2018

Impact of Information and Communication Technology on Academic Achievement for Exceptional Student Education Inclusion Students

Patricia Marcino
Walden University

Walden University

College of Education

This is to certify that the doctoral dissertation by

Patricia Marcino

has been found to be complete and satisfactory in all respects,
and that any and all revisions required by
the review committee have been made.

Review Committee
Dr. Carol Watson, Committee Chairperson, Education Faculty
Dr. Wade Smith, Committee Member, Education Faculty
Dr. Paula Dawidowicz, University Reviewer, Education Faculty

Chief Academic Officer
Eric Riedel, Ph.D.

Walden University
2018

Abstract

Impact of Information and Communication Technology on Academic Achievement

for Exceptional Student Education Inclusion Students

by

Patricia Marcino

MS, Full Sail University, 2010

MA, University of West Florida, 1984

BS, Auburn University at Montgomery, 1976

Dissertation Submitted in Partial Fulfillment

of the Requirements for the Degree of

Doctor of Philosophy

Educational Technology

Walden University

January 2018

Abstract

Students with disabilities are less likely to graduate from high school and tend to score lower on standardized tests than their general education peers. Although use of Information and Communication Technology (ICT) can improve these outcomes for traditional students, it has been unclear whether its use positively affects learning gains for the inclusion student. The purpose of this study was to determine if the academic test performance of 5th grade ESE inclusion students was enhanced by implementing ICT as a curriculum resource in their classrooms. Two frameworks provided structure for this study: the theory of social constructivism and the capability approach. The study population consisted of all 5th grade ESE inclusion students in 74 school districts in one southern state. Data sources were the state's annual assessment scores for English language arts (ELA) and mathematics. Data were analyzed using 2 Mann Whitney U tests to compare ESE inclusion students' assessment scores in the 2nd year of testing as compared to the 1st year of testing (2015-2016 as compared to 2014-2015). The findings of the study revealed no significant difference between the ESE inclusion students' scores in the 1st and 2nd years for ELA and math scores even with ICT used as a resource. This outcome impacts social change by answering a question about whether ICT made a difference as used, and indicates that other studies must be done to better understand why ICT was not successful or how it can be used to significantly improve inclusion student outcomes.

Impact of Information and Communication Technology on Academic Achievement for Exceptional Student Education Inclusion Students

by

Patricia Marcino

MS, Full Sail University, 2010

MA, University of West Florida, 1984

BS, Auburn University at Montgomery, 1976

Dissertation Submitted in Partial Fulfillment

of the Requirements for the Degree of

Doctor of Philosophy

Educational Technology

Walden University

January 2018

Acknowledgements

This study would not have been possible without the guidance of my committee members, Dr. Carol Watson and Dr. Wade Smith, a school district’s administration, and the support of my family, friends, and mentors.

Two of my sisters, Tanji and Toni, gave me constant positive support and encouragement to not give up and to work through all the challenges that I faced in completing this project.

Table of Contents

List of Tables iv

List of Figures iv

Chapter 1: Introduction to the Study...1

Introduction..1

Background 3

Rationale for Inclusion 8

Problem Statement 14

Purpose..14

Research Question 16

Theoretical Framework 17

Nature of the Study 19

Definition of Terms 20

Assumptions..25

Scope, Delimitations, and Limitations 25

Delimitations 26

Limitations 26

Significance of the Study 26

Social Implications of the Study 29

Summary 30

Chapter 2: Literature Review 32

Introduction..32

Literature Search Strategy 35

Theoretical Foundation 35
Literature Review Related to Key Variables 36
Legislation Governing Education for Students with Disabilities 36
Inclusive Practices for Special Needs Students 37
Previous Studies of Inclusion Research 45
Teacher Preparation and Training... 52
Technology Implementation in the General Education Classroom for
Inclusion Students.. 60
Summary...69
Chapter 3: Methodology 71
Introduction..71
Research Design and Rationale 71
Methodology...72
Population 73
Sampling Procedures 73
Procedures for Data Collection.. 74
Data Analysis Plan..77
Threats to Validity 79
Ethical Procedures 83
Summary...84
Chapter 4: Results..85
Introduction..85

Data Collection 86

Preliminary Data Management 86

Reliability and Composite Scoring 90

Statistical Analysis 91

Comparison of ELA Scores From Years One vs. Two.. 91

Comparison of Math Scores From Years One vs. Two 93

Summary 94

Chapter 5: Discussion, Conclusions, and Recommendations 97

Introduction...97

Interpretation of the Findings...97

Limitations of the Study..99

Recommendations...99

Implications...101

Conclusion 102

References..104

Appendix A..131

Permission Letters..131

Appendix B 133

2010-2011 Reliability of Math CBAT made with FCAT Test Maker Item Bank...........133

Appendix C 135

Reliability Analyses 135

List of Tables

Table 1. Numbers of Valid and Missing Scores on ELA and Math Tests for Year One (2014-2015) and Year Two (2015-2016) 88

Table 2. School Types During Year One (2014-2015) and Year Two (2015-2016).........90

Table 3. Descriptive Statistics on ELA Scores for Year One (2014-2015) and Year Two (2015-2016) 92

Table 4. Descriptive Statistics on Math Scores for Year One (2014-2015) and Year Two (2015-2016) 93

List of Figures

Figure 1. Frequency histograms for ELA scores from years one and two… 93

Figure 2. Frequency histograms for math scores from years one and two… 94

Chapter 1: Introduction to the Study

Introduction

The study was designed to examine whether Information and Communication Technology (ICT) as a resource affected academic learning gains for Exceptional Student Education (ESE) inclusion students in the mainstream classroom. The inclusion classroom provides special needs students with an equal opportunity to demonstrate that they could learn and apply the same skills as their regular education classmates (DiMiola & Conterelli, 2008). As inclusion evolved, however, it became apparent that the method by which instruction was delivered did not support the expectations of academic achievement by the ESE student (Yilmaz, 2011). Yilmaz observed that there must be a more diverse delivery of instruction to accommodate the needs of the inclusion student. The integration of ICT was implemented to assist the inclusion students to compete on an equalized playing field with their peers (Yilmaz, 2011).

Norman (1993) stated that the impact of technology in the education field has long been misunderstood. In the past, many teachers looked upon integrating technology as just something else to learn without understanding the benefits of technology for both students and teachers (Norman, 1993). Norman further stated that this lack of support and training has become a barrier to integrating technology into the classroom curriculum. Researchers, psychologists, and theorists have posited that technology will eventually change the inertia that individuals possess and become the driving force behind that change (Norman, 1993). Norman also stated that new technologies require supporting staff who are willing to use technology experientially, in order to determine its success.

The author surmised that, as the digital world expands, technology use would be a basic requirement for most careers. If this holds true, the benefits that ICT could provide may be looked upon as an important resource.

Kim and Reeves (2007) stated that it is necessary that educators select and integrate technologies by considering their potential contribution to pedagogical effectiveness instead of making generalized assumptions about the preferences of their students. Kim and Reeves also stated that it is important to assist educators and learners to use technology as cognitive resources to improve academic skills and to develop intellectual skills such as critical thinking, problem solving, information and collaboration. Students need to understand and be guided by educators who understand that technology is not simply for entertainment purposes but is necessary for academic development (Head & Eisenberg, 2009; National Education Association [NEA], 2012).

Literature reviews have revealed a deficiency in information literacy (Association of College and Research Libraries [ACRL], 2015; Fontichiaro, 2012; Head & Eisenberg, 2009). Today's students are less literate and write less efficiently than compared to past generations; however; these students also lack proficiency in technology and digital media. Becoming literate in technology and digital media is necessary for students to become well-rounded members of the 21st-century digital world (ACRL, 2015; NEA, 2012). Technology resources will also help students to foster development in other curricular areas, develop critical thinking skills, become more creative, and develop real world problem-solving skills (Head & Eisenberg, 2009).

The important consideration is whether educators are helping students prepare for the future (Daggett, 2010; NEA, 2012). A factor in integrating ICT into the inclusion classroom is teachers' efficacy. Teacher beliefs play a very important role in whether ICT is implemented and the extent to which it is integrated into the curriculum. Teachers, staff, and administrators are all stakeholders who decide whether to implement technology into the curriculum (Bandura, 1993). Researchers, such as Goddard (1998), have indicated a connection between teachers' self-efficacy and student achievement, which indicates that a strong correlation may exist between inclusion students' gains and ICT integration. According to Bandura (1993), this would suggest that if teachers are prepared to teach technology as well as inclusion students, then there should be a strong sense of self-efficacy among the teachers. Billingsley and McLeskey (2004), recommended that colleges and universities examine their teacher preparation programs to determine if the training is adequate to encompass teaching students with disabilities as well as integrating technology. Earlier research by Phillips, Alfred, Brulli, and Shank (1990), indicated that teacher attitudes were influential in how the curriculum was delivered. To date, there has been little improvement in teacher attitudes towards inclusion of ESE students in the mainstream classroom (Elmore, 2010).

Background

In 1975, government legislation formally passed a landmark resolution granting a free and equal opportunity education for all students. This legislative ruling was known as the Individuals with Disabilities Act (IDEA). In 2017, public schools across the United

States serve more than six million students possessing a variety of disabilities; however, the promise made in 1975 remains unfulfilled.

Although the passage of the IDEA appeared to be a resolution to the education of students with disabilities, more problems emerged, in addition to the lack of funding and distribution of funds. The revision of the IDEA law revealed and focused on a variety of new issues that had surfaced:

1. Access: Assuring that students with disabilities have access to the general education curriculum and appropriate general education classes.
2. Discipline: Assuring that there are alternative placement options for dangerous students, so they can continue their education without hampering the education of other students.
3. Assessment: Assuring the accurate and appropriate assessment of the academic achievement of students with disabilities. (U.S. Department of Education, 2012).

Although headway has been made to address these issues, school districts across the United States are not uniform in the application of the codes of practice for special education students. According to the U.S. Department of Education (2012), resources are mandated for special needs students who are educated in the public-school system. With the passage of the Americans with Disabilities Act (ADA), specific services are to be made available for special needs students. Section 504 of the Rehabilitation Act of 1973 delineates mandated criteria, such as allowing extra time for test completion and reading of specific material for eligible special needs students. Because there is no uniformity across the country, different states have different criteria for eligibility, services available, and the procedures for implementing these laws. Federal law states that special needs students are entitled to receive additional services or accommodations through public schools. The law further states that every child is entitled to a free and appropriate education in the least restrictive environment possible. This mandate led to the inclusion movement.

Section 504 is a part of the Rehabilitation Act of 1973 that prohibits discrimination based upon disability. Section 504 is an anti-discrimination, civil rights statute that requires the needs of students with disabilities to be met as adequately as the needs of the non-disabled are met. Section 504 requires that schools not discriminate against children with disabilities and provide them with reasonable accommodations. It covers all programs or activities, whether public or private, that receive any federal financial assistance. Reasonable accommodations include untimed tests, sitting in front of the class, modified homework, and the provision of necessary services. Typically, children covered under Section 504 either have less severe disabilities than those covered under IDEA or have disabilities that do not fit within the eligibility categories of IDEA. Under Section 504, any person who has an impairment that substantially limits a major life activity is considered disabled. Learning and social development are included under the list of major life activities (U.S. Department of Education, 2012).

The ADA requires all educational institutions, other than those operated by religious organizations, to meet the needs of children with psychiatric disorders. The ADA prohibits the denial of educational services, programs or activities to students with disabilities and prohibits discrimination against all such students. In 2001, the federal government enacted the No Child Left Behind (NCLB) Act that established an accountability system for states, school districts, and schools receiving federal education funds (P.L. 107-110). The law required the establishment of academic standards, required annual progress in having every student achieve the standards to close the gaps between all students and certain subgroups of students, test students for academic gains and collect data to demonstrate the gains. Furthermore, the schools that did not meet the requirements were to be monitored until they did achieve the gains, or the schools would be closed.

President Obama signed into law the Race to The Top (RTTT) program in 2009. The program modified the NCLB; however, many of the same issues that prevailed during the NCLB reign continued to emerge during the new RTTT program. Wherein the NCLB mandated schools to establish a program of change to meet the academic standards; the RTTT provided incentives to achieve academic improvement.

Both the NCLB and the RTTT required that all students achieve set standards in math, reading or language arts and science. The state tests are designed to measure what the student has learned in each subject area and if they are proficient in the skills required to master the topic tested. However, there is no differentiation of tests for ESE students.

There are differences in the requirements for teachers under the NCLB and the RTTT: the NCLB requires teachers working in Title I-supported programs to be “highly qualified.” To meet this standard, the law requires teachers to (a) have full state certification or pass the state teacher licensing exam or, if a charter school teacher, meet the state requirements for such teachers and (b) not be teaching under temporary, emergency, or provisional credentials or any other kind of certification waiver. For elementary level teachers, to be highly qualified means the teacher (a) holds at least a bachelor's degree and (b) has passed a rigorous state subject knowledge and teaching skills exam in reading, writing, math, and other areas of the state's basic elementary curriculum. For a middle or secondary school teacher, it means (a) having at least a bachelor's degree and (b) either passing a rigorous state exam in each of the subjects taught or successfully completing an academic major, having a graduate degree, or completing coursework equal to an undergraduate major in the subject taught.

The RTTT grant moved beyond the NCLB to focus on teacher effectiveness as well as qualifications. It did this by giving higher scores to states that link teacher evaluations and student performance. Also, the RTTT grant scoring addressed principals as well as teachers. It emphasized teacher and principal evaluations and required winning states to ensure that effective and highly effective teachers and principals were equitably distributed to high-poverty and high-minority schools and districts. Finally, it gave states points for providing high-quality teacher and administrator preparation programs, including programs that provided alternative routes to teacher and administrator certification. The latter programs sought to attract qualified candidates who did not graduate from traditional college teacher preparation programs.

As a condition of applying for the RTTT grant, the United States Department of Education (USDOE) required that, at the time the state submits its grant application, it have no legal, statutory, or regulatory barriers at the state level to linking data on student achievement or growth in student achievement to individual teachers and principals for evaluation.

Neither the NCLB nor the RTTT has produced the results sought by federal Department of Education. On December 10, 2015, President Obama signed into law Every Student Succeeds Act (ESSA). The focus of the new law is on college and career to create more equitable goals for student success (U.S. Department of Education, 2016).

Rationale for Inclusion

The 1960s brought about significant social and educational initiatives as special education development evolved. Before the passage of the IDEA laws and the ADA, special needs students were educated in self-contained classrooms. It was not until the passage of the No Child Left Behind Act in 2001 that special needs students began to be included in the mainstream classroom. Improvement has been noted with many more special needs students receiving diplomas and contributing to society in general; however, problems continue to emerge with no resolution due a lack of resources that are mandated but not fulfilled (U.S. Department of Education, 2013).

There is urgency for understanding technology assistance, since the ESE inclusion students have a mandated curriculum diversification instituted by government guidelines. To support student success, a diversity of resources should be present in the ESE inclusion classroom, including technology. In the *Blueprint for Success*, the U.S. Department of Education (2013) stated that there is a need for schools and districts to maximize technology integration “recognizing educational success, professional excellence, and collaborative teaching” (p. 3).

Vygotsky's (1978) Social Learning Theory postulates that students benefit from watching and learning from their peers. Piaget (1967), as cited in (Huitt & Hummel, 2003), developed four stages of learning theory. Piaget believed that social interaction in early childhood years played a crucial part in the future cognitive development of a child. A missing link is in Piaget's theories in that not all children's cognitive maturation occurs concurrently across different domains of knowledge. This lack of cognitive development brought about the need for a different type of education for those students not possessing the same cognitive abilities as their peers. Piaget's theories also have been thought to undervalue the influence that culture and social interaction contribute to the cognitive development of a child (Huitt & Hummel, 2003).

Theorists like Robbie Case, Andreas Demetriou, and others have completed research that accounted for differences in cognitive development incorporating working memory and processing information. Demetriou ascribes an important role to hyper-cognitive processes of 'self-monitoring, self-recording, self-evaluation, and self-regulation,' and it recognizes the operation of several autonomous domains of thought' (Demetriou, 1998; Demetriou, 2003, p. 153; Demetriou, Spanoudis, & Mouyi, 2011).

Therefore, as education evolved, proponents of inclusion advocate that the benefits of inclusion outweigh the reasons for not including the ESE student in a regular education classroom. One stated reason is that inclusion students are exposed to the same learning curricula as their non-ESE peers. The advocates believed that inclusion provides academic achievement along with the development of self-esteem and social skills (Demetriou et al., 2011).

Hocutt (1996) researched placement of students with disabilities in a regular classroom. The author concluded that “instruction, not setting” is the key to the achievement of success as measured by student outcomes (p.97). Gupta and Ferguson’s (1992) study resulted in the findings that “integration does not work, but inclusion does.” The difference is that students who are inclusion are expected to perform at the same level as their peers, although they have a somewhat diversified curriculum. Hilton and Liberty (1992) performed a study of 16 secondary students placed in nine Oregon high schools and suggested that immersing severely handicapped students in integrated settings does not guarantee that either social or academic success will occur.

Two factors to be considered are that the inclusion students need to receive the extra support that is designed to help them to succeed and that the teacher is capable of diversifying instruction to meet the needs of all students (Yell & Shriner, 1996, p.103). The research based on inclusion is not adequate and varies widely in terms of methods. The body of researchers in the literature has lent support to the continued need for educating special needs students; however, the focus on individual instruction to demonstrate benefits for inclusion has not been resolved to meet the expected requirements of government regulations.

Hunt, Farron-Davis, Beckstead, Curtis, and Goetz (1994) examined students with varying disabilities to determine their academic success in an inclusion classroom and outside an inclusion classroom. The results of this study revealed that superiority of regular class placements occurred over special education classes, including Individual Educational Plans (IEP) with more academic objectives, greater social interaction, and less time spent alone. A summary of three meta-analyses of effective settings demonstrated a “small to a moderate beneficial effect of inclusive education on the social and academic outcomes of special needs students” (Baker, Wang, & Walberg, 1994, p. 34).

A major concern of placing special needs students in a regular classroom has been the attitude and qualifications of the teacher who is to be responsible for ensuring the academic success of the special needs student. Teachers develop specific attitudes and methods of instructional delivery over time. If the teacher is prepared and has adequate training and support, then the attitudes are somewhat different than those for the teachers who have no training in working with the diverse needs of challenged students, even though the teachers are compassionate (Phillips et al., 1990).

Another concern was that although students are often placed in inclusion classrooms, they often were not receiving the support they needed, as defined by law (Zigmond & Baker, 1995). Over the course of inclusion development, this remains a concern. Baines, Baines, and Masterson (1994), Liu (2011), and Wallace and Georgina (2014) concluded that students do not receive the support they need and the regular classroom teacher is expected to provide the support even when the teacher has not been provided specialized training.

