids** (2017): Attended a two-day training on Whole Brain Teaching (WBT).
- **Southwest Louisiana Teachers of Mathematics (SWLTM) Mini-Conference** (2017)
- **Louisiana Association of Computer Using Educators (LACUE) Conference**. New Orleans, LA (2014-2018).
- **Intro to Simple K12** (2016): Attended training about using Simple K12 in the classroom.
- **IMPACT High School Webinar 1** (2015): IMPACT (Integrating Meaningful Practices Aligned with Curriculum and Technology) professional development.
- **Twitter 101 Online Course** (2015): Completed two-week online course that focused on methods to network with other professionals and learn new ideas to improve teaching techniques.
- **Blackboard Smackdown—Webinar** (2015): Attended webinar on using blackboard for communicating with students and parents.
- **Bayou Bug Mini-Conference—Louisiana Blackboard Users Group** (2012-2014): Conference on blackboard use in classrooms.
- **Middle/ High Kagan Cooperative Learning Training** (2014). Training on cooperative learning activities.
- **National Conference on Differentiated Instruction** (2014). Attended 5-day long National Conference on Differentiated Instruction at Las Vegas, Nevada.
- **I-Pads in the Classroom 9-12: Integrated Technology Enriched Classroom (ITEC) Pilot** (2014). Conference on best use i-pads with students in a classroom.
- **Google for Education Summit** (2014): Two-day training on Google in Education.
- **TNT Grant Winners Webinar** (2014): Attended webinar on use of i-Pads and Apple TV.
- **TNT Conferences** (2009-2019). Attended annual TNT conference where more than 90 sessions are presented each year on new technologies to be used in a classroom.
- **Positive Behavioral Interventions & Supports (PBIS) Training** (2013). Attended one-day training on managing student behavior through positive interventions.
- **National Science Foundation (NSF) Marine Career Tech Workshop** (2012): Attended the NSF Marine Career Tech Workshop at the University of Louisiana,

Lafayette, LA.

- **Common Core State Standard Transition Part I & II** (2012): Two-day workshop on common core standards unpacking.
- **iTEACH – Sessions 1, 2 & 3** (2011): Attended three-day training on use of SoftChalk software as a requirement of iTEACH (using technology to engage, accelerate, create, and harness the power) grant.
- **Promethean ActivExpressions** (2010-2011). Training on how to use *Activ Expressions* with *Promethean* board for getting feedback from students by formative and summative assessments.
- **PRAI101: Introduction to ActivInspire** (2011): Training on how to use Promethean board in a classroom.
- **BB201: Utilizing Blackboard to Support Curriculum – Getting Students Involved** (2010). Four-week long training on enrolling students to Blackboard website and engage them in online discussion board, online submission of assignments.
- **EDCI 489C: LaConnect—Connecting Curriculum and Instructional Practice** (2010). Three-hour college credit course provided by Tech Department, CPSB on using best practices in curriculum and instruction.
- **Datastreme Ocean Education Resource Teacher—American Meteorological Society** (AMS) (2010). Completed this three-hour college credit for masters plus thirty provided by AMS on oceans and weather forming conditions.
- **BB101: Introduction to Using Blackboard as a Classroom Website** (2009). Trained on creating a Blackboard website for sharing lessons and other information with students.
- **Teaching Mathematics, Part I** (Grades 1-8) (2007): Attended 15-day training provided by Solution Math on teaching math that are engaging and result oriented.
- **Intel Teach to the Future Program** (2004). Attended fifteen-day training on the use of computers in education.

AWARDS AND HONORS

- **Blackboard Mentor Project** (2013- 2019). Serving as a mentor for the Blackboard Mentor Project of CPSB (Calcasieu Parish School Board).
- **District Teacher of the Year** (2018-2019). Awarded the Calcasieu Parish School Board District's Teacher of the Year for 2018-2019.
- **District Math Curriculum Development Committee** (2014, 2015, 2017,2019). Served on math curriculum development committee for the Curriculum & Instruction Department of Calcasieu Parish.
- **LACUE Teacher of the Year** (2018): Awarded Teacher of the Year in 2018 for region V Louisiana Association of Computer Using Educators (LACUE).

- **Teacher of the Year Award** (2017): Selected for Teacher of the Year Award for 2017 by LaGrange High School. LaGrange High School is a public senior secondary school in Southwestern Louisiana.
- **Mentor Teacher for New Teachers** (2017-2018): Selected for mentoring incoming new teachers hired by Calcasieu Parish School Board (CPSB).
- **District Calendar Committee Member** (2017). Nominated as a member of Calcasieu Parish School Board's 2018-2019 District Calendar Preparation Committee.
- **Louisiana State Science & Engineering Fair Judge** (2017): Served as a judge in Louisiana Science and Engineering Fair.
- **Oddessyware Feedback Committee** (2017). Served on Odesseyware Committee to provide feedback on this software to be used in the district by math teachers.
- **Mentor for FIRST Project** (2016-2017). Served as mentor for FIRST (For Inspiration & Recognition of Science & Technology).
- **Louisiana Region 5 Science & Engineering Fair Judge** (2014-2016). Served as a judge in Louisiana Region 5 Science and Engineering Fair.
- **Demonstration Classroom Teacher** (2015- 2016). Selected for "Demonstration Classroom Teacher" for Progress Project in Calcasieu Parish School Board.
- **Sea Perch Grant** (2013, 2015): Received this grant from Seaperch.org, an organization supporting STEM education, to build five ***under water remotely operated vehicles*** (ROV).
- **Teaching & Technology Institute Grant** (2013): Awarded Teaching and Technology (TNT) Institute Grant (e.g**.,** 5 i-Pads and Apple TV) for classroom use.
- **Drew Grant** (2012): Awarded the Drew Grant in the amount of $5,800.00 for classroom use for the year 2012-2013 by ***Drew Trust***.
- **iTEACH Grant** (2011-2012): Received grant from Technology Department of Calcasieu Parish School Board, LA. The iTEACH (*Using Technology to Engage, Accelerate, Create and Harness the Power!)* project engages classroom teachers in high-quality professional development and professional growth.
- **Southwest Louisiana Teachers of Mathematics Grant** (2011): Recipient of *Southwest Louisiana Teachers of Mathematics (SWLTM) Grant* in the amount of $750 for classroom instruction.
- **ITEC Grant** (2010-2011): *Integrated Technology Enrichment Classroom (ITEC) Grant* recipient from the Technology Department of Calcasieu Parish School Board, LA.
- **Talented Teacher Award** (2005)**:** Awarded appreciation certificate for excellence in 10^{th} grade education instruction. Honored for producing 100% result in CBSE (Central Board of Secondary Education) classes.
- **Principal's Appreciation Certificate** (2005): Awarded for achieving excellent academic result for teaching 10^{th} grade math in CBSE (Central Board of Secondary Education).

MEDIA COVERAGE

- Featured in *Electronic Newsletter of LATM* (*Louisiana Association of Teachers of Mathematics*) for receiving SWLTM mini grant of $750.00.
- Featured on Calcasieu Parish School Board's website as "Demonstration Classroom Teacher" for high schools for 2015-2016. The link is https://www.cpsb.org/Page/7684.
- Featured on Calcasieu Parish School Board's Technology Training Center website for receiving ITEC Model classroom grant. https://www2.cpsb.org/techcenter/itec.htm
- Featured on Calcasieu Parish School Board's website for receiving DREW Grant in 2012. The link is https://www.cpsb.org/site/handlers/filedownload.ashx?moduleinstanceid=528&dataid=374&FileName=2012DrewGrants.pdf.
- Featured on school tube for submitting a video for LACUE 2013 High School Video Contest on "Poverty and Education". The link is School Tube Video.
- Featured in Issue 37, Volume 11 of *Tech Connect of CPSB* for receiving iTEACH Grant. The link is http://www2.cpsb.org/system/techdepartment/tech_connect/volume%2011/issue37.htm.
- Featured on official newsletter of CPSB (Calcasieu Parish School Board) in Volume 36, Number 3, March 2011 for receiving SWLTM math grant. Link http://www2.cpsb.org/share/3_11.pdf
- Blackboard website featured on Calcasieu Parish School Board's website in 2013,2017. The technology department features outstanding websites of teachers and other staff.
- Featured in news on KPLC TV Lake Charles. Link https://www.kplctv.com/story/37759852/cpsb-announces-of-the-year-winners/
- Featured on CPSB district website for district teacher of the year. Link https://www.cpsb.org/site/Default.aspx?PageType=3&DomainID=2342&PageID=9026&ViewID=7b97f7ed-8e5e-4120-848f-a8b4987d588f&FlexDataID=26801

PROFESSIONAL MEMBERSHIPS

- **Louisiana Association of Teachers of Mathematics (LATM)**
- **Southwest Louisiana Teachers of Mathematics (SWLTM)**
- **Institute of Mathematical Statistics (IMS)**
- **American Statistical Association (ASA)**
- **International Behavioral Neuroscience Society (IBNS)**
- **American Educational Research Association (AERA)**

- **Louisiana Association of Computer Using Educators (LACUE)**

TECHNICAL SKILLS

- **Certified Apple Teacher**: Certified to use Apple products in Education.
- **Blackboard Website Trainer/Mentor**: Trained in creating blackboard website; posting lessons and assignments; creating online tests and quizzes; creating discussion board, wikis, and other learning platforms for students; mentoring teachers of five different schools in the district.
- **Promethean Board Certification:** Certified in using Promethean board and Active Panel in classroom
- **ISTE Certified Educator**: Certified from ISTE in ISTE standards of technology to be used in classroom.