First, there is need to understand why ICT could be considered an asset in the inclusion classroom. The term “technology” is defined as a process of using scientific, material or human resources to meet a human need or purpose. The term “information” is defined as that which can be communicated and understood” (Spector, 2012). If these two are linked together, it provides a definition of: “the use of information to meet human need or purpose including reference to the use of technology devices such as phone, chrome books, laptops, the Internet, computer software, and many other Web 2.0 tools” (Spector, 2012).

Lanni (2005) stated that students are attracted to ICT because not only is it challenging, but they see it as part of their everyday lives. When ICT is integrated with their other curricula, students benefit and gain much more from the curriculum assignments than what was expected (Lanni, 2005). Papert (2002) stated that ICT is a valuable asset to be introduced into schools where children pursue with their own passion and from their heart. When students work together to do something difficult, the teacher has to acknowledge children as learners and understand that children can learn experientially. According to Papert (1997), technology is not what it does to learning; it is about what society would like children to learn.

The National Education Technology Plan was enacted in 2016 to align with Every Student Succeeds Act (ESSA), as authorized by Congress in December 2015. The plan is entitled *Future Ready Learning: Reimaging the Role of Technology in Education* (U.S. Department of Education, 2016). The plan calls upon all who are involved in American education to ensure the quality of access to transformational learning experiences that are enabled by technology. The director of the Office of Educational Technology stated, “The National Educational Technology Plan provides a vision of transformational learning experiences empowered by technology that can shrink long-standing equity and accessibility gaps” (U.S. Department of Education, 2016, p. 1).

The use of ICT for enhancing pedagogical activities has enormous potential to increase educators' and learners' capabilities (Chigona & Chigona, 2010). For ICT to be an effective resource in the classroom, teachers need to understand how to align technology to pedagogical content. Although teachers' beliefs and values are important to the success of any classroom, these beliefs may not provide adequate motivation to deliver appropriate technology embedded curriculum (Cox & Abbott, 2004; Glover & Miller, 2001). What is needed is professional development to provide extensive knowledge of ICT, and strategies on how to integrate technology into curricula.

Kilic (2017) states that technology is a part of everyone's daily life. Kilic believes that the use of ICT is important in education curriculum and that it can be used to solve educational problems. A reason provided is that technology assists students in developing capabilities to understand curriculum better. Kilic studied 278 music teachers who were teaching in various parts of Turkey. The results of the study showed that self confidence level of the teachers depended in part on whether the teachers possessed a personal computer. Those teachers who did have a personal computer showed a higher confidence level of using ICT than those who did not have a personal computer. Kilic believes that ICT has a definite place in educational curriculum but how ICT is integrated is dependent upon the teachers' level of self confidence in using ICT.

Moseley et al. (1999) stated that there is a clear distinction between educators who choose to use ICT resources to integrate technology into curricula and those who deliver curriculum without any direct application to the use of technology within the curriculum. Using ICT in the curriculum requires that teachers develop knowledge of technology, known as Technological-Pedagogical-Content Knowledge (TPCK; Mishra & Koehler, 2006). For technology to be adequately integrated into curriculum, teachers need to master certain technological as well as pedagogical skills. These skills can only be mastered through effective professional development (Mumtaz, 2000; Scrimshaw, 2004).

Problem Statement

The concept of inclusion is based on the idea that students with disabilities should not be segregated in a special needs classroom but instead should be included in a regular classroom—with special accommodations—with their typically developing peers (Office of Special Education Programs, 2015). "A student in an inclusion classroom needs only to show that she is not losing out by being in the classroom, though she may not necessarily be making significant learning gains" (Perles, 2017, p. 1). This statement may not apply to all inclusion settings, but proponents of inclusion tend to "place more emphasis on life preparation and social skills than on the acquisition of level-appropriate academic skills" (Perles, 2017, p. 1).

Purpose

The purpose of this study was to determine the relationship between implementation of ICT into the inclusion 5th grade classroom with changes in the FSA scores in math and English language arts (ELA). If ICT implementation (according to Florida State implementation standards) has been successful, learning gains will be demonstrated. If not, the relationship may point to lack of implementation of ICT or other confounding variables that may have influenced the learning outcomes.

Research on the impact of technology continues to be in its infancy; however, this study contributed to the knowledge base in determining whether the ICT technology contributed to academic learning. Aql (2011) aimed to determine the effect of computer-aided instruction on eighth grade students' mathematics achievement. Fifty percent of the sample used the "I CAN Learn" computer instruction system, and fifty percent received traditional "chalk-and-talk" classroom instruction; both groups took the Missouri Assessment Program (MAP). The results revealed that all five student groups assessed during data analysis—males only, females only, special need students, students on free/reduced lunch, and the sample as a whole—scored higher on the MAP assessment when they were in the group receiving computer-aided instruction (Aql, 2011). These findings indicated that computer-based instruction can be beneficial for many student groups.

Research over the past decade shows that even though technology is implemented in many schools, there have not been effective studies to demonstrate the impact that technology could have on learning (Bebell & Kay, 2010). Although academic education concentrates on the core curriculum of English language arts, math and writing, it is important to understand that critical thinking skills, collaboration and text analysis will be needed in both college and career.

The study was important in understanding how to adequately implement and integrate ICT into the ESE inclusion classroom, so that curriculum guidelines and pedagogy can conform to expectations for academic gains.

Research Question

RQ1: What is the effect of academic test results on fifth grade ESE inclusion students' scores when ICT is used as a resource in curriculum instruction?

$H_{0:}$ There is no significant difference in academic outcomes of fifth grade inclusion students who use ICT as a resource in curriculum instruction and those inclusion students who do not.

$H_{1.}$ Fifth grade inclusion students exposed to ICT in their classrooms will show significantly higher academic performance than students who lacked ICT exposure.

Disadvantaged schools, such as Title 1 schools, face many challenges to provide adequate resources. ESE and inclusion students are at a disadvantage for various reasons, i.e., lack of enough trained quality instructors, financial resources and overcrowding. ICT could be useful in Title 1 schools to supplement existing or non-existing resources (Hardman, 2005). A capability approach helps to understand the challenges facing educators in disadvantaged schools by using ICT to aid in curriculum delivery. Sen (2000) focused, not the technology itself, but on how the technology can be used to deliver meaningful benefits. Miller, Naidoo, Van Belle, and Chigona (2006) noted in their study of the use of ICT in a Khanya project, that even though teachers had received professional development in the use of ICT to deliver instruction, not all of the teachers were using ICT.

In the past, researchers have viewed ICT as a tool and examined how it was used in schools, rather than studying the capabilities that teachers and students have to effectively use the technology. Simply providing ICT in and of itself does not provide effective management of ICT. Capabilities of the teachers and students need to be studied to determine the effectiveness of the utilization of ICT. It is also important to identify the factors, which support or do not support the integration of ICT into the ESE inclusive classroom. In the current study, the researcher will strive to find evidence-based approaches to close the gap in the existing research.

A goal of education is student learning gains, and questioning whether more technology should be implemented in classrooms is reasonable in this age of technology. In addition to assisting students with academic skills, the hands on collaborative opportunities provided by using ICT, could result in students learning from one another (Keser, Huseyin & Ozdamli, 2014).

Theoretical Framework

The theoretical basis for this study was Vygotsky's (1978) theory of social constructivism. This theory is based on the fundamental role of social interaction in the development of cognition. The approach demonstrates how students learn within the Zone of Proximal Development. Vygotsky (1978) argued, "…learning is a necessary and universal aspect of the process of developing culturally organized, specifically human psychological function" (p. 90). This method of learning leads to self-efficacy.

Placing ESE students in the mainstream classroom is only part of the solution for preparing the ESE student for social absorption. One of Vygotsky's (1978) principles, known as the More Knowledge Other (MKO), refers to someone who has a higher knowledge or understanding than another. An example of MKO could be a classmate who has a working knowledge of using a specific technology program who could share an experience with the ESE inclusion student (Vygotsky, 1978). In this study, I will investigate whether the technology would provide a more level playing field for the ESE inclusion student.

The technology framework for this study was a relatively new framework, the Capability Approach. I chose this approach since the study was concentrated on the implementation of ICT in the ESE inclusion classroom. This approach identifies a space in which people make cross-cultural judgments about life. Nussbaum (2002) praised the IDEA as a means to understand how the capabilities can be manifested in the current educational system. The approach is an alternative way to measure development. Hatakka (2011) validated the capabilities approach through a study in Bangladesh that established a clear role for technology in education.

Oosterken and van den Hoven (2012) compiled studies completed by several researchers on how the capabilities approach is applied in technology. Zheng (2012) evaluated the research on the capabilities approach and ICT to provide a theoretical perspective for evaluating social implications of technology and to give some examples of how to apply it (pp. 57-76). Reindal (2008) conducted research on the capability approach application to special education and inclusion. Reindal concluded that the capability approach has many attributes, particularly in the arena of socialized development, which can also be related to the use of technology. Norwich (2014) stated that the capability approach "provides a renewed ethical approach and some conceptual resources to re-examine issues in the disability and field of education" (pp. 16-21).

Cox, Preston, and Cox (1999) reported that many teachers think of ICT as a tool for improving presentation of curriculum, making lessons fun for the students, and ensuring a more efficient classroom. According to Scrimshaw (2004), ICT provides fast and accurate feedback to learners. The use of ICT in pedagogy could promote deep learning and allow educators to respond better to the various needs of different learners by developing cognitive skills, critical thinking skills, information access, evaluation and synthesizing skills (Castro, 2003).

Newhouse (2002) put forth that one of the most crucial elements of the constructivism theory of learning is the concept of proximal learning. This concept accepts that a learner builds upon his or her own knowledge from a base of scaffolding, which could be provided by either the educator or computer. Hence, teachers can use technology to help create ideal types of learning environments and systematic support for learner-centered approaches. This has been ignored, however, and ICT has failed to be implemented in the past (Newhouse, 2002).

Nature of the Study

The nature of this study was quantitative. Quantitative research is consistent with analyzing data sets from secondary sources to compare to a current database. By using a quantitative approach, I compared the data to show any growth over the period that was measured. I collected archival secondary data for two school years, 2014-2015 and 2015-2016. Data from the first year was prior to the integration of ICT. Data from the second year was with ICT implemented in the ESE inclusion classrooms. Mandated inclusion was established in a Florida school district in the school year (2015-2016), requiring the use of several resources for the inclusion student, including ICT programs. I compared students who were ESE inclusion but were not exposed to ICT programs in the first year to ESE inclusion students who were using technology as a resource in the second year.

Quantitative data are the best choice for comparing the two groups, and I r used descriptive and inferential statistics to analyze the data. According to Gall, Borg, and Gall (2007), these two analyses would be the best choice since I needed to organize, summarize and display sets of numerical data. For identifying inferential data, sets of mathematical procedures are best to infer sample information to arrive at conclusions concerning the sampling population (Gall et al., 2007).

Definition of Terms

Activity: Learning is not perceived as an individual action, but as a social activity in which people and artifacts play important roles (Winn, 2002).

ADA: The ADA Amendments Act of 2008 (P.L. 110-325) prohibits discrimination and ensures equal opportunity for persons with disabilities in employment, state and local government services, public accommodations, commercial facilities, and transportation.

Agency: This refers to “the endowments, belief systems, self-regulatory capabilities and distributed structures and functions through which personal influence is exercised, rather than residing as a discreet entity in a particular place” (Bandura, 2001, p. 2).

Alignment: As defined by Wenger (1998), alignment is one’s ability to coordinate perspectives and actions to direct energies to a common purpose. Similarly, alignment refers to a way of ensuring the mutually informed adaption of technology and practice (Barab & Plucker, 2002).

Assessment: Assessment refers to “the process of measuring, documenting, and interpreting behaviors related to learning” (Simonson, Smaldino, Albright, & Zvacek, 2012, p. 62).

Capability approach: This describes “the core of moral and personhood is something all human beings share, shaped though it may be in different ways by their differing social circumstances” (Nussbaum, 2002, p. 70).

CCSS (Common Core State Standards): These standards provide clear and consistent learning goals to help prepare students for college, career, and life (U.S. Department of Education, 2014).

Communities of practice: These communities develop standardized representations of practice to mitigate problems “as a form of capturing the pedagogy appropriate to a type of objective” (Laurillard, 2008, p. 150).

CBI (Computer-based instruction): This describes curriculum adapted to delivery by computer rather than teacher-lecture delivery (Bernard et al., 2004; Bernard et al., 2009; Clark, 1994; Kozma, 1991; Ullmer, 1994).

Computerized curriculum: This describes innovative academic programs and curricula reconceptualized to prepare students to compete in a global economy (Cunningham, Lachapelle, & Lindgren-Streicher, 2009; Hsu, Cardella, Purzer, & Diaz, 2010).

Constructive learning theory: This refers to a set of learning theories which fall between cognitive and humanistic views (Vygotsky, 1978).

Context: This term describes "the surrounding environment, circumstances, or facts which help give a total picture of something" (Young, Reiser, & Dick, 1996, pp. 65-78).

*Data: "*The use of statistical techniques that can be used to help faculty members and advisors to become more proactive in identifying at-risk students and responding accordingly" (Campbell & Oblinger, 2007).

Data analysis: Collective data analysis to determine institutional effectiveness, student retention issues, defining areas that directly impact students (Papamitsiou & Economides, 2014).

Discipline: Jones (2000) stated that in an educational context, "discipline is the business of enforcing simple classroom rules that facilitate learning and minimize disruption" (p. 26). It is important to note that this research does not encompass the literature on disciplining special education students in either self-contained or mainstreamed settings. The definition pertains to areas of instruction.

ELA (English Language Arts): Refers to all reading, writing programs in the K-12 learning environment.

Engagement: Engagement is an indication of successful classroom instruction in which students are visibly interested in their work and take pride in the accomplishment of all tasks (Fletcher, 2008).

ESE (Exceptional Student Education) students with disabilities.

ESSA (Every Student Succeeds Act): This law modified the NCLB Act of 2001, and was signed by President Obama in December 2015. There is a 391-page bulletin that outlines all the changes that are to be enacted including reference to special needs students (U.S. Department of Education, 2016).

Evidence-based practice: This includes aspirations to change practice, or to improve learning outcomes in classrooms by incorporating empirically grounded work that links studies of practice to processes of technology and adoption (Alsop & Thompsett, 2007, pp. 28-39).

FLE (Flexible learning environment): This describes a learning environment that enables learners to make choices, select learning material, and personalize their learning trajectory based on the formulated learning needs and learning goals (Specter, 2012, p. 366).

FSA (Florida State Assessment): Standardized tests in Florida to assess student growth in subject areas.

Generational differences: For the purposes of this research, generational differences will refer to differences in how educators become educated, train, teach, and supervise in this generation, particularly in the use of technology (Bennett, Maton, & Kervin, 2008; Elmore, 2010; Prensky, 2010).

Inclusion: Congress passed a law in the 1970s to ensure that all children who were handicapped would receive an education. This law was the Education for All Handicapped Children Act (1975).

ICT (Information and Communication Technology): The application of computer skills and ability to use computers and related technologies to improve learning, productivity, and performance (Leye, 2007; Umrani & Ghadially, 2003).

IDEA (Individuals with Disabilities Education Act): In 1990, 1997, and 2004, reauthorizations of the EAHC act were upgraded to mandate that not only should all handicapped children be afforded an education, they should also be placed in the least restrictive environments which means that handicapped children should be educated alongside students without disabilities (U. S. Department of Education, 2016).

IEP (Individualized Education Program): Written programs established for special needs students to assist in their educational growth.

MKO (More Knowledge Other): This refers to someone who has more knowledge, a higher ability, or a better understanding than a learner with respect to a particular task, process or concept (Vygotsky, 1978).

NEA (National Educational Association): An association supporting educators.

RTTT (Race to The Top): This is a revision of the original No Child Left Behind Act (NCLB) enacted in 2010 (U.S. Department of Education, 2012).

Self-directed learning: Knowles (1975) described this as “a process in which individuals take initiative, with or without the help of others, in diagnosing their learning needs, formulating learning goals, identifying human material resources for learning and choosing and implementing appropriate learning strategies, and evaluating outcomes” (p. 18).

Self-efficacy: This refers to one's beliefs about their capabilities to produce designated levels of performance that exercise influence over events that affect their lives (Bandura, 1993).

TPAK (Technological pedagogical content knowledge): This term refers to the knowledge about the complex relations among technology, pedagogy, and content that enables teachers to develop appropriate and content-specific teaching strategies (Spector, 2012).

ZPD (Zone of Proximal Development): Vygotsky's Zone of Proximal Development consists of a set of tasks that students can accomplish with assistance (Pea, 2004; Vygotsky, 1978).

Assumptions

Although there are many changes that can occur during any study, such as organizational structure, social implications, and practical applications that may alter teachers' perceptions regarding the integration of ICT in the inclusion classroom, those were beyond the scope of the study. I made the following assumptions for this study: (1) students were tested in the same environment for both tests, (2) that ICT was delivered as it was supposed to be, according to Florida State standards, and (3) students put forth their best efforts on the test.

Scope, Delimitations, and Limitations

Within the scope of this study, teachers and students describe technology integration into the inclusion classroom as a learning process. The implementation involved the selection of appropriate technology resources to meet the diverse needs of the inclusion student. Bruner (1966) stated, “the essence of teaching and learning is to help learners to acquire knowledge and use the knowledge they have acquired to create other knowledge” (p. 72). I hoped that information gathered from this quantitative study would expand the current literature to include results of the use of ICT as a resource in the inclusion classroom.

Delimitations

The following delimitations apply to this research:

1. One district in the state of Florida, consisting of 45 ESE inclusion classrooms in 25 elementary schools, was examined.
2. Most of the students that were studied were registered in Title 1 schools.

Limitations

The following limitations exist for the study:

1. Only fifth-grade students in inclusion classrooms in 25 elementary schools were participants.
2. English language arts and math were the only subjects for which I collected data.

I have explained the study’s limitations and delimitations in Chapter 3, along with other pertinent data that could surface.

Significance of the Study

This research fills a gap in the literature by focusing specifically on the infusion of technology into the ESE inclusion classroom. There are varieties of technology, such as iPads, touch screen computers, and Self-Monitoring Analysis and Reporting

Technology (SMART) tables that could assist the ESE student who needed modifications, as well as addressing challenges for the regular education student. There is necessity for understanding technology assistance, since the ESE inclusion students have a mandated curriculum diversification instituted by government guidelines. To support student success, a diversity of resources should be present in the ESE inclusion classroom, including technology. The U.S. Department of Education's *Blueprint for Success* (2013) also stated the need for schools and districts to maximize technology integration.

Ryan and Bauman (2016) reported that the United States continues to lag behind other countries in educational attainment. These authors noted that only 29% of Americans rated their country's K-12 education in science, technology, engineering, and math (STEM) as above average or the best in the world. The results of standardized testing have revealed that American students have gained percentages over the past two decades, however, these students still rank in the middle of countries reporting academic gains.

Also over the past decade, European countries have made ICT in classroom instruction, a priority. Blanskat, Blamire, and Kefala (2006) conducted a study in national, international, and European schools to determine evidence of advantages and or benefits to implementing ICT in classrooms. The findings revealed that ICT has a positive impact on students' results in exams, particularly in primary schools in the English language, but less in science.

Teachers in European countries are convinced that significant learning occurs with the use of ICT and that students are more motivated when computers and the Internet are accessed during class. These teachers also thought it might be very helpful for students with special needs. The disparities are reduced among students because of teamwork to complete tasks, projects or assignments. ICT use helps students to organize their work.

The impact on education would be that ICT would have a positive effect on students in an inclusion classroom as well as teachers would benefit from the implementation of ICT during the process of delivering instruction. In the European countries, 90% of the teachers stated that ICT was helpful in preparing lesson plans, working in teams and sharing ideas for implementation in the school curriculum. Evidence showed that broadband and interactive white boards play an important role in maintaining communication and increasing collaboration between educators (Elmailfi, 2014). The educational benefits of ICT in the inclusion classroom appear to have a positive impact on students' learning capabilities. These studies, and most others I reviewed, are based on studies in countries other than the United States. Therefore, I hoped to discover if ICT could be beneficial as a resource for the inclusion student in U.S. classrooms.

The implementation of ICT can play an important role in supporting educational reform and transformation (Kozma & Russell, 2011; Means, Roschelle, Penuel, Sabelli, & Haertel, 2004). Currently, educational reforms in European countries are focused on using ICT to support shifts in pedagogy and curriculum revisions as well as assessments.

ICT is being utilized to encourage higher order thinking skills and apply key concepts to solve real-world problems that students may encounter when they emerge into the world outside of the classroom (Bransford, Brown, & Cocking, 2000). The use of ICT incorporates 21st-century skills that prepare students for the knowledge economy, creativity, self-efficacy and to become responsible for one's learning (ISTE, 2007: Trilling & Fadel, 2009).

Maende and Opiyo (2014) explored the necessity for training teachers in implementing ICT in the classroom. The study examined use of ICT among teachers in Kenya. The focus of the research was to reiterate the role that ICT can play in educating students. The authors believe that ICT training should be mandated in all colleges that provide courses for teacher training. Additionally, the authors state that not only do teachers need to learn about the methods of implementing technology, but also computer skills for end users.

Social Implications of the Study

Ilomaki (2008) completed a study to investigate the effects of ICT on teachers' and students' perspectives. Ilomaki found that students became capable and motivated users of new technologies. The investigator concluded that many teachers have sufficient skills to implement ICT; however, there are many who continue to find it difficult to integrate ICT in pedagogy. An interesting concept that Ilomaki discovered was a generation gap in the use of ICT and competence between teachers and students.

Overall, it is believed that ICT can empower teachers and learners, promote change and foster the development of 21st century skills; however, the data to support these beliefs continues to be limited. One of the issues surrounding the escalation of ICT in the classroom is that the educational planners and technology advocates first think of technology and then investigate the educational applications of the technology (Trucano, 2005). In previous studies where data have been collected regarding the impact of ICT in education, the data is often related to the number of computers rather than data that could assist policy makers to determine the impact of ICT interventions on student learning. I was seeking to unveil that determination. The gap is that researchers have not measured the direct impact of the use of ICT in the ESE inclusion classroom. Researchers have demonstrated positive and negative effects with the use of technology, but not how it is delivered; thus, ICT could become an effective and integral resource for the inclusion student (Trucano, 2005).

Hernandez et al. (2017) presented a bibliometric analysis for the purpose of examining research activities about the use of ICT in learning communities. According to their research, there is a steady growth in the use of ICT since its inception in the nineties. One issue that appears to be significant is the effect of ICT on emergent behavior and confidence building, which are important aspects in the ESE inclusion classroom. One analogy is that traditional learning is changed with the use of ICT, which brings about new educational environments within the learning community.

Summary

In Chapter 1, I focused on the purpose of the quantitative study. I conducted the study using collection of secondary data to support the research question. Although there is abundant research about ESE inclusion students, the purposes for inclusion, the establishment of certain laws to support inclusion, and assistive technology, there is little information on the implementation of ICT in the inclusion classroom and the learning gains that may or may not have been examined. I hoped that examining the data over a 2-year period would provide the potential for further study after a full review of analyzed data as well as the social implications this study may uncover.

In Chapter 2, I performed a review of past and current studies of the ESE inclusion classroom and technology implementation. The study was undertaken to present gaps existing in the field of educational technology about ICT integration in the ESE inclusion classroom and further justification for future study. This chapter also paves the way for the development of the research question and to provide a background for the research.

In Chapter 3, I provided the design used to analyze the data collection that will answer the research question. I defined the process of how ideas were delineated by how data will be analyzed, and I used Creswell's (2012) guide to quantitative analysis in order structure the acquisitioned data to arrive at results for this study.

Chapter 2: Literature Review

Introduction

Chapter 2 includes review of the literature that illustrated the lack of research on the use of Information and Communication Technology as a resource in the Exceptional Student Education (ESE) inclusion classroom. There is ample research on ESE classrooms, as well as the use of varying types of technology that is used in and out of the ESE classroom. Researchers have performed few studies, however, on academic gains or losses in the ESE inclusion classroom where ICT is integrated.

The No Child Left Behind Act (NCLB) of 2001 stated that all students, to include students with disabilities, must participate in state measured assessments and demonstrate stated proficiencies by the 2013-2014 school year. The NCLB provisions delineated that students identified as students with disabilities would take the state assessments with the appropriate accommodations, which were determined by the students' Individualized Education Plan (IEP) team. The team consisted of classroom teachers, psychology personnel, district ESE coordinators, principals, counselors, parents and other personnel deemed necessary to assess the students' capabilities and identify the students' specific disability.

The team identified student subgroups by race, ethnicity, limited English proficiency, socioeconomic status, and disability. The NCLB stated that each student subgroup along with the total student population must meet their state's annual measurable objective (AMO) to achieve adequate yearly progress (AYP). Since the implementation of NCLB in 2002, educational stakeholders have sought methods and strategies to assist in increasing the academic achievement of all students, particularly students who were categorized in the students with disabilities (SWD) subgroup.

For students with disabilities, inclusion in the regular classroom has increased substantially since the passage of the NCLB Act of 2002. Before the NCLB Act of 2002, the Individuals with Disabilities Education Act (IDEA) was passed in 1997. This became a mandate to provide assistive technology in schools, with federal legislation being enacted that provided special funding for the development of training programs as well as provisional services and equipment for those who provided services for people with disabilities.

The U.S. Department of Education developed a *Blueprint for Success* policy in 2013 that outlines guidelines to develop new visions in teaching and leading by incorporating technology in all classrooms. On page 1, the policy bulletin states that only 78 percent of students complete high school in four years. The bulletin further states that "students who are on the wrong side of our nation's persistent achievement gaps, are simply not getting what they need to achieve" (U.S. Department of Education, 2013, p. 1). The use of technology particularly in inclusion classrooms, could personalize learning so that each student could learn at her own pace with an array of resources. For this to become reality, teachers must also be educated in information and communication technology to guide students in how best to use the technology so that the technology enhances instruction. Technology use for the inclusion student could allow for the teacher to be flexible and have more time to assist the at-risk students to achieve their maximum potential.

Although inclusion has been a positive move for the special needs student, it remains to be seen whether this is the best approach for all special needs students.

Typically, inclusion students may adapt socially. It is uncertain however, whether there are any academic gains for the inclusion student in a regular classroom where technology is the norm. There are different types of designs for learning, but the design most utilized for students with disabilities is the Universal Design for Learning (UDL). The UDL format allows for modifications so that students with disabilities can access information more readily. They do this through using an instructional model using technology. An example is that when the students access a program such as Success Maker, students can select sound so that the content can be read to them (Turnbull, 2013).

A further purpose of this study was to determine the possible relationships between the academic performance of the inclusion student and the use of information and communication technology as compared to those students who are inclusion but did not have access to ICT.

With the implementation of the NCLB Act of 2002, teachers and administrators have been held to a higher level of accountability as has been shown in school districts across the country. Stakeholders have searched ways to increase academic gains for all students, not just special needs students. I will review a history of special education, how and when inclusion was mandated by revealing inclusion educational practices in and out of the regular classroom. Studies about the use of technology with and without students with disabilities, will be outlined to provide an in- depth consideration, about how to increase academic gains with the inclusive student in the regular educational classroom.

Literature Search Strategy

Search terms used in the research for the study were *ESE students, inclusion, technology, Information and Communication Technology, student learning gains, teacher efficacy with technology and university programs relative to teacher and technology preparedness*. The literature review encompasses peer-reviewed journals, scholarly articles that are within the past five years, except for a few older studies that were important to this research. Several databases were searched using Walden's search tools for ERIC and Google scholar. Visits were made to local colleges to peruse their libraries and databases (using the same terms noted above) for information on ESE inclusion and technology use.

Theoretical Foundation

The theoretical basis for this study was Vygotsky's (1978) theory of social constructivism. This theory is based on the fundamental role of social interaction in the development of cognition. The approach demonstrates how students learn within the Zone of Proximal Development. Vygotsky (1978) argued, "learning is a necessary and universal aspect of the process of developing culturally organized, specifically human psychological function" (p. 90). This method of learning leads to self-efficacy.

The technology framework for this study is a relatively new framework, the Capability Approach. The researcher chose this approach since the study is concentrated on the implementation of ICT in the ESE inclusion classroom and how it is implemented. This approach identifies a space in which people make cross-cultural judgments about life. Nussbaum (2002) praised the IDEA in understanding how the capabilities can be manifested in the current educational system.

Nussbaum (2002) stated that the IDEA is indebted to the capabilities because it has made a commitment to provide opportunities for disabled students to develop academically and fulfill their human functions. The approach is an alternative way to measure development rather than the traditional methods of measurement. Hatakka (2011) validated the capabilities approach through a study in Bangladesh that established a clear role for technology in education.

Literature Review Related to Key Variables

Legislation Governing Education for Students with Disabilities

Although there have been laws governing the education of special needs students since 1918, parents found their special needs children were not readily accepted in the public-school system (Yell, Rogers, & Rogers, 1998). Many parents refrained from sending their children to school and instead kept the children home and taught them. Sadly, many of these students were not educated but placed in institutions or a work environment. Society prevailed in not advocating for special needs students until the mid-1930s.

After the onset of the Civil Rights movement, the United States Supreme Court ruled for equal protection under the law for minorities in Brown v. Board of Educ., 1954. The ruling led advocacy groups to pursue rights to public education for special needs students. Even though laws were passed to allow for the education of special needs students in the public education system, the students were grouped in a restrictive environment. The students were only socialized with other special needs students, which also limited their access to some academic resources.

Public Law 94-142, later known as the Education for All Handicapped Children Act, which was passed by Congress in 1975, required all public schools to educate special needs students in a "least restrictive environment". Later in 1980, the Act became known as the Individuals with Disabilities Education Act (IDEA). The provisions outlined in this Act were that all schools were required to provide services deemed necessary for special needs' students as well as students were to be placed in classes with a smaller ratio of teacher to student (Yell et al., 1998).

The No Child Left Behind Act of 2001, signed into law in 2002, amended the Elementary and Secondary Education Act of 1965 (ESEA) that was enacted to improve the academic achievements of disadvantaged students. The IDEA in 2004, incorporated sections outlined by NCLB to acknowledge a critical need to establish goals to create an environment of success for the students who were at risk, not only with physical disabilities but also those with learning disabilities. As a result of the push by the IDEA, courts ruled in favor of equality of education for all students regardless of race, ethnicity or socioeconomic class.

Inclusive Practices for Special Needs Students

Inclusion is a belief system or philosophy guiding all practices in the school setting (Wisconsin Educational Council, 2014). Inclusion includes the notion that every student is valued, belongs, and has the right to be a member of a classroom environment regardless of the student's disability status. Under IDEA, "education of children with disabilities can be made more effective by having high expectations and ensuring their access to the general education curriculum in the regular education classroom, to the maximum extent possible" (U.S. Department of Education, 2005, p .4).

Due to revisions to NCLB, IDEA, and Regular Education Initiative, the term *inclusion* has evolved to the point of many academic debates involving local, state, and government policies. One of the revisions to impact IDEA heavily and bring about many changes was the Individuals with Disabilities Education Act Amendments of 1997. The law favored that students with disabilities be included in the traditional education classroom and provided with the same curriculum. Additionally, the law proposed that students with disabilities participate in state assessments alongside the regular education students. The NCLB Act included accountability not only for schools receiving funding but also established that there should be no differentiation among students. In other words, all students were deemed regular education students because special needs students were to be included in the general education classroom.

Due to the ongoing debates over inclusion, there is a gap relating to the different perspectives and views in the research. Researchers have not provided ample evidence regarding the effects of inclusion on the academic success of special needs students. In addition, there is little research available about the effects of the use of information and communication technology for inclusion students even though the IDEA in 1990 mandated that all public schools provide assistive technology for students with disabilities. To add to the barriers teachers face with ESE inclusion, there is integration of technology as well as an existing lack of training for teachers of students with disabilities in the inclusion classroom. There is not adequate professional development for teachers to prepare them for the quality of delivery of instruction that is expected (Wallace & Georgina, 2014).

The IDEA was once again amended in 1997 to require public schools to provide the use of technology for special needs students. A further mandate in 2004 required that assistive technology, which includes all types of technology including information and communication technology, all regular education teachers must be knowledgeable regarding technology to provide not adequate, but quality services for the inclusive student (Van Laarhoven, Kos, Weichle, Johnson, & Burgin, 2014). Since the IDEA also mandated that special needs students participate in state assessments and state assessments are computerized, the general education teacher must deliver effective technology instruction to ensure inclusion students are proficient with computerized technology (Parette, Hourcade, Nichole, Boeckmann, & Blum, 2008). Some states stipulate that general education teachers working with students with disabilities have a clear understanding of technology resources to aid in academic activities for the inclusive student.

Florida implements programs and coordinates with government agencies to provide these services; however, severely handicapped students are not part of the revamped inclusion classroom. In the rare case that this should occur, assistive technologies such as touch screen, text to voice, translation software would be provided. The research delved into ICT for all students to include those inclusion students in a regular education classroom. Little research can be found that discusses the barriers for the ESE inclusion student utilizing ICT in the regular education classroom that demonstrates academic success because of utilizing this resource.

Relative to the research in determining whether ICT is an important resource for the inclusion student that demonstrates or does not demonstrate academic gains, there also is little research regarding the delivery of ICT with inclusion students by the regular education teacher; such as, how information and communication technology is implemented into the general curricula. There is considerable research regarding teacher attitudes and perceptions of using any technology in both the regular and inclusive classroom, but again, no credible research that explains whether the implementation of ICT as a resource affects academic gains.

Teacher perception, preparation, and attitude are important factors in the consideration of whether a method of delivery is a valid and reliable variable in determining whether this would influence academic gains. Researchers have shown that teachers were not prepared for inclusion and or technology implementation, Liu (2011). Liu stated that "empirical evidence indicates that teacher programs have not taught new teachers how to use technology effectively" (p.1), and that pre-service teachers are unprepared to teach inclusion students with integrated technology.

Bindu (2017) explored the attitude and awareness of using ICT in the classroom by teachers in India. Fifty-seven teachers from seven schools were selected for the study. The study examined relationships between the teacher and student use and implementation of ICT in the classroom. This study's findings were that teachers have a positive attitude toward the use of ICT in the classroom; however, Bindu also perceived that more consideration should be provided in educational settings.

Comi et al. (2016) studied whether ICT practices affected student achievement. The study was conducted measuring a specific set of data depicting teacher use of ICT and assessment scores on a national test for tenth grade students. After analyzing the data, one finding was that computer-based teaching methods did increase student achievement, if the teacher is able to obtain materials needed for preparation of lectures, and provided the delivery of the information increases student awareness. The conclusion was that the effectiveness of ICT depends on teachers' ability to properly integrate ICT into pedagogy.

Ernst and Williams (2014) conducted a study to determine the capacity of service by technology and engineering teachers servicing students who qualify for accommodations and those students who are Limited English Proficient (LEP). The authors stated that general education teachers are held responsible for the academic performance of inclusive students. Their findings were that the teachers feel unqualified to deliver adequate instruction for the diverse needs of students, including the delivery of technology implementation. The research examined collective and stratified technology and engineering educator service load regarding students with categorical disabilities and LEP through secondary analysis.

Their survey sample was K-12 school districts, schools, library media centers, and administrators across the United States. The overall conclusion was that teachers can impact students with at-risk indicators using technology.

Henning and Mitchell (2002) conducted research at Pennsylvania State University to study attitudes of six teachers in regular and special education programs. The researchers analyzed two teachers' input and revealed that their attitudes and perceptions were improved following training for inclusion. Teachers took a pre-and post-test about their attitudes and perceptions related to working in an inclusion classroom.

Maciver et al. (2016) conducted a case study in Scotland, with 125 educators and other staff from seven different schools as participants. The study was concentrated on high school students with varying disabilities. Maciver et al.'s (2016) focus was to discover what the participants deemed as "best practices." The study provides evidence that inclusion for special needs students is a positive venue. Based on the results of the study, the research team found that, particularly new teachers do not feel adequately trained to implement many of the necessary strategies needed to provide resource instruction for the inclusive student.

Rupley et al. (2015) proposed that using a multi-touch, multi-coding, multi-sensory system could enhance learning for struggling students. The system involves the use of e-textbooks to support and scaffold learning for special needs students. The introduction of Common Core State Standards (CCSS) imposed deeper informational text comprehension for students in K-12. However, many students do not possess the reading comprehension skills necessary for academic success under the new auspice of the strict standards set forth in CCSS curriculum. The issue became how to assist teachers with their instructional skills so that the pedagogy content is available to all students. Rupley et al. (2015) believe the use of digital text is very useful as a resource to aid in assisting the students and teachers in successful adaptation of reading-to-learn skills.

Steiner and Mendelovitch (2017) conducted a study to investigate whether teachers are truly using ICT to promote critical thinking skills in elementary class rooms. There were twelve teachers selected for their study who had been considered to possess a high level of ICT literacy in science lessons.

Steiner and Mendelovitch (2017) noted that their findings revealed that teachers' willingness to use ICT technologies is dependent upon their expertise and background knowledge along with fluency of implementing computer skills. The results of the study also showed that overall the teachers stated they used ICT tools primarily for visual aspects, not necessarily to improve academics.

Yumurtaci (2017) posited that ICT should be re-evaluated in terms of learning and education. He states that "the act of learning, itself, relies heavily on the capability of the learner to create knowledge" Yumurtaci (2017, p. 215). Yumurtaci reported that in this digital age, learning is dependent upon technology and the strengths and weaknesses of technology within the learning environment. The two-pronged approach proposed by Yumurtaci suggests that the infrastructure of learning utilize mobile technologies. Mobile technologies allow the learner to participate in environments outside of the classroom or workplace and manage their learning by establishing ownership of time and space.

Zhou, Smith, Parker, and Griffin-Shirley (2011) stated in their research of teachers of inclusion students that they felt it was only necessary to learn basics of technology. The understanding of the teachers was that “technology” meant assistive technology which would be tools for the student with disabilities.

As previously noted, there are differences in types of technology. Assistive technology is for more severely disabled students, whereas, ICT is for the more adaptable inclusion student. As stated in the NCLB Act, educators of students with disabilities must be highly qualified to deliver instruction that is identified as highly effective to support students’ goals to achieve academic gains by utilizing necessary resources to aid in this endeavor (U.S. Department of Education, 2013).

The U.S. Department of Education has issued various policy changes since the NCLB became effective in 2002. The most recent change to NCLB is now Every Student Succeeds Act (ESSA) of 2015. President Obama signed this law on December 10, 2015. The new law revamps the 50-year-old ESEA, revised to become NCLB and now ESSA. This law builds on key areas of progress in recent years made possible by the efforts of educators, communities, parents, and students across the country (U.S. Department of Education, 2013).

The amended law states that the ESSA provisions can promote student academic gains and proficiencies by:

1. Advancing equity by upholding critical protections for America's disadvantaged and high-need students;
2. Requiring—for the first time—that all students in America be taught to high academic standards that will prepare them to succeed in college and careers;

3. Ensuring that vital information is provided to educators, families, students, and communities through annual statewide assessments that measure students' progress toward those high standards;
4. Helping to support and grow local innovations—including evidence-based and place-based interventions developed by local leaders and educators—consistent with the Investing in Innovation and Promise Neighborhoods;
5. Sustaining and expanding the administration's historic investments in increasing access to high-quality preschool;
6. Maintaining an expectation that there will be accountability and action to effect positive change in lowest-performing schools, where groups of students are not making progress, and where graduation rates are low over extended periods of time. (U.S. Department of Education, 2013).

Previous Studies of Inclusion Research

There have been numerous studies discussing both the pros and cons of the effects of inclusion of ESE students in the regular education classroom. Various scholars have yielded mixed results of how teachers feel about inclusion and technology, according to Cagran and Schmidt (2011). Cagran and Schmidt's study also showed that teachers' professional experience and training in working with students with special needs was an important factor in determining attitudes. Another study by Patkin and Timor (2010) stated that many teachers projected negative attitudes about inclusion. According to their study, there were no positive results about inclusion.

Arukaroon et al. (2017) stated in their study that the benefits of the use of ICT are not always observable. They compared the use of ICT with students to the non-use of ICT in the classroom. Two groups were studied and the researchers' conclusion is that the subjective norm appears to be the only effect on students' behaviors. The researchers' opinion is that ICT integration is not an effective tool for teaching at any level of educational achievement.

Benton and Johnson (2015) reviewed technology design methods and techniques that are involved in teaching students with special needs in education. The study was done in the UK where the UK government recently implemented a program called Special Education Needs and Disability herein referred to as SEND. It is much like the U.S. Department of Education's program for students with disabilities. The United Kingdom's program calls for technology to be implemented in educational programs for students with disabilities. A design: Participatory Design (PD) is incorporated in which the user is involved in the decision-making process in the design of the technology process. The process involves students and adults in designing how technology is implemented in the educational setting. The conclusion reached following the research reveals that the SEND program involving students with disabilities has many far-reaching capabilities and encourages more work around special needs students and the development of more technology as a resource.

Boyle et al. (2013) focused their study on teachers' attitudes towards inclusion for special needs students. The case study incorporated 391 teaching and management staff from 19 general education and 6 special education schools in one district in Scotland.

Interestingly, the results of the survey show that many of the teachers were in favor of inclusion and of that majority, most were female teachers. As with many other research studies, Boyle et al. (2017) found that a lack of teacher preparation for inclusion continues to exist. Teachers are expected to differentiate instruction for the inclusive students while maintaining a general education level of instruction for the remaining students who are not inclusive. Most of the participants reported that more support and resources are needed for inclusion to be successful for both the students and the teachers.

Casarez and Shipley (2016) focused on the Universal Design for Learning (UDL) specifically for disabled students as well as for the general population of students. Although the study focused on online learning, technology was at the heart of the study. The authors cited that online learning should be accessible to disabled, minorities and marginalized students. Regarding inclusion, Braunsteiner and Mariano-Lapidus (2014) posited that inclusion was the "fundamental right of all children and adults to fully participate, and contribute in all aspects of life and culture, without restriction or threat of marginalization" (Braunsteiner & Mariano-Lapidus, 2014, p. 32). This fundamental right extends to inclusive education being an institutional-wide attitude and philosophy, committed to the determination and resources necessary to provide education for all learners. Casarez and Shipley (2016) contend that more and more disabled students are desiring to continue their education and that without technology, specifically online instruction, this would not be an option for them. Therefore, computer technology with UDL is of upmost importance to the learning community who cannot attend brick and mortar schools.

Eskay et al. (2013) research took place in Nigeria where the government has recently acknowledged that special needs students who were inclusive, needed access to ICT in the classroom to be equally educated with students who are not challenged or disabled. The authors stated that a lack of equal access to education threatens human potential and social cohesion. Eskay et al. (2013) postulated that ICT implemented in education could be improved and should be mainstreamed for students to achieve their maximum potential.

Fletcher-Watson (2014) studied technology use with autistic children. The researcher aimed to increase the effectiveness of using ICT with autistic students, who are also included in the definition of inclusion students in the mainstream classroom. Fletcher-Watson stated that much more research is needed to determine residual effects of technology use and how it is implemented to determine academic gains in special needs students.

Foss et al. (2013) investigated the use of Participatory Design (PD) with students with special needs. It is their contention that if these students are engaged with the development of technology programs using PD that communication skills may be improved. The initial study consisted of ten boys ages 11-12 with a variety of learning disabilities. The students worked with the researchers to develop a prototype learning game. The researchers used a strategy termed Cooperative Inquiry (CI) which an adult will present an idea to students and the students collaborate and expand on the idea to either improve a technology program or create a new program that benefit the population of special needs students involved.

Gresham, Sugai, and Horner (2001) noted that “deficits in social skills are key criteria in defining many high-incidence disabilities that hinder students’ academic progress,” such as mental diseases affecting many children like attention deficit hyperactivity disorder (ADHD), developmental disorders, and emotional problems (p. 332). In these authors’ perceptions, social skills are the initial reasoning for having ESE students become inclusive in hopes that once acclimated to a regular classroom, academic learning will follow.

According to Gresham et al. (2001), if social skills are absent, it is especially difficult for the teacher to impart instruction, because much of the academic learning involves cooperative learning, group work, giving and providing feedback. Students are required to be good listeners to understand assignments and what is expected to disclose appropriate meaning. Ultimately the ESE inclusion students, as well as all students, need to master cooperative learning skills to advance academically.

Knott and Asselin (1999) completed a study of 214 special education teachers to determine their perceived practices related to teaching special needs students. The findings of the study showed that the teachers perceived they had an adequate knowledge of the concepts involving teaching a quality inclusive curriculum. Barriers to teaching in an inclusion classroom were also moderate. The teachers reported that more professional development was needed to ensure that students achieved positive outcomes and successful grade-level transitions.

The power for positive change for all learners lies in technology (Hobgood & Goddard, 2011). Educators should observe the necessary characteristics, cultural perspectives, needs and attributes of all students. There is no need for a “digital divide.” In order for students to be creative, learn, and apply computer skills, they should be exposed to technology (Degennaro & Brown, 2009).

Lidstrom and Hemmingsson, (2014) researched possible benefits of using ICT in school activities within the classroom with students who were mentally and or physically challenged. Their conclusion was that although ICT seemed to benefit students with special needs, different types of interventions should be noted for the particular need of the student.

Mady and Muling (2017) conducted research spanning 15 years of empirical studies into the methods of support for special needs students learning the French language. The students studied and the teachers implementing practices are inclusive special needs students. A national survey was conducted of 2000 French as a Second Language (FSL) teachers that revealed student diversity in the inclusive classroom is their greatest challenge. The overall findings showed that technology as one of the resources contributed to the success of FSL emersion in special needs inclusive classrooms.

Ribeiro (2016) stated that students who plan to become responsible, knowledgeable citizens must be prepared to work in a society that is technology-driven. Ribeiro contends that teachers and students must be immersed in essential literacy skills along with information and communication intercultural awareness. The author suggests that positive student engagement thrives with ICT. Information Communication Technology (ICT) provides an avenue by which teachers can use digital storytelling to assist students in improving their confidence that allows them to communicate effectively.

Digital technology (DT) is one of many ICT tools that enable students to tell their story and value other culture by creating awareness of their own culture. Ribeiro states that storytelling through technology allows students to have a voice, generate understanding and create an appreciation of differences. Through the use of ICT, students can relate the pedagogy of text to self, text-to-text and text-to-world and gain a better understanding of the world in which they live. Ribeiro surveyed 140 participants to gain a better understanding of her study into using technology to enhance learning through digital storytelling. Ribeiro also questioned 70 students to gain their perspectives of using technology to expand their knowledge. Overall, the study appeared to have been successful, with both students and teachers providing positive feedback and stating that the experiment was very valuable.

Santi and Baccaglini-Frank (2015) introduced a new paradigm to frame special needs students' academic achievement in mathematics. Their theory of objectification to characterize student learning with the use of iPads. As noted in previous studies, the special needs students' needs have been differentiated with several options from placing the students in isolated schools to the current inclusive practices. All of these options have been justified in one way or another to assist the special needs student to develop academic skills which would achieve learning objectives.

Santi and Baccaglini-Frank's (2015) research noted that teaching strategies play an important role in the delivery of mathematics instruction to the special needs student.

The team’s objective was to bring about a shift from analysis of cognitive functioning to understanding of students’ general life experiences. The authors developed a teaching intervention involving Santi and one of his students. The intervention was called Microworld, the intervention involved touch as in utilization of the iPad. The second author, Baccaglini-Frank, developed a system called Mak-Trace, which was designed to create an accessible environment for struggling students. Both designs are digital learning devices and interventions that assist the special needs student to become emotionally engaged in the activity for which they are involved. The conclusion of the authors’ research showed that the student involved in the research continued to experience difficulties, however, was more successful with Mak-Trace, which helped the student to become more self-confident.

Teacher Preparation and Training

The general education teacher who is responsible for teaching the ESE inclusion student is not adequately prepared according to (Kleinhammer-Trammel, Geiger, & Morningstar, 2003). Kleinhammer-Trammel et al. (2003) revealed that in Florida, no certification or endorsement in transition is available; however, a limited amount of transition knowledge is included on the Florida Teacher Certification Exam. The number of teachers surveyed is not available, however, Kleinhammer-Trammel et al. (2003) stated that 80% of the teachers surveyed remarked that they believed they would get the training they needed through their teacher preparation programs or professional development.

A teacher’s competence is widely identified as the most influential factor on student learning, compared to demographic and social factors (Hanushek, 2014). Teachers are expected to be able to manage a classroom of diverse students (Levine, 2006). Today, teachers’ effectiveness is measured by student learning gains, meaning that the teacher is responsible for academic achievement outcomes of her students (Darling-Hammond, 2012). Teacher education programs are being sanctioned to ensure that graduates can meet the growing conditions they face by attributing students’ learning gains to their learned expertise (Allen, 2013; Kazemi, Ghousseini, Cunard, & Turrou; Levine, 2006; Lison, 2012).

Anderson et al. (2017) conducted a study to understand preservice teachers’ experience with integrating technology into lessons delivered to students with learning disabilities. The study was conducted with 14 early childhood education majors who were participating in a special education course with an internship component. The authors concluded that teachers’ use of iPads demonstrated the teachers’ efficacy of using technology to enhance academic achievement. The researchers also interviewed the students who affirmed the validity of using iPads for instruction of lessons. Findings demonstrate that technology can be an equalizer for inclusive students because of the intrinsic motivation experienced by special needs’ students. The use of iPads provides another method of student expression and learning.

Asian and Zhu (2017) explored teachers’ competency and the integration of ICT into their teaching practices. Data was studied from a pool of 599 preservice teachers in Turkey. Curriculum utilized in the study was Turkish language, elementary mathematics, social sciences and science in the fourth year of the teacher preparation program. The conclusion of Asian and Zhu's study was that pedagogical knowledge along with ICT competence and ICT courses significantly contributed to a prediction of an applicable 17% integration into teaching practices.

Choy, Wong, and Gao (2009) found that pedagogical content, classroom management and a lack of knowledge of how to integrate technology into the K-12 curriculum often overwhelm inexperienced teachers. Girgin, Kurt, and Odabasi (2011) stated that teachers not only need to learn how to use technology, but also, they must learn how to use effectively the applications that most meet the needs of students.

Fu (2013) provided a relevant research on teacher perception and the use of ICT in education. Fu discussed gaps in the literature and encouraged future studies on ICT implementation for education in the classroom. Fu stated barriers to using ICT in the classroom included low teacher expectation, insufficient skills for managing software programs, lack of proficiency in technology programs geared towards pedagogy and pressure to improve students' scores on academic assessments. Fu referenced another study conducted by Doering, Hughes and Huffman (2003) that analyzed teachers' perceptions about using ICT in the classroom. Similarities in that study were comparable to Fu's discoveries.

Koh et al. (2017) researched the concept of the integration of ICT in the professional development process in pedagogical content for teachers. The study consisted of 37 teachers from a school in Singapore who were placed in seven lesson design teams. The study was researched for one year. Koh et al. (2017) found that the teachers reported positive effects on teachers' confidence with integrating ICT into pedagogical content. Further, five of the teams reported they could incorporate 21st century learning into their lesson planning. Six of the teams reported academic improvement with their students.

Killi et al. (2016) reported on the conclusions of two studies involving pre-service teachers' self-efficacy with technology integration in the classroom. The first study consisted of 200 pre-service teachers. The second study consisted of 22 pre-service teachers and 16 adult education students. Three hypothesized scales were used to measure the participants' self-efficacy. Both studies demonstrate that teacher-level barriers to technology integration in education are often related to a lack of confidence, limited technological competencies, negative attitudes, and resistance to change (p. 444). Self-efficacy relates to a person's belief in his or her capabilities in the performance of an activity (Bandura, 1977). The lack of self-efficacy with pre-service teachers is due to inconsistencies of teacher professional development and or college preparation courses in education. However, many colleges and universities offer courses to prepare teacher candidates for the implementation of technology in pedagogy.

Killi et al. (2016) stated there is evidence that demonstrates teachers' self-efficacy could be enhanced through proper professional development and instruction of technology implementation in classrooms.

Bandura (1997) stressed that because of the rapid development of technological tools, the pedagogical use of technology may require special types of teacher self-efficacy. He argued that if teachers have high self-efficacy regarding their ability to use technology, they would be more willing to adopt new technologies in their classroom practices.

Lewis (2015) studied the implications for pre-service teachers expected to develop a technology rich class room without having the benefit of technology instruction in their graduate programs. Based upon the author's research, according to International Society for Technology in Education (ISTE)'s standards for technology preparation courses, most colleges and universities do not effectively include this type instruction in their core curriculum for students of educational studies. The National Educational Standards (NETS) expects that both teachers and students can meet the frameworks' expectation for mastery of technology skills to become proficient in 21st century curriculum. Lewis states that:

> Research suggests that outside of specific educational technology courses (Anderson & Maninger, 2007; Doering, Hughes, & Huffman, 2003; West & Graham, 2007) or direct instruction during the practicum (Graham, Tripp, & Wentworth, 2009), preservice teachers do not learn to integrate technology into their lesson planning in a manner that is consistent with state and national standards during the core courses of their teacher preparation program.

According to Lewis (2015), many pre-service teachers did not feel comfortable with integrating technology into the curriculum. This lack of self-efficacy results in a disservice to both the teacher and students. The study for Lewis' research involved a large public research university in the southwestern United States accredited by the Higher Learning Commission. The study indicated that approximately 4700 students per semester participated in the higher education learning program leading to teacher certification. The researcher surveyed 62 participants resulting in a conclusion that some type of technology instruction should be incorporated into the teacher certification program.

Rosenzweig (2009) stated that although general educators are expected to teach special needs students in the general education classroom, teacher preparation studies and professional development do little in preparation of accommodating the various needs of the inclusion student. Rosenzweig (2009) "examined the extent to which preservice and current educators are lacking in their ability to assist special needs students" (p. 6). Rosenzweig's personal survey of 2009 revealed that eight out of 10 teachers surveyed stated they did not adequately know how to assist special needs students.

Sivin-Kachala and Bialo (2009) conducted a study that focused on the social skills of students in grades 2, 4 and 6, in online public schools supported by the K-12 curriculum and technology resources. Although this study was conducted for online students, the authors discovered that teacher training in technology and the ability to integrate technology into the K-12 curriculum are pertinent factors that contribute to the success or failure of academic gains for students using technology either as a resource or as part of the curriculum. The study's participants were 176 students, 276 parents, and 58 teachers who provided information for the analysis of the results. The study focused on non-handicapped students. The researchers did not compare these ratings to the ratings for handicapped students. The authors' overall conclusion about teacher involvement was a lack of teacher knowledge and how to use the technologies effectively plus a lack of support from technology personnel.

Vaughn, Bos, and Shumm (2007) stated that many general education teachers perceive that their roles and the roles of the specialized ESE teacher have become blurred. It is possible to infer, therefore, that general education teachers are expected to differentiate the curriculum to ensure the academic success of the inclusive student. Differentiation occurs in all classrooms; however, for the inclusion student, this may be more demanding.

Young and Bush (2004) conducted a study in Ireland on teachers’ attitudes towards using technology for the development of new skills, pedagogies, and school-provided support. Their study was conducted across 22 schools in Ireland. Participants included 670 teachers and 1,150 students. The study collected data from 259 teachers across all sites using baseline data and questionnaires. The results were positive from the teachers, although tempered with concern about their own confidence, competence, and changes in the classroom.

The IDEA mandates that the inclusion student and at-risk students are provided with intervention programs and resources to ensure all students’ success. This statement aligns with the current revision of the NCLB, which is now ESSA. There are several accommodations that are required for the special needs student, including various types of technology. The general education teachers are expected to diversify curriculum for all students to include the use of technology (U.S. Department of Education, 2016). The special needs students are held to same accountability standards as their general education peers.

Researchers such as Worrell (2008) have shown that many teachers misunderstand the intent of differentiated instruction, particularly for the ESE inclusion student because they are not adequately prepared through in-service training or their teacher preparation courses. Worrell emphasized that "a solid foundation of knowledge about the students' disabilities, educational needs, accommodations, modifications, and the laws that affect both the student with the disabilities and the teacher" is necessary (p. 44). Based upon Worrell's research, general education teachers do not possess the ability to properly educate and engage special needs students in the general education classroom due to their lack of training.

Kale and Goh (2014) conducted a study of 161 teachers from eight middle and high schools in both rural and urban settings. The researchers attempted to identify teachers' attitudes towards using technology in their delivery of instruction. Their findings indicated that while teachers were fairly proficient in their computer and Internet skills, the workload demand inhibited the teachers from implementing immersive technology in their classrooms.

Bogan, Harper, and Bifuh-Ambe (2014) noted "the idea of a highly qualified teacher has been a major focus for parents, administrators, and educators. A part of being a highly qualified teacher is being able to use technology effectively in the classroom. Technology plays a role in problem solving, problematic tasks, and conceptual focus in the mathematics classroom" (p. 1). Starr (2011) concluded that many teachers lack the personal experience of exposure to technology and do not know how to incorporate technology-based activities and projects into their curriculum. The author further posited that teachers have to be provided time in the form of professional development in order to learn how to use tools for technology and understand the terminology. Starr stated that if technologies are used properly, technology can be useful as a resource not only for the students but also for the teachers. Teachers have reported several barriers that prevent the effective implementation of technology into classroom instruction, such as technology support, teacher perceptions, and resistance to learning something new, experience, as well as mandated implementation (Gulbahar & Guven, 2008).

Technology Implementation in the General Education Classroom for Inclusion Students

Adam-Turner (2016) explored the Arts & Sciences faculty and media specialist's attitude towards using digital sources to enhance student learning. The author stated that digital learning is a driving force in the development of student proficiency with technology skills. Adam-Turner quoted, "With no consensus for what constitutes digital literacy, these competencies are incomplete and insufficient to incorporate assistive technology (AT) into the curricula" in (Voogt, Ersta, Dede & Mishra, 2013, p. 5). The author expects that the results of the study will convince administrative personnel to incorporate digital literacy training and development into the professional development for faculty of schools, colleges and universities, given that digital literacy is an expectation for 21st century learning for all students.

Aksal and Gazi (2015) contend that ICT is a medium in which special needs students can connect their lives with society and education. The authors state that not enough attention has been given to ICT as a resource for special needs students. This study was conducted in North Cyprus to hopefully assist in a policy change for integrating ICT into the special needs classroom. The study was a qualitative case study employed in two special education schools. The findings were that limited facilities were available for the implementation of ICT. The authors cite many reasons to implement ICT in the special needs classrooms to provide an avenue for building and fostering social and educational relationships.

Bacca et al. (2014) discussed the probability of using augmented reality in inclusion classrooms. The gap for this is that the author proposed that not enough research has been studied regarding the use of augmented reality. It has been studied for online learning environments, but not deeply into the general education Face to Face (F2F) classrooms.

Bricker (2015) explored the use of iPads for students who are deaf and hard of hearing. Bricker studied students from ages 3-21 to determine if the iPad technology would make a difference in academic achievement for these students. Her study showed that the students were eager to become engaged in learning even though they were handicapped. The introduction of iPad technology helped the students to become pioneers to demonstrate their new capabilities in learning.

Ernst and Clark (2012) constructed research revolving around CTE teachers and their students. The researchers provided concrete data that computer gaming does enhance learning and concepts around computer technology. The authors noted that further study is needed to determine if gaming would be an appropriate tool to use with ESE students in the inclusive classroom at the elementary school level.

Hardman (2015) conducted a study to discover how using Web 2.0 technology could build a virtual learning community known as professional learning community (PLC) so that preparation could be enacted to support special education teachers. There were 218 pre-service teachers and in-service teachers who participated in the study. Hardman noted that previously, Web 2.0 tools were primarily for one-way delivery of technology for specific programs. However, as technology evolves and more demands are placed upon teachers of special education students, it is becoming necessary to move beyond passive instruction to active engagement. Hardman (2015) states, “the use of technology to provide support services in teaching and learning in the inclusive classroom is becoming widespread” (p.11). Hardman (2015) further postulates, “recent research provides abundant evidence that technology is and will continue to play an important role in 21^{st} century inclusive classrooms” (p.11).

Harris and Al-Bataineh (2015) conducted a quantitative study with 4^{th} grade Title 1 students in a school in Illinois. The study was undertaken to determine whether one-to-one technology implementation impacts academic achievement for the students. The study’s focus was on technology implementation used as a resource to aid in academic success. The NCLB (2002) implementation sought to eliminate the digital divide and increase students’ technology literacy regardless of disability. The study showed that teachers who implemented one-to-one technology were at an advantage over the teachers who did not have technology available to them. The results of the study demonstrated that the students who were exposed to technology implementation scored higher on tests than those students not exposed to technology implementation.

Hobgood and Goddard (2011) posited that differentiating instruction using technology is a necessity for all classrooms. These authors' specific take on technology is using virtual technology to enhance curriculum absorption. Even though teachers may approve the idea of integrating technology in the classroom, it becomes frustrating due to the high stakes accountability of each student receiving proficient scores on state assessments. The inclusion classroom compounds the issue because data has shown that students with disabilities do not perform as well as their peers on standardized tests (Thurow, 2002).

Howery, McClellan, and Pedersen-Bayus (2013) conducted a 3-year study of a pyramid of intervention approaches with computer technology as one of the intervention approaches. Financial issues were at the root of why some districts do not utilize technology as an intervention piece when mandates are in place to educate the inclusion student alongside the mainstream class. Further research is needed to determine why financial aspects should be a concern when the interventions are mandated—perhaps understanding the Universal Design for Learning (UDL) design.

Marra and Bogue (2006) provided a critical assessment of the use of on-line survey instruments "to gather data that measure the impact of certain activities relative to its objectives" (Scriven, 1991, p.1). Purposes of assessments are varied from individual diagnosis of performance to improvements in teacher planning and curriculum delivery.

For purposes of this research, the researcher will use Florida State Assessment (FSA) tools to measure student data.

Naranjo et al.'s (2016) purpose for their research was to observe the relationship between online teaching programs and special education programs. The authors believe their work contributes to the understanding of how instructional technologies used to connect research to practice in special and general education, and to enhance teachers' knowledge and skills related to the inclusion of students with disabilities in the general curriculum. Eight participants who were enrolled in a graduate level online program were surveyed for the study. This study is ongoing to determine if enhancing specific aspects of technology implementation will assist them in assessing their disabled students' academic progress and to aid in determining a course of instruction to improve learning.

Sessions, Kang, and Womack (2016) studied the effects of integrating iPad applications into the curriculum for fifth graders. This study is similar to the current research with the use of ICT integration into the curriculum. The National Assessment of Educational Progress (NAEP) piloted a computer-based writing exam in 2012 for fourth graders and also proctored a writing exam for eighth and twelfth graders to determine if the integration of technology affected the outcome of student gains. The results in 2012 were that teachers would need to increasingly evaluate available technology tools that could enhance the overall quality of student writing. Sessions et al. (2016) found that combining pedagogy with appropriate technologies could positively influence student learning for all students. The academic gains that could be gained would align with the current common core standards.

Kolb’s (2012) Experiential Learning Theory posits that different people prefer different learning styles. Kolb reasoned that there are three stages of a person’s development and suggested that a person’s propensity to reconcile and successfully integrate four different learning styles improve during development. For the special needs student, many are limited in experiencing learning due to limitations in their abilities to acquire certain skills and abilities. Kolb further contended that technology can enable experiential learning. Kolb (2012) mentioned, “learning is the process whereby knowledge is created through the transformation of experience” (p. 21).

McTighe and Brown (2005) articulated a disconnect between true differentiation of instruction and research that forms the constitution of student engagement. The authors contend that teachers have a “flawed perception” of what differentiation really is, particularly when technology is involved. Many teachers believe that they are expected to “teach to the test” ignoring very meaningful concepts, strategies and skills that are necessary especially for the inclusion student to master (McTighe & Brown, 2005, pp. 234-244).

Shumway et al.’s (2016) study was to determine if a relationship exists between the instructional modality used for teaching fractions to third and fourth grade students’ responses and strategies to open-response fraction problems. The study consisted of 155 third grade and 200 fourth grade students located in 17 public school classrooms. There were two instructional groups: those students who used virtual manipulative devices and those students who used textbooks and physical manipulatives. However, in this study, the conclusion from the analysis showed achievement outcomes were relatively the same.

Nevertheless, it is important to note, according to the research team, that virtual manipulative tools are important to use as instructional devices to enhance overall understanding of fractional relationships.

Implementing technology into the special needs classroom is a key factor for strategies in the education system (Bates, 2011). Implementing technology in classroom instruction promotes critical thinking skills, provides hands-on activities for specific skills learning, research and how to effectively communicate (Hakverdi-Can & Dana, 2012; Hechter & Vermette, 2014). Pellerin (2013) also conducted a 2-year study of using technology in special needs classrooms. Pellerin concluded that technology is needed in all classrooms, particularly in special needs classrooms, and that support from stakeholders for funding to provide the diversification mandated is needed.

Trucano (2005) stated that there is unequivocal data to support the belief that ICT integration in the inclusion classroom aids in assisting ESE inclusion students to achieve higher academic gains. Trucano further stated that the data required to prove that ICT does contribute to student gains is difficult to measure. The author attributed this belief to teachers' pedagogical knowledge and the ability to use technology integration as it is intended to be, as part of the curriculum. Trucano posited that teachers' philosophies contribute to the success or failure of the impact of ICT on academic learning in the inclusion classroom.

Valcke, Sang, Rots, and Hermans (2010) validated that pedagogical beliefs directly affect whether technology is implemented in classrooms. If the mainstream teacher has few or no resources and is not trained to integrate technology, then possibly academic success could be lacking, as well as teachers not recognizing that different types of technology could be resources.

Wenglinsky (1998**)** assessed whether simulation and higher-order thinking technologies were a positive influence on a national sample of 6,227 fourth grade students and 7,146 eighth graders. The author achieved this by examining mathematics achievement on the National Assessment of Education Progress. Wenglinsky controlled for socioeconomic status, class size, and teacher characteristics. The author found that the greatest inequities in computer use are not in how often they are used, but in the ways in which they are used. Poor, urban, and rural students are less likely to be exposed to higher order uses of computers than non-poor and suburban students. In essence, the researcher found that technology could matter, but that this depended on how it was used. The size of the relationship between the various positive uses of technology and academic achievement was negligible for fourth graders, but substantial for eighth graders. Taken together, findings indicate that computers are neither a cure-all for problems facing the schools nor mere fads without impact on student learning (Wenglingsky, 1998).

Israel, Marino, Delisio, and Serianni (2014) postulated that technology could act as an equalizer, particularly in an ESE inclusion mainstream classroom discarding the notion that students with disabilities cannot use the same technology as general education students typically use. Teachers have to differentiate curriculum to meet the needs of all students which can be challenging in a classroom with every student having a different need. Information and Communication Technology (ICT) can open avenues for students to access that were closed to them before the implementation of technology. Technology is used as a resource particularly when there is no extra staff for support services.

The 26th Annual Report to Congress on IDEA (U.S. Department of Education, 2005) reported that approximately 96% of general education teachers have students in their classrooms with learning disabilities. Embracing the power of technology requires that teachers possess the ability to use it to deliver instruction. Every student learns differently; therefore, the teacher has the flexibility to address each student's need and modify curriculum appropriately to engage the student.

In the majority of states, computer testing is mandated for specific grade levels for all students. Computer access in the inclusion classroom, however, is not mandated for every student. Therefore, if students are required to demonstrate proficiency in the use of computer software, it would seem there would be an unintended consequence relative to student scores if there is not sufficient technology training or instruction for the ESE inclusion student. One such consequence is that if teachers are not aware that a specific skill will be required to demonstrate mastery, such as a computer skill, teachers may not include this accommodation in the curriculum instruction. This would have a negative impact on the learning of the ESE inclusive student (U.S. Department of Education, 2013).

Experts have argued that technology is more important in inclusion classrooms because learning can go from being complex to simple as it addresses the individual needs of the learner (The International Council for Education of People with Visual Impairment, 2010). Children with disabilities need technology learning environments to effectively learn and play with their regular classroom peers (International Council for Education of People with Visual Impairment, 2010). Although it has been mandated, there are many barriers to effective ICT implementation (Espique, 2008).

Summary

Based on review of the literature, the research gap is that previous studies have not demonstrated conclusive results. There has not been sufficient evidence produced to show whether ICT is a positive or negative influence in the ESE inclusion classroom in terms of academic gains for the inclusion student. Some scholars have concluded that technology would be an appropriate resource for the ESE inclusion classroom. Others have supported the idea that stakeholders need to understand that funding must be realized to support the needed technology as an intervention resource. It has been proven in a variety of education settings that technology does help to improve learning; however, more research across different grade levels may support the need for technology as a resource of intervention. The government mandates resource intervention for inclusion students and mandates that teachers be responsible for the academic success of the students; however, these laws have failed in recognizing that technology is a necessity and not just an elective. The current study was needed to demonstrate where the technology intervention was successful and how much impact it had on learning by reviewing test data which could provide evidence that technology was needed in all classrooms across North America to elevate the academic success of all students, not just special needs students.

The gap exists in demonstrating whether technology integration does contribute to student gains on state mandated assessments. There is an abundance of research on the effectiveness of technology, the inadequate training for teachers of inclusion students and the intended use of technology in the inclusion classroom. The gap that I, as a researcher, hoped to close was to determine whether technology instruction was delivered efficiently to ensure learning gains. The reason was that educational planners and technology advocates think of technology first and then investigate the educational applications of technology (ICT) later (Kozma, 1991).

Vygotsky's (1978) social learning theory and Nussbaum's (2002) capability approach to learning impact the scope of this study by defining how each applies to the ESE inclusion student and ICT as a resource in the classroom. The literature demonstrates Vygotsky's utilization of humanistic interpretation of cognitive responses to a person's environment. The capability approach notes that it is not technology itself, but the capability of the person using the technology, that will determine its effectiveness.

Both theories reflect upon the interpretation of knowledge based upon previous learning and social interactions and whether direction to achieve goals was stipulated. The difference in the two approaches is the locus of learning. Social cognitivists believe that learning is centered psychologically, and capability approach theorists believe that learning is distributed across all types of activities. Since one theory is ancestral and one is relatively new, the two have therefore not been joined in previous studies. In this study, I intended to marry the two theories and arrive at a justification for embedding both into future research.

Chapter 3: Methodology

Introduction

In this chapter, I describe the methodology of the study, including discussions of the subjects involved, sampling technique, and the instruments of research. I explain the processes of data collection and the statistical analysis that was used to measure and interpret the data. The purpose of this quantitative study was to determine the extent to which the standardized academic test performance of fifth grade Exceptional Student Education (ESE) inclusion students was enhanced by implementing Information and Communication Technology (ICT) as a curriculum resource in their classrooms.

Research Design and Rationale

In this study, a quantitative approach was employed. According to Creswell (2012), quantitative methods are most effective when the researcher is trying to uncover objective facts on the ground rather than seeking subjective opinions. Quantitative methods are useful when the data collected are numerical in nature and are to be interpreted with the assistance of statistical analyses. The discovery of existing facts restricts subjectivity while promoting objectivity, and allows for a subject-object relationship.

RQ1: What is the effect of academic test results on fifth grade ESE inclusion students' scores when ICT is used as a resource in curriculum instruction?

$H_{0:}$ There is no significant difference in academic outcomes of fifth grade inclusion students who use ICT as a resource in curriculum instruction and those inclusion students who do not.

H_1: Fifth grade inclusion students exposed to ICT in their classrooms will show significantly higher academic performance than students who lacked ICT exposure.

Quantitative data are the best choice for comparing two groups, which in this study was the control group from year one, and the non-control group in year two. This was a nonexperimental causal-comparative study because the assignment of students to groups was not randomized. Rather, the groups compared were preexisting. The students in the control group (year one) did not use ICT. The students in the experimental group (year two) did use ICT because ICT was implemented in year two. ICT was the independent variable, with two levels represented by the two groups. The dependent variables were the students' scores in ELA and math. The researcher used descriptive and inferential statistics to analyze the data. According to Gall et al. (2007), these two types of analyses are appropriate for organizing, summarizing, and analyzing sets of numerical data in answering questions about the cases who are represented by those data. Descriptive statistics provide a description of the characteristics of the samples under investigation, and inferential statistics enable one to determine whether the characteristics of those samples (i.e., differences between groups) can be reliably generalized to the population from which the samples were drawn (Gall et al., 2007).

Methodology

To understand the impact of ICT on learning outcomes for the ESE inclusion student, and thereby infer the effectiveness of ICT as a resource in curriculum instruction, I measured student performance in English language arts (ELA) and math, and compared scores from school year 2014-2015 (year one), during which ICT was not available in ESE inclusion classes, with scores from school year 2015-2016 (year two) during which ICT was used in those classes. The archival (secondary) FSA data evaluated in the study were limited to fifth grade ESE inclusion students from one school district in Florida.

Population

The general population for this study consists of all fifth grade ESE inclusion students in all 74 school districts in Florida, who have taken the FSA English language arts (ELA) and math assessments. The samples drawn from this population consisted of fifth grade ESE inclusion students from one school district in Florida: 267 students during year one (without ICT) and 295 students during year two (with ICT).

Sampling Procedures

The location for this research study was one school district in Florida. Archival data from twenty-five schools within that school district were analyzed. The majority of the schools were Title 1 schools, of which there were 17. There were two charter schools and six non-Title 1 schools. The six non-Title 1 schools were also non-charter schools but high achieving schools.

Convenience sampling was used to draw data for this study from the archives of standardized test scores for students through the state of Florida. Bornstein, Jager, and Putnick (2013) have described convenience sampling as using data on the basis of their accessibility. The researcher's personal familiarity with the chosen school district and the greater accessibility of data for this district prompted the choice to sample data from that school district. The decision to examine data from the fifth graders was because students at that grade level, who used ICT in the classroom during year two, were doing so in preparation for a totally digital middle school experience the following year.

The data collected were test scores on the state administered standards assessment given towards the end of each school year. Archival standardized test scores for each grade level are recorded both at the state and district level. Scores are recorded in two forms in the archive—scale scores and achievement level scores. Scale scores provide a continuous measure of academic achievement across a score range of over 100 points, while achievement level scores range only from 1-5, collapsing scale scores into five class intervals or score bands. Achievement level scores are used to determine whether or not students pass or fail the grade level for which they tested. However, scale scores provide a more precise measure of students' academic achievement than achievement level scores. Consequently, scale scores for ELA and math were used in the present study.

Procedures for Data Collection

I used Florida State Sunshine State Standards student test data from the participating district's custodial archived data storage to determine if there were any significant differences in academic performance between students in year one (without ICT in the classroom) and students in year two (with ICT). Permission to collect data was obtained from the Walden University Institutional Review Board (IRB) after Utilization Resource Review (URR) approval and completion of the Oral Defense of the proposal. Additional permission to access the data was obtained from the participating school district's IRB. Data were delivered to the data manager, the data manager anonymized the data, and then the anonymized data were provided to the researcher to be analyzed.

Instrumentation and Operationalization of Constructs

Florida State Examination Scores: The source of student data was the FSA state exam. Reliability and validity information provided in the Florida Comprehensive Assessment Test (FCAT) Test Maker Item Bank warrant that the test questions used in assessments during both year one and year two were written to conform to the Florida's Next Generation Sunshine State Standards/Grade Level expectations and were built to FCAT 2.0 Test Item Specifications. The Kuder-Richardson (K-R20) method was used to determine the reliability of the test administration during the past four years (Appendix B).

The FSA report for 2014-2015 will be used here to summarize empirical evidence about the reliability and validity of both the 2014-2015 and 2015-2016 tests. For purposes of this study, only ELA and math components of the exam are reviewed.

Multiple reliability estimates for each test were reported in the FSA 2014-2015 report, including stratified-coefficient *alpha*, Feldt-Raju, and the marginal reliability. The reliability estimates were presented by grade and subject as well as by demographic. The report also included conditional standard errors of measurement by grade and subject, as well as standard deviation of theta and mean standard errors of measurement of theta.

The Bureau of K-12 Assessment is responsible for all aspects of Florida's K-12 statewide student assessment programs, including developing, administering, scoring, and reporting the results for assessments aligned to the Florida Standards or Next Generation

Sunshine State Standards, as well as assisting with the administration and reporting of several other K-12 student assessment programs. Services are provided both by Florida Department of Education (FDOE) staff and through various contracts with assessment vendors. The primary goal of these assessments is to provide information about student learning in Florida, as required by Florida law (Florida Department of Education, 2017).

The FSA yields test scores that are useful for understanding to what degree individual students have mastered the Florida Standards and, eventually, whether students are improving their performance over time. Additionally, scores can be aggregated to evaluate the performance of subgroups, and both individual and aggregated scores can be compared over time in various program evaluation efforts. Test items were selected prior to the test administration to ensure that the test construction aligned to the approved blueprint. The content and psychometric verification log was kept tracking the compliance of the test structure to the FSA requirements.

In the FSA assessment administered in 2015 (for the 2014-2015 school year), student-level scores included T-scores, percentile ranks, and raw scores at the reporting category level. On January 6, 2016, after the State Board of Education approved performance cuts, scaled scores were retrofitted for spring 2015 tests and reported back to districts. These scale scores and achievement level scores were also reported for the spring 2016 test (for the 2015-2016 school year). Only scale scores on ELA and math were analyzed in the present study.

Thus, the reliability coefficients for these test scores and the validity of the test scores must be examined to support practical use across the state, (see Appendix C).

Within the IRT framework, measurement error varies across the range of ability as a result of the test information function (TIF). The TIF describes the amount of information provided by the test at each score point along the ability continuum.

Data Analysis Plan

Archival data on ELA and math test scores from FSA standardized tests served as the dependent variables in this study. Those data were collected during the 2014-2015 school year (year one) and 2015-2016 (year two). During year one, fifth grade ESE inclusion students in the selected school district were not exposed to ICT in the classroom. During year two, fifth graders in the ESE inclusion classrooms were exposed to ICT in the classroom. Thus, ICT served as the independent (or grouping) variable, with two levels, no ICT exposure and ICT exposure.

ELA and math scores from those two school years were compared using two Mann-Whitney U tests—one test for each of the two dependent variables. The Mann-Whitney U test is used when the dependent variables are not normally distributed, the groups being compared display markedly different levels of data variability, or the dependent variable is measured only at the ordinal scale (Lehmann, 2006). The Mann-Whitney U test is in the category of nonparametric significant difference tests because the results of the test are robust with respect to violations of the assumptions of normality, homogeneity of variance, and interval or ratio scale dependent variables associated with parametric alternatives such as the *t*-test. The Mann-Whitney U test can also be used in place of the *t*-test, even if the parametric assumptions of the *t*-test are satisfied by the data. In that case, for a sample of a given size, the Mann-Whitney U test provides slightly less statistical power than the *t*-test (Lehmann, 2006). For instance, in a *t*-test comparison of two independent samples, each of size *n*=50, using the .05 level of significance (two-tails), the statistical power available to detect a population difference of medium strength is approximately 70%. In comparison, this same comparison performed using the Mann-Whitney U provides statistical power of 68%. In other words, given data that fit the parametric requirements of the *t*-test, the *t*-test has a slightly greater likelihood than the Mann-Whitney U test of identifying an effect as statistically significant. On the other hand, if the parametric assumptions of the *t*-test are violated (as they almost are to some extent), the validity of the results of the *t*-test, particularly the reported significance levels, are distorted and interpretation of the results is clouded.

The Mann-Whitney U procedure has the advantage over the *t*-test in that the Mann-Whitney U performs well regardless of the parametric characteristics of the data. The only parametric consideration that affects the Mann-Whitney U test has to do with the shapes of the two groups' distribution of scores on the dependent variable. Regardless of what those distribution shapes might look like, if those distributions are of similar shapes, the Mann-Whitney U test is a test of the difference between the group medians. In that case, when the Mann-Whitney U test is significant, the size or magnitude of the difference between groups can easily be specified as the difference between the group medians.

However, if the group distributions are of substantially different shapes, a significant Mann-Whitney U test is more difficult to interpret. It can only be concluded in that case that one group's scores were higher than those of the other group, but it is not possible to specify *how much* higher (Hart, 2001). The Mann-Whitney U test was chosen for use in this study as a robust procedure for the comparison of independent samples that, given the large samples available, would provide more than adequate statistical power to detect any meaningful effects of incorporating ICT into the fifth grade ESE inclusion classroom. The research question to be answered in this study, with corresponding null and alternative hypotheses was:

RQ1: What is the effect on the academic test results on fifth grade ESE inclusion students' scores when ICT is used as resource in curriculum instruction?

$H_{0:}$ There is no significant difference in academic outcome of fifth grade inclusion students who use ICT as a resource in curriculum instruction and those inclusion students who do not.

$H_{1:}$ Fifth grade inclusion students exposed to ICT in their classrooms will show significantly higher academic performance than students who lacked ICT exposure.

Threats to Validity

The *internal consistency* method can be employed when it is not possible to conduct repeated testing administrations. Whereas other methods often compute the correlation between two separate tests, this method considers each item within a test to be a one-item test.

Justification for the reputability and best source for the data that were analyzed were the FSA academic scores for the 2015 school year. The new program, named the Florida Standards Assessments (FSA), replaced the Florida Comprehensive Assessment

Tests (FCAT) 2.0 in English Language Arts and Mathematics. Students in grades 3 and 4 were administered fixed, operational ELA and Mathematics forms on paper. Students in grades 5 through 10 were administered fixed, operational ELA forms online, and students in grades 5 through 8 were administered fixed, operational Mathematics forms online.

In the grades with online testing, paper forms, in lieu of online forms, were administered to students whose Individual Educational Plans (IEP) or Section 504 plans indicated such a need. Evidence based on test content is a crucial component of validity, because construct underrepresentation or irrelevancy could result in unfair advantages or disadvantages to one or more group of examinees.

Technology-enhanced items were examined to ensure that no construct irrelevant variance is introduced. If some aspect of the technology impeded, or advantaged, a student in his or her responses to items, this could affect item responses and inferences regarding abilities on the measured construct. Florida makes use of the technology-enhanced items developed by the American Institutes for Research (AIR), and the items are delivered by the same engine as is used for delivery of the Smarter Balanced assessment. Hence, the FSA makes use of items that have the same technology-enhanced functionality as those found on these other assessments. A cognitive laboratory study was completed for the Smarter Balanced assessment, providing evidence in support of the item types used for the consortium and in Florida. The complete study is provided as a compendium to the FSA technical reports in Volume 7, of the FSA Tech Report showing support for the item types used on the FSA tests.

The second source of validity evidence was based on "the fit between the construct and the detailed nature of performance or response actually engaged in by examinees" (AERA, APA, & NCME, 2014). This evidence was collected by surveying examinees about their performance strategies or responses to items. Because these items were developed to measure constructs and intellectual processes, evidence that examinees have engaged in relevant performance strategies to correctly answer the items supports the validity of the test scores.

The third source of evidence for validity was based on internal structure: the degree to which the relationships among test items and test components relate to the construct on which the proposed test scores are interpreted. Differential item functioning, which determined whether some items may function differently for subgroups of examinees, is one method for analyzing the internal structure of tests. Other possible analyses to examine internal structure are dimensionality assessment, goodness-of-model-fit to data, and reliability analysis.

A fourth source of evidence for validity was the relationship of test scores to external variables. *The Standards* (AERA, APA, & NCME, 2014) divided this source of evidence into three parts: convergent and discriminant evidence, test-criterion relationships, and validity generalization. Convergent evidence supported the relationship between the test and other measures intended to assess similar constructs. Conversely, discriminant evidence delineated the test from other measures intended to assess different constructs. To analyze both convergent and discriminant evidence, a multitrait-multimethod matrix was used. Additionally, test-criterion relationships indicated how accurately test scores predicted criterion performance. The degree of accuracy mainly depends upon the purpose of the test, such as classification, diagnosis, or selection. Test-criterion evidence was also used to investigate predictions of favoring different groups. Due to construct underrepresentation or construct-irrelevant components, the relation of test scores to a relevant criterion may differ from one group to another. Furthermore, validity generalization is related to whether the evidence is situation-specific or can be generalized across different settings and times. For example, sampling errors or range restriction may need to be considered to determine whether the conclusions of a test can be assumed for the larger population.

A study linking state tests to the National Assessment of Education Progress (NAEP) test (Phillips, 2016) found that the Florida grades 4 and 8 level 4 performance standards, in both Mathematics and ELA, mapped to the NAEP proficiency levels. This is a rigorous standard that only Florida met as reported by Phillips (2016).

Fifth, the intended and unintended consequences of test use should be included in the test-validation process. Determining the validity of the test should depend upon evidence directly related to the test; this process should not be influenced by external factors. For example, if an employer administers a test to determine hiring rates for different groups of people, an unequal distribution of skills related to the measurement construct does not necessarily imply a lack of validity for the test. However, if the unequal distribution of scores is in fact due to an unintended, confounding aspect of the test, this would interfere with the test's validity. As described in Volume 1 of the FSA Tech Report, test use should align with the intended purpose of the test.

Supporting a validity argument requires multiple sources of validity evidence. This then allows for one to evaluate if sufficient evidence has been presented to support the intended uses and interpretations of the test scores. Thus, determining the validity of a test first requires an explicit statement regarding the intended uses of the test scores, and subsequently, evidence that the scores can be used to support these inferences.

The State of Florida is very diligent in ensuring that all of the assessments used in Florida have a high degree of inter-test reliability in the area of the instruments' tested area. The same test form is given twice, and the scores are correlated to yield a coefficient of stability. Inter-test reliability determines if the scores generalize across time. Florida is very specific in its choice of contracted vendors for assessment testing and strongly emphasizes reliability and test retest validity, see (Appendix C).

Ethical Procedures

Prior to the collection of archival data, approval was obtained to conduct the study from the Institutional Review Boards of both Walden University and the participating school district from which the study was conducted. Once approval was granted, the FSA archived results in math and English language arts were collected and analyzed. All data were anonymized to protect the rights of student participants as well as the individual schools within the school district. The collected data has been retained in a password protected file to avoid any unauthorized access. After the study is completed and approved by Walden University, the archived data will be returned to the school district and disposed of immediately, at the district's Student Data Assessment Manager's request.

Summary

This study was a quantitative, nonexperimental comparison of the archived FSA ELA and math scores of ESE inclusion students from two school years. During year one (2014-2015) fifth grade ESE inclusion students in the participating school district were not exposed to ICT in their classrooms. During year two (2015-2016), fifth graders in ESE inclusion classrooms were exposed to ICT. The purpose of comparing data from those two years was to determine if implementing ICT during year two brought an improvement in academic performance of the students. In this chapter I described and justified the methodology and procedures used in the study, including a detailed review of the psychometric qualities of the FSA test. The Mann-Whitney U test used in comparing year one and year two data was also described and defended.

In Chapter 4, I will provide an analysis and interpretation of the outcomes of the results. Descriptive statistics, tables, and graphs are used to describe the students and schools in the participating school district. Finally, the results of the Mann-Whitney U tests are presented and interpreted to answer the study's research question.

Chapter 4: Results

Introduction

The purpose of this study was to determine if implementing Information and Communication Technology (ICT) as a curriculum resource in inclusion classrooms enhanced the standardized academic test performance of fifth grade Exceptional Student Education (ESE) inclusion students. Archival data on the FSA ELA and math tests from one Florida school district were analyzed. Data included scores from the academic years 2014-2015 (year one) and 2015-2016 (year two). ICT had not yet implemented in ESE inclusion classrooms during year one, but ICT was used as a curriculum resource in ESE inclusion classrooms during year two. Comparisons of performance on the ELA and math components of the FSA standardized test during years one and two thus provided a test of the efficacy of introducing ICT into the curriculum.

The research question posed in this study was: What is the effect on the academic test results of fifth grade ESE inclusion students when ICT is used as a resource in curriculum instruction? The null hypothesis was that there is no significant difference in academic outcomes of fifth grade inclusion students’ scores who use ICT as a resource and those students who do not use ICT as a resource. The alternative, research hypothesis was that ESE inclusion students exposed to ICT in their classrooms would show significantly higher academic performance than students who lacked ICT exposure. This chapter describes how the data were collected, processed, and analyzed in addressing the study’s research question.

Data Collection

Following the receipt of IRB approval from both Walden University, and the participating Florida school district, archived FSA test data were pulled for fifth grade ESE inclusion students from one school district in Florida for the academic years 2014-2016. Data were drawn with the cooperation of the Office of Student Assessment.

On January 6, 2016, the State Board of Education established Achievement Level standards for the Florida Standards Assessments (FSA). The 2014-15 school year provided the first set of results based on these new standards. In the spring of 2015 FSA results were reported to students as percentile scores. The results from the initial release that have been converted to the new score scale were provided so that stakeholders and the general public could see what the results would have been if these standards had been implemented at that time. Because of this conversation, these scores are referred to as the retrofitted scores.

Preliminary Data Management

Data were provided by the participating school district in the form of a confidential Excel file. The file specified the year during which test scores were obtained, i.e., 2014-2015 and 2015-2016. The test year was used as the independent variable ("grouping variable") in this study. The data file also provided FSA ELA and math test scores of anonymized individual students. Both "scale scores" and "achievement level scores" were included in the file. Fifth grade ELA *scale scores* could range from 257 to 385, while math scale scores could range from 256 to 388. However, actual score ranges observed in this study were somewhat narrower than these ranges, especially lacking scores at the top ends of the theoretical score ranges.

On the other hand, *achievement level scores* only ranged from 1 to 5, and captured each of five scale score intervals or bands. While achievement level scores provide a simplified and convenient means of conveying test results to students and parents, those scores lack the precision that is available in the scale scores. Consequently, achievement level scores were not examined in this study; rather, all data analyses used scale scores.

No student demographic data were available in the data file. Limited information about school types (type “A” schools, type “B” schools, charter schools, virtual schools, and Title 1 schools) was provided in the data file, but information that would identify individual schools was deleted. The data were imported into SPSS and all subsequent data manipulations and analyses were performed using IBM SPSS software (Version 24.0), except for power analyses which were performed using G*Power software (Version 3.1.9.2) (Faul, Erdfelder, Lang, & Buchner, 2007).

Data processing began with a check on the accuracy of variable definitions (e.g., variable name, type of variable, scale of measurement) following the data importation process. Where the default definitions were found to be inaccurate, corrected specifications were provided. The data were reconfigured into a format that would be suitable for comparisons of data from year one vs. year two on the two dependent variables—scale scores on ELA and math. Since the data were drawn from an official state archive, no data screening was performed to identify out-of-range or other score inaccuracies; all recorded data values were assumed to be accurate. However, data with missing values were discarded. There were 286 records provided for year one, but 17 of these contained no test score data and were deleted, leaving 269 records for year one. There were 316 records provided for year two, but 18 of these contained no test scores and were also deleted, leaving 298 records. In several cases, either ELA or math test scores were available, but not both. Those records were retained in the data file so that subsequent statistical tests could utilize all available valid data. Table 1 summarizes the numbers of valid scores on ELA and math tests for years one and two. No screening was performed for univariate outliers, non-normality of distributions, or heterogeneous group variances because the Mann-Whitney U test statistic used in performing between-subjects' comparisons is very robust to extreme scores, does not assume that the dependent variable is normally distributed, and does not rest on the homogeneity of variance assumption.

Table 1

Numbers of Valid and Missing Scores on ELA and Math Tests for Year One (2014-2015) and Year Two (2015-2016)

	Year One (No ICT)			Year Two (ICT)		
Tests	Valid	Missing	Total	Valid	Missing	Total
ELA	267	2	269	295	3	298
Math	266	3	269	287	11	298

Note. Year One is academic year 2014-2015; Year Two is academic year 2015-2016.

G*Power software (Version 3.1.9.2) (Faul, et al., 2007) was used to estimate the statistical power of the planned Mann-Whitney U tests for the sample sizes that were available. In the context of the Mann-Whitney U test, statistical power refers to the likelihood that the test will produce a statistically significant finding at a specified level of significance if the difference being tested for significance actually exists in the population from which the sample data were drawn (Dattalo, 2008). The following parameters were specified for this power analysis. Sample sizes available for year one and year two were slightly uneven, approximating a ratio of 1 to 1.1 for both ELA and math dependent variables. Level of significance (α) was set at .05 (two-tailed). Finally, the strength of the difference in the population, measured by Cohen's *d* statistic, was evaluated at three levels, $d = .20$ (a weak difference), $d = .50$ (a medium strength difference, which is described as one which would be apparent to a careful observer, without statistical analysis), and $d = .80$ (a strong difference). For both Mann-Whitney U test comparisons (i.e., FSA ELA scores at years one vs. two; FSA math scores at years one vs. two), the sample sizes that were available in this study provided 63% statistical power to detect a weak population difference, but over 99% statistical power to detect a population difference of medium strength or stronger.

As no student demographic information was provided by the school district, sample description is limited to noting that all students in the analysis were fifth graders enrolled in ESE inclusion classrooms. The only descriptive information provided by the district for schools was information about school type. That information is summarized in Table 2.

Table 2

School Types During Year One (2014-2015) and Year Two (2015-2016)

	Year One (No ICT)		Year Two (ICT)	
School Type	*f*	%	*f*	%
Type A Schools	104	38.7	100	33.6
Type B Schools	6	2.2	11	3.7
Charter Schools	9	3.3	19	6.4
Virtual Schools	1	0.4	0	0.0
Title 1 Schools	149	55.4	168	56.4
Total	269	100.0	298	100.0

Note. Year One is academic year 2014-2015; Year Two is academic year 2015-2016. Year Two percentages do not sum to 100.0% due to rounding.

Reliability and Composite Scoring

FSA standardized test scores on ELA and math reported by the participating school district were provided in the form of total (composite) scores. Student responses at the level of the individual test items were not available. Consequently, it was not necessary to calculate composite scores and it was not possible to calculate either Cronbach's alpha or Kuder-Richardson measures of internal consistency reliability of the FSA ELA and math tests. However, the psychometric qualities of the FSA instrument were evaluated thoroughly by the state of Florida and the reliability and validity characteristics of the instrument were reported previously.

Results

Two Mann-Whitney U tests were used to address the study's research question. In both between-subjects' comparisons, the independent variable was ICT implementation, with two levels: ICT was not implemented (during year one) vs. ICT was implemented (during year two). These samples are independent, as required by the Mann-Whitney U procedure, because different students formed each of the two samples and the composition of the year one sample did not influence the composition of the year two sample (Privitera, 2018). The dependent variable in the first analysis was ELA scale scores, and math scale scores served as the dependent variable in the second analysis. These scores provide a continuous scale of measurement that is at least ordinal in scale (Miller and Lovler, 2017), also as required by the Mann-Whitney U.

Comparison of ELA Scores From Years One vs. Two

Descriptive statistics on ELA scale scores from year one and year two are provided in Table 3.

Table 3

Descriptive Statistics on ELA Scores for Year One (2014-2015) and Year Two (2015-2016)

	Year One (No ICT)	Year Two ICT
n	267	295
Minimum	257	257
Maximum	359	356
M	304.94	304.69
Mdn	304.00	304.00
SD	17.06	19.25

Note. Year One is academic year 2014-2015; Year Two is academic year 2015-2016.

Figure 1 provides frequency histograms for ELA scores from years one and two in the form of a population pyramid that facilitates comparing the shapes of the distributions. The interpretation of the Mann-Whitney U is affected by whether or not the groups being compared show similarly shaped data distributions. Figure 2 shows that ELA data from year one and year two were similarly distributed. Consequently, the Mann-Whitney U can be considered to provide a test of the significance of the difference between the ELA medians from years one (*Mdn* = 304.00) and two (*Mdn* = 304.00). The medians were identical, and the Mann-Whitney U test was statistically nonsignificant, U = 39368.00, $z = -0.008$, $p = .994$ (two-tail).

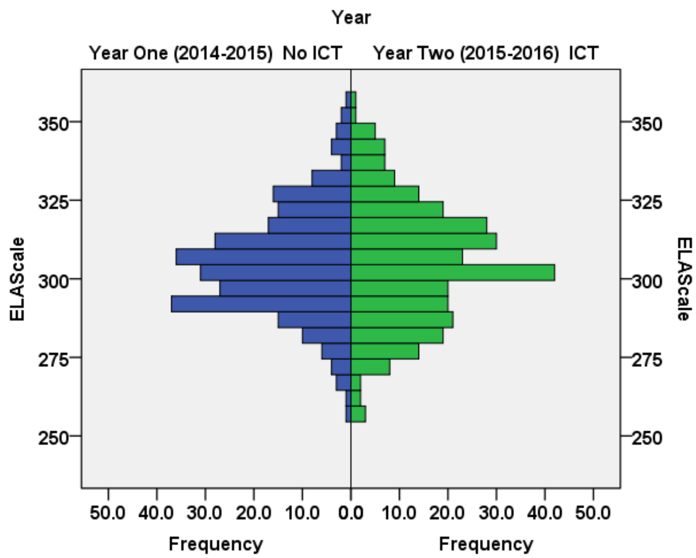

Figure 1. Frequency histograms for ELA scores from years one and two.

Comparison of Math Scores From Years One vs. Two

Descriptive statistics on Math scale scores from year one and year two are provided in Table 4.

Table 4

Descriptive Statistics on Math Scores for Year One (2014-2015) and Year Two (2015-2016)

	Year One (No ICT)	Year Two (ICT)
n	266	287
Minimum	256	256
Maximum	361	375
M	305.88	306.40
Mdn	306.00	308.00

Note. Year One is academic year 2014-2015; Year Two is academic year 2015-2016.

Figure 2 provides frequency histograms for ELA scores from years one and two in the form of a population pyramid. The distributions were similarly shaped. Consequently, the Mann-Whitney U test can be considered to provide a test of the significance of the difference between median math scores from year one (*Mdn* = 306.00) and year two (*Mdn* = 308.00). The Mann-Whitney U test found the difference to be statistically nonsignificant, U = 36988.50, $z = -0.630$, $p = .529$ (two-tail).

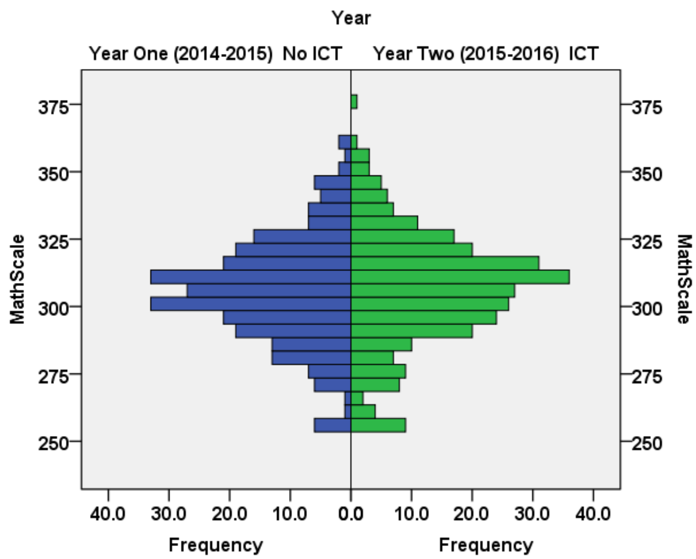

Figure 2. Frequency histograms for math scores from years one and two.

Summary

The purpose of this study was to determine if the use of ICT in fifth grade ESE inclusion classrooms had the effect of improving students' academic performance. Academic performance was measured using FAC ELA and math scale scores from academic years 2014-2015 (year one) and 2015-2016 (year two). The data were drawn from archived FSA test scores from one school district in Florida. ICT was not implemented in ESE inclusion classrooms during year one, but was incorporated into the curriculum in year two. Consequently, comparing standardized test scores obtained during these two years provided a means of assessing the effects of ICT in the ESE inclusion classroom. Two Mann-Whitney U tests were used in making those comparisons, one test which treated FSA ELA scale scores as the dependent variable, and the other which treated FSA math scale scores as the dependent variable. Sample sizes ($n = 562$ in the comparison of ELA scores from year one to year two and $n = 553$ in the comparison of math scores) were sufficient to provide over 99% statistical power to identify population differences of medium strength or larger. The Mann-Whitney U statistic was chosen as a conservative test which would be unlikely to find trivial differences to be statistically significant and was robust to any outliers, non-normal distributions, and heterogeneous sample variances. The interpretation of the Mann-Whitney U as a between-subjects test of sample medians requires that the dependent variable is distributed in a similar manner for the two samples being compared and that requirement was satisfied both for ELA score distributions and for math score distributions.

The comparison of data from years one and two on the ELA outcome variable was statistically nonsignificant. In fact, the median ELA scores were identical from year one to year two. This result did not support the research hypothesis that incorporating ICT into ESE inclusion classrooms would improve students' ELA test score performance. The exceptional level of statistical power (> 99%) that was provided for this test by the samples that were evaluated suggests that the absence of a statistically significant difference can be taken at face value and is very unlikely to be an artifact of Type II error.

Although the year two median math score was slightly higher than the median math score for year one, this difference was very small and was also found to be statistically nonsignificant. This result also failed to support the research hypothesis that using ICT in ESE inclusion classrooms would enhance students' math test score performance. Again, statistical power for this test was in excess of 99% and the lack of statistical significance is highly unlikely to be due to Type II error.

Chapter 5 will provide a summary and review of this study with an emphasis on evaluating and interpreting the results that have been presented here. Possible explanations for the failure to support the research hypothesis will be considered, including the research design that was chosen and the dependent variables used in comparing the groups. The external validity of the study's findings, i.e., their generalizability beyond the samples at hand, will also be considered. The chapter will conclude with implications for applications and future research.

Chapter 5: Discussion, Conclusions, and Recommendations

Introduction

The purpose of this quantitative study was to determine if Information and Communication Technology (ICT) integrated with curriculum instruction for Exceptional Student Education (ESE) inclusion students had an impact on academic achievement, specifically Florida State Assessment (FSA) scores. The study was designed to analyze archived FSA data from two school years' FSA data namely 2014-2015 and 2015-2016. The first school year's data was examined for a group of ESE fifth grade students who did not have access to technology integration, and was compared to the data of ESE students who had technology integration in curriculum instruction during the second school year (2015-2016).

Interpretation of the Findings

The literature showed that simply placing students with disabilities in inclusive classrooms does not necessarily facilitate or increase their learning capabilities. My findings aligned with much of the literature in that simply providing technology to ESE inclusion students in the second year, 2015-2016, did not improve these students' academic scores on the FSA tests. Supports, such as assistive technology must also be in place and be used.

In addition, the research indicates that teachers' attitudes towards students placed in inclusive classrooms are a mitigating factor in successful academic gains for the inclusive student (Mintz & Wise, 2015). Teachers are generally trained only to teach in a regular classroom, and lack experience and/or skills for working with inclusion students (Mintz

& Wise, 2015). This supports the many studies that call for more teacher preparation in the areas of technology use and teaching inclusive students. This is needed to address the diverse needs of inclusive students who are placed in the regular education classroom as shown by Fernandez-Batanero and Colmenero-Ruiz, (2016) in their study of 63 teachers and their attitudes about using ICT in the inclusion classroom.

Since my quantitative study concentrated on the relationship between technology and student scores, a teacher survey was not introduced. Therefore, my recommendations are that a more in-depth study is warranted that would support the literature that depicts a possible lack of training for teachers in the implementation of effective technology use in the classroom. A teacher survey could also provide information on the ways in which teachers integrated (or not) technology into their teaching. It is possible that, although the technology was available in classrooms, it was not utilized effectively with students, and therefore, no change in grades was noted.

The literature also shows that most students with disabilities can benefit from the use of technology, and that technology can increase students' motivation to learn, if used correctly in the classroom. Holzberg (1994) stated that even students with the most severe and profound disabilities can join a classroom of regular education students, and learn to be successful in ways that were not available in previous years.

Interestingly, the findings of this study revealed no significant difference between the ESE inclusion students' scores in school year 2014-2015 (no ICT) and the ESE inclusion students' scores in year 2015-2016 (with ICT). Therefore, the null hypothesis is accepted. Although the literature clearly predicts there should have been a change in the academic scores, there was no difference.

Limitations of the Study

One of the limitations of the study was that the participant data was from only one school district in Florida, where there are 74 school districts. It was also limited to one grade level, fifth grade ESE inclusion students, and only FSA testing data was available to analyze. A teacher survey to determine how and if technology was implemented was not available for this study, but should be considered in future research.

Recommendations

Based on the findings of this study, a different research design could be implemented. For example, a case study with a mixed method approach might have yielded data that would explain the results because it would be useful to understand possible contradictions between the quantitative data (provided for this study) and qualitative findings (provided by teachers). A teacher survey regarding the utilization and familiarization with ICT would perhaps have provided a richer data set and uncovered possible reasons for the lack of student progress between the two years of data. Although ICT was available as a resource, it is unknown whether teachers' efficacy on the use of technology had any impact on the outcome of the students' FSA scores in the second school year. Another consideration is whether the students' efficacy with ICT could have been at risk. Instead of analyzing standardized tests, which are far removed from the classroom experience, perhaps a measure that tapped students' satisfaction with their educational experience would have worked better. However, what was discovered was just as important, that the standardized tests are unresponsive to big changes in the classroom.

In the future, a more in-depth study measuring different variables with a larger sample size would help to determine a truer hypothesis because with a larger sample size, it may be possible to reveal the true nature of the population. By using a larger sample size, it would be expected that the sample mean and the sample proportion would be closer to the population mean and proportion. A larger sample size could, therefore, provide more convincing evidence. It is hoped that this study could be used as blueprint for conducting studies using similar demographics across a multi-grade level of students with varying achievement level. For instance, a benchmark study that compared normal expectations for natural growth in academics that would occur during a year of life for an average student, as compared to growth for an ESE student inclusion student.

The hypothesis that there is a significant difference in academic outcomes of fifth grade ESE inclusion students who use ICT as a resource in curriculum instruction and those inclusion students who do not, did not yield a positive outcome. Therefore, further research is recommended. One important study that could be conducted would be to interview/observe teachers to see how they use ICT in the classroom. It is possible that, although technology is available, it is not being implemented or used in a seamless manner with inclusive students. In addition, other studies, such as McKinley (2014), suggest that more research needs to be undertaken to determine if there are specific demographics, attitudes or technology efficacies among teachers that could affect technology implementation in curriculum instruction. Malcom-Bell (2012) suggests that further study could be informative by using different demographics, such as non-ESE inclusions students and perhaps higher socio-economic class. An additional recommendation is to conduct a study on teachers' perceptions of implemented technology relative to student performance on academic tests. Finally, rather than using the results of one test, a study could be done comparing the results of district mandated tests with state mandated tests.

Implications

In spite of the outcome, it could have a positive impact on social change by potentially influencing decisions on the implementation of ICT in the ESE inclusion classrooms. In the past, ESE students have been at a disadvantage when placed in the general education classroom, whereas technology can help to level the playing field. If ICT assistance is provided to inclusion students as a resource, this should lead to improved literacy skills, which will contribute to higher graduation rates among that population. Higher graduation rates will also improve the socio-economic status of individual students, particularly those students currently attending Title 1 schools.

As students become more proficient in skills required for college and career readiness, percentages for success increase, preparing students to compete for high paying jobs in the global marketplace. Since the demands made on teachers are increasing, it is imperative that teachers develop their own knowledge and skills in order to successfully educate ESE students. The European Commission (2013) states that initial education and continuous professional development of the highest quality for teachers of inclusion students is essential for the success of the ESE inclusion student.

This study has contributed to the literature concerning technology interventions and whether ICT influences academic gains or the lack thereof. It is hoped that stakeholders will evaluate and consider other factors surrounding technology implementation in ESE inclusion classrooms. Several parameters that could be investigated, include revisiting technology policies and procedures for Bring Your Own Device (BYOD), reviewing the human infrastructure of the school district and the technology infrastructure of each school.

Based upon the results of this study, the following recommendations are made:

- Provide on-going professional development in the areas of technology implementation in the ESE inclusion classroom
- Ensure that teachers who are placed in ESE inclusion classrooms have adequate training to develop the necessary skills to instruct inclusion students
- Provide an open-door policy that will enable teachers to have collaborative conversations about their needs and student needs in the ESE inclusion classroom

Conclusion

According to John Hopkins and Civic Enterprises, almost 20% of students that are expected to graduate do not (Ed.gov, 2016). Twenty-nine percent of African American students, 25% of Hispanic students, 39% of students who have limited English proficiency, and 27% of low income students do not graduate from high school (Ed.gov, 2016). These numbers reflect a declining rate in graduation when there should be an increase, given the influx of technology in the 21st century digital world. A decade ago, Warschauer (2007) stated that low socio-economic students, as a sub group, were using technology more for remedial purposes than for research. Digital engagement to enrich academics, appeared directed towards the higher income students. Implemented technology for simulations is needed to conquer the digital divide (p.148). This decade old reference is used here shows that these conditions still exist today.

The findings of this study revealed a slight improvement in math scores in school year two (2015-2016), but the ELA scores were identical for both school years analyzed. These results led me to conclude that perhaps the technology implementation was not done, or could have been used more for remediation and drills than for grade-level standards. ICT calls for on-going, purposeful research, problem-solving and completion of activities. ICT is designed to mitigate barriers and effectively motivate low-level learners to become higher-order thinking achievers who can participate in a 21st century digital learning environment.

Students need to learn to be creative, share their ideas, and collaborate with a variety of peers and teachers on a leveled playing field. ICT does that for students, when it is utilized correctly. The teacher's role in supporting a technology-rich environment is crucial to empowering students to become active learners. It is only when stakeholders acknowledge that teachers and students must effectively collaborate through technology, that a positive social change can take place.

References

Adam-Turner, N. (2016). Digital literacy adoption with academic technology namely digital information literacy to enhance student learning outcomes? In G. Chamblee & L. Langub (Eds.), *Proceedings of Society for Information Technology & Teacher Education International Conference 2016* (pp. 1666-1672). Chesapeake, VA: Association for the Advancement of Computing in Education (AACE).

Aksal, F., & Gazi, Z. (2015). Examination on ICT integration into special education schools for developing countries. *Turkish Online Journal of Educational Technology, 14*(3), 70-72.

Allen, J. (2013). Observations of effective teacher-student interactions in secondary classrooms: Predicting student achievement within the classroom assessment scoring systems secondary. *School Psychology Review, 42*(1), 76-98.

Anderson, S., Griffith, R., & Crawford, L. (2017). TPACK in special education: Preservice teacher decision making while integrating iPads into instruction. *Contemporary Issues in Technology and Teacher Education, 17*(1), 97-127 Association for the Advancement of Computing in Education (AACE).

Alsop, G., & Thompsett, C. (2007). From effect to effectiveness: The missing research questions. *Educational Technology and Society, 10*(1), 28-39.

Arukaroon, B., & Krairit, D. (2017). Impact of ICT usage in primary-school students' learning in The Case of Thailand. *International Journal of Web-Based Learning and Teaching Technologies (IJWLTT), 12*(2), 21-42.

doi:10.4018/IJWLTT.2017040102

Aslan, A., & Zhu, C. (2017), Investigating variables predicting Turkish pre-service teachers' integration of ICT into teaching practices. *British Journal of Educational Technology*, *48*: 552570.doi:10.1111/bjet.12437

Association of College and Research Libraries (ACRL). (2015). *Framework for information literacy for higher education.* Retrieved from http://www.ala.org/acrl/sites/ala.org.acrl/files/content/issues/infolit/Framework_ILHE.pdf

Bacca, J., Baldiris, S., Fabregat, R., Graf, S., & Kinshuk. (2014). Augmented reality trends in education: A systematic review of research and applications. *Educational Technology & Society, 17*(4), 133-143. Retrieved from http://www.ifets.info/

Baines, L., Baines, C., & Masterson, C. (1994). Mainstreaming: One school's reality. *Phi Delta Kappan, 76*(1), 39-40.

Baker, E., Wang, M., & Walberg, H. (1994). The effects of inclusion on learning. *Educational Leadership, 52*(4), 33-35.

Bandura, A. (1993). *Social learning theory*. Englewood Cliffs, NJ: Prentice-Hall.

Bandura, A. (2001). Social cognitive theory: An argentic perspective. *Annual Review of Psychology, 52*(1), 1-26.

Barab, S., & Plucker, J. (2002). Smart people or smart context? Cognition, ability, and talent development in an age of situated approaches to knowing and learning. *Educational Psychologist, 117*(2), 288-318.

Bates, A. (2011). *Managing technology in higher education: Strategies for transforming Teaching and learning.* San Francisco, CA: Jossey-Bass/Wiley.

Bebell, D., & Kay, R. (2010). One to one computing: A summary of the quantitative results from the Berkshire learning initiative. *The Journal of Technology, Learning and Assessment, 9* (2), 5-60.

Bennett, M., & Maton, K., & Kervin, L. (2008). The digital natives debate: A critical review of the evidence. *British Journal of Educational Technology, 39*(5), 775-786.

Benton, L., & Johnson, H. (2015). Widening participation in technology design: A review of the involvement of children with special educational needs and disabilities. *International Journal of Child-Computer Interaction*, *3-4*23-40. doi: 10.1016/j.ijcci.2015.07.001

Bernard, R., Abrami, P., Lou, Y., Borokhovski, E., Wade, A., & Wozney, L. (2004). How does distance education compare with classroom instruction? *Review of Educational Research, 74*(3), 379-439.

Bernard, R., Abrami, P., Borokhovski, E., Wade, A., Tamin, R., & Surkes, M. (2009). A meta-analysis of three types of interaction treatments in distance education. *Review of Educational Research, 79*(3), 1243-1289.

Billingsley, B., & McLeskey, A. (2004). Special education teacher retention and attrition: A critical analysis of the research literature. *The Journal of Special Education, 38*(1), 39-55.

Bindu, C. (2017). Attitude of, and awareness of using ICT in classrooms: A case of expatriate teachers in UAE. *Journal of Educational Practice 8* (1), pp 10-17 Retrieved from http://files.eric.ed.gov/fulltext/EJ1131567.pdf

Blanskat, A., Blamire, R., & Kefala, S. (2006). *A review of studies of ICT impact on schools in Europe*. Retrieved from http://unpan1.un.org/intradoc/groups/public/documents/unpan/unpan037334.pdf

Bogan, M., Harper, S., & Bifuh-Ambe, B. (2014). Elementary pre-service mathematics teachers and technology: Are they ready*? Journal of Academic and Business Ethics*, *2*(1), 1.

Bornstein, M., Jager, J., & Putnick, D. (2013). Sampling in developmental science: Situations, shortcomings, solutions, and standards. *Developmental Review: DR*, *33*(4), 357–370. http://doi.org/10.1016/j.dr.2013.08.003

Boyle, C., Topping, K., & Jindal-Snape, D. (2013). Teachers' attitudes towards inclusion in high schools. *Teachers and Teaching: Theory and Practice*, *19*(5), 527-542. doi: 10.1080/13540602.2013.827361

Bransford, J., Brown, A., & Cocking, R. (Eds). (2000). *How people learn: Brain, mind, experience and school*. Washington, D.C.: National Academy Press.

Bricker, V. (2015). iPads for Access, Independence, and Achievement. *Odyssey: New Directions in Deaf Education*, *16*, 10-13.

Braunsteiner, M., & Mariano-Lapidus, S. (2014). A perspective of inclusion: Challenges for the future. Global Education Review, *1*, 32-43.

Bruner, J. (1966). *Toward a theory of instruction*. Cambridge, MA: Harvard University Press.

Cagran, B., & Schmidt, M. (2011). Attitudes of Slovene teachers towards the inclusion of pupils with different types of special needs in primary school. *Educational Studies*, *37*(2), 171–195.

Campbell, J., & Oblinger, D. (2007). *Academic analytics.* Retrieved from https://net.educause.edu/ir/library/pdf/PUB6101.pdf

Castro, C. (2003). *Education in the information age: Promises and frustrations.* Retrieved from http://www.iadb.org/sds/doc/Edu&Tech2.pdf.

Cavanaugh, K. (2003). *Preparing teachers for the inclusion classroom: Understanding assistive technology and its role in education*. Retrieved from https://www.unf.edu/~

Casarez, L., & Shipley, G. (2016). Accessibility Through Universal Design in Online Education. In *Proceedings of E-Learn: World Conference on E-Learning in Corporate, Government, Healthcare, and Higher Education 2016* (pp. 345-350). Chesapeake, VA: Association for the Advancement of Computing in Education (AACE).

Chigona, A., & Chigona, W. (2010). *An investigation of factors affecting the use of ICT for teaching in the western Cape schools.* Presented at the 18th European Conference on Information Systems, Pretoria, South Africa.

Choy, D., Wong, A., & Gao, P. (2009). Student teachers' intentions and actions on integrating technology into their classrooms during student teaching: A Singapore study. *Journal of Research on Technology in Education*, *42*(2), 175–195.

Clark, R. (1994). Media will never influence learning. *Educational Technology Research* *and Development, 42*(2), 21-29.

Cohen, J. (1992). A power primer. *Psychological Bulletin, 112*, 155-159.

Comi, S., Gui, M., Origo, F., Pagani, L., & Argentin, G. (2016). Is this the way they use it? Teachers, ICT and student achievement. *Econ Papers.* Retrieved from http://econpapers.repec.org/paper/mibwpaper/341.htm

Conto, S. (2009). ICT and NGO: Difficulties in attempting to be extremely transparent. *Ethics and Information Technology*, *11*(3), 221-131. doi: 10.1007/s10676009-9180-3.

Cox, M., & Abbott, C. (2004). ICT and attainment: A review of the research literature, Coventry and London, British Educational Communications and Technology Agency/Department for Education and Skills.

Cox, M., Preston, C., & Cox, K. (1999). *What factors support or prevent teachers from using ICT in their classrooms*? London, UK: Kings College.

Creswell, J. (2012). *Qualitative inquiry and research design: Choosing among the five approaches.* Thousand Oaks, CA: Sage.

Cunningham, C., Lachapelle, C., & Lindgren-Streicher, A. (2009). Elementary teachers' understandings of engineering and technology. In *American Society for Engineering Education Annual Conference & Exposition*. Chicago, IL: American Society for Engineering Education.

Daggett, W. R. (2010). *Preparing students for their technological future.* Rexford, NY: International Center for Leadership in Education.

Darling-Hammond, L. (2012). *Creating a comprehensive system for evaluating and* *supporting effective teaching.* Retrieved from https://edpolicy.stanford.edu/sites/default/files/publications/creating-comprehensive-system-evaluating-and-supporting-effective-teaching.pdf

Dattalo, P. (2008). *Determining sample size: Balancing power, precision, and practicality.* Oxford: Oxford University Press.

DeGennaro, D., & Brown, T. (2009). Youth voices: Connections between history, enacted culture and identity in a digital divide initiative. *Cultural Studies of Science Education, 4*(1), 13–39.

Demetriou, A. (1998). A three-level of theory of the developing mind: Basic principles and implications for instruction and assessment. In R. J. Sternberg & W. M. Williams (Eds.), *Intelligence, instruction, and assessment*. (pp. 149–199). Hillsdale, NJ: Erlbaum.

Demetriou, A. (2003). Introduction. *Monographs of the Society for Research in Child Development*, *67*(1), 1–38. doi: 10.1111/1540-5834.671174.

Demetriou, A., Spanoudis, G., & Mouyi, A. (2011). Educating the developing mind: Towards an overarching paradigm. *Educational Psychology Review, 2011*(23), 601. doi: 10.1007/s10648-011-9178-3.

DiMiola, D., & Conterelli, C. (2008). *Importance of inclusion classrooms.* Retrieved from http://specialed.about.com/cs/integration/a/inclusion.htm

Education for All Handicapped Children Act of 1975. (1975). PL 94-142, 20 U.S.C 1401

Elmaifi, J. (2014). *Advantages of using ICT in the Learning-Teaching process.* Retrieved from http://edtechreview.in/trends-insights/insights/959-advantages-of-using-ict-in-learning-teaching-processes

Elmore, T. (2010). *Generation iY: Our last chance to save their future*. Norcross, GA: Poet Gardener.

Ernst, J., & Clark, A. (2012). Fundamental computer science design. *Journal of STEM Education: Innovations & Research*, *13*(2), 40-45.

Ernst, J., & Williams, Jr., T. (2015). Technology and engineering accommodation service profile: An ex post facto research design. *Journal of Technology Education 26* (n1) pp 64-74.

Eskay, M., Ezegbe, N., Anyanwu, J., & Ikwumelu, S. (2013). Implementation of information and communication technology in inclusive education in Nigeria: Future perspective. *International Journal of Computer Science Issues (IJCSI)*. Mahebourg *10*(4) pp. 317-325.

Espique, F. (2008). *Integrating computer technology in handling students with special learning needs.* Retrieved from http://www.fit-ed.org/congress2008/contents/ESPIQUE/Espique%20PAPER.pdf.

European Commission (2013). *Supporting teacher competency development for better learning outcomes.* Retrieved from http://ec.europa.eu/education/policy/school/teaching-professions_en

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

Fernandez-Batanero, J., & Colmenero-Ruiz, M. (2016). ICT and inclusive education:

Attitudes of the teachers in secondary education. Journal of Technology and Science Education, 6(1), 19-25. doi:http://dx.doi.org/10.3926/jotse.208.

Fletcher, A. (2008, November). Giving students ownership of learning, 2005. *Educational Leadership, 66*(3).

Fletcher-Watson, S. (2014). Evidenced-based design and commercialization: Recommendations derived from research in education and autism. *Tech Trends, 59*(1), 84-88.

Florida Department of Education (FDOE). (2016). K-12 student assessment. Retrieved from http://www.fldoe.org/accountability/assessments/k-12-student-assessment/fsa.stml

Fontichiaro, K. (2012). *Everything you wanted to know about information literacy but were afraid to Google.* Ann Arbor, MI: University of Michigan.

Foss, E., Guha, M., Franklin, L., Clegg, T., Findlater, L., & Yip, J. (2013). *Designing technology with students with learning differences: Implementing modified cooperative inquiry*. University of Maryland: College Park, MD.

Fu, J. (2013). ICT in education: A critical literature review and its implications. *International Journal of Education and Development Using Information and Communication Technology*. *Bridgetown 9*(1) pp. 1120125. Retrieved from http://search.proquest.com.ezp.waldenulibrary.org/central/docview/1353086729/18BF8FFC068A45B2PQ/6?accountid=14872

Gall, M., Borg, W., & Gall, J. (2007). *Educational research: An introduction*. (8th ed.) Boston, MA: Pearson/Allyn & Bacon.

Girgin, U., Kurt, A., & Odabasi, F. (2011). Technology integration issues in a special education school in Turkey. *Cypriot Journal of Educational Sciences, 6*(1). Retrieved from http://www.world-education-center.org/index.php/cjes

Glover, D., & Miller, D. (2001). Running with technology: The pedagogic impact of the large-scale introduction of interactive whiteboards in one secondary school. *Technology, Pedagogy and Education, 10*(3), 257-258.

Goddard, C. (1998). *Semantic analysis: A practical introduction*: New York, NY: Oxford University Press.

Gresham, F, Sugai, G., & Horner, R. (2001). Interpreting outcomes of social skills training for students with high-incidence disabilities. *Exceptional Children, 67*(3), 332.

Gulbahar, Y., & Guven, I. (2008). A survey on ICT usage and the perceptions of social studies teachers in Turkey. *Educational Technology & Society, 11*(3), 37-51.

Gupta, A., & Ferguson, J. (1992). Beyond “culture”: Space, identity, and the politics of difference. *Cultural Anthropology, 7*(1), 6–23. doi: 10.1525/can.1992.7.1.02a00020.

Hakverdi-Can, M., & Dana, T. (2012). Exemplary science teachers’ use of technology. *Turkish Online Journal of Educational Technology, 11*(1), 94-112. Retrieved from http://internationalschoolsandict.wordpress.com/2012/03/30/how-do-exemplary-scienceteachers-use-technology/

Hanushek, E. (2014). Enhancing teacher education with simulations. *Tech Trends, 60*(3), 260-267.

Hardman, J. (2005). An exploratory case study of computer uses in a primary school mathematics classroom: New technology, new pedagogy? *Perspectives in Education, 23*(4).

Hardman, E. (2015). How pedagogy 2.0 can foster teacher preparation and community building in special education. *Social Inclusion, 3* (6) 42-55. doi:10.17645/si. v316.415

Harris, J., & Al-Bataineh, A. (2015). One to one technology and its effect on student academic achievement and motivation. In *Proceedings of Global Learn 2015* (pp. 579-584). Association for the Advancement of Computing in Education (AACE).

Hasselbring, T. (2001). A possible future of special education technology. *Journal of Special Education Technology, 164*(4), 19-26.

Hatakka, M. (2009). Build it and they will come? Inhibiting factors for reuse of open content in developing countries: *Electronic Journal of Information Systems in Developing Countries, 37*(5), 1-16.

Head, A., & Eisenberg, B. (2009). *Lessons learned: How college students seek information in the digital age.* Retrieved from http://projectinfolit.org/pdfs/PIL_Fall2009_finalv_YR1_12_2009v2.pdf

Hechter, R., & Vermette, L. (2014). Tech-savvy science education? Understanding teacher pedagogical practices for integrating technology in K-12 classrooms. *Journal of Computers in Mathematics and Science Teaching, 33*(1), 27-47.

Henning, M., & Mitchell, L. (2002). Preparing for inclusion. *Child Study Journal,32*(1), 19-29.

Hernández, J., Chalela, S., Arias, J., & Arias, A. (2017). Research trends in the study of ICT based learning communities: A bibliometric analysis. *EURASIA Journal of Mathematics, Science and Technology Education*, *13*(5), 1539-1562.

Hew, K., & Brush, T. (2006). Integrating technology into K-12 teaching and learning: Current knowledge gaps and recommendations for future research. *Educational Technology Research*, *55*, 223-252.

Hilton, A., & Liberty, K. (1992). The challenge of ensuring educational gains for students with severe disabilities who are placed in more integrated settings. *Education and Training of the Mentally Retarded, 27*(2), 167-175.

Hobgood, B., & Goddard, B. (2011). *Inclusion in the 21st Century: Differentiating with technology*. Retrieved from http://www.learnnc.org/lp/editions/every-learner/6776

Hocutt, A. (1996). Effectiveness of special education: Is placement the critical factor? *Special Education for Students with Disabilities, 6*(1), 77-102.

Hofstetter, F. (2001). The future's future: Implication of emerging technology for special education program planning. *Journal of Special Education Technology, 16*(4), 7-13.

Holzberg, C. Technology in special education. *Technology and Learning 14*(7) (1994):18-21.

Howery, K., McClellan, T., & Pedersen-Bayus, K. (2013). Reaching every student with a pyramid of intervention approach: One district's journey. *Canadian Journal of Education*, *36*(1), 271-304.

Hsu, M., Cardella, M., Purzer, S., & Diaz, N. (2010). Elementary teachers' perceptions of engineering and familiarity with design, engineering and technology: Perspectives from a national population. Paper presented at American Society for Engineering Education 2010 Annual Conference.

Huitt, W., & Hummel, J. (2003). *Piaget's theory of cognitive development.* Valdosta, GA: Valdosta State University.

Hunt, P., Farron-Davis, F., Beckstead, S., Curtis, D., & Goetz, L. (1994). Evaluating the effects of placement of students with severe disabilities in general education versus special classes. *Journal of the Association for Persons with Severe Handicaps, 19*(3) 200-214.

Ilomaki, L. (2008). *The effect of ICT on school: Teachers and students' perspectives.* Turun Yliopiston Julkaisuja: Annales Universitatis Turkunsis.

International Council for Education of People with Visual Impairment. (2010, January). Inclusive education. *The Educator, 22*(2), 1-40.

International Society for Technology in Education (ISTE). (2007). *Profiles for Technology ICT Literate students.* Retrieved from http://www.iste.orgContent/NavagtionMenu/ NETS/ForStudents/2007Standards/NETS-S_2007_Student_Profiles.pdf.

Israel, M., Marino, M., Delisio, L., & Serianni, B. (2014). *Supporting content learning through technology for K-12 students with disabilities.* Gainesville, FL: CEEDAR Center.

Istenic, A. (2010). Educational technology for the inclusive classroom. *The Turkish*

Online Journal of Educational Technology, *9*(3), 26-37.

Jones, F. (2000). *Tools for teaching*. Hong Kong, China: Frederic H. Jones & Associates.

Kale, U., & Goh, D. (2014). Teaching style, ICT experience, and teachers' attitudes towards teaching with Web 2.0. *Journal of Education and Information Technologies*, *19*(1).

Kazemi, E., Ghousseini, H., Cunard, A., & Turrou, A. (2015). Getting inside rehearsals: Insights from teacher educators to support work on complex practice. *Journal of Teacher Education, 67*(1). Retrieved from http://journals.sagepub.com/home/jte

Keser, H., Uzunboylu, H., & Ozdamli, F. (2012). The trends in technology supported collaborative learning studies in 21st century. *World Journal on Educational Technology, 3*(2), 103-119.

Kilic, C. (2017). Examining music teachers' self confidence levels in using information and communication technologies for education based on measurable variables. *Educational Research and Reviews*, *12*(n3) pp101-107.

Kiili, C., Kauppinen, M., Coiro, J., & Utriainen, J. (2016). Measuring and supporting pre-service teachers' self-efficacy towards computers, teaching, and technology integration. *Journal of Technology and Teacher Education*, *24*(4), 443-469. Chesapeake, VA: Society for Information Technology & Teacher Education.

Kim, B., & Reeves, T. (2007). Reframing research on learning with technology: In search of the meaning of cognitive tools. *Instructional Science*, *35*(3), 207-256.

Kleinhammer-Trammell, P., Geiger, W., & Morningstar, M. (2003). Policy contexts for transition personnel preparation: An analysis of transition-related credentials, standards, and course requirements in state certification and licensure policies. *Career Development for Exceptional Individuals, 26*(1), 185-206.

Knott, L., & Asselin, S. (1999). Transition competencies: Perceptions of secondary special education teachers. *Teacher Education and Special Education, 22*(1), 55-65.

Knowles, M. (1975). *Self-directed learning*. New York, NY: Cambridge.

Koh., Chai, C., & Lim, W. (2016). Teacher professional development for TPACK-21CL. *Journal of Educational Computing Research V 55* (2) pp 172-196 doi: 10.1177/0735633116656848

Kolb, D. (2014). *Experiential learning: Experience as the source of learning and development.* Upper Saddle River, NJ: Pearson.

Kozma, R. (1991). Learning with media. *Review of Educational Research, 61*(2), 179-212.

Kozma, R., & Russell, J. (2011). Multimedia learning of chemistry. In R.E. Mayer (Eds.). *Cambridge handbook of multimedia learning* (pp.409-428). New York, NY: Cambridge.

Lanni, D. (2005). *The rationale: ICT in language teaching in 6 points.* Retrieved from http://www.itiscannizzaro.net/lanni/articles/rationale.htm.

Laurillard, D. (2008). TPD as online collaborative learning for innovation in teaching. In O. Lindberg & A. D. Olofsson (Eds.), *Online learning and Teaching Professional Development: Methods for Improved Educational Delivery*. Berlin, Germany: Springer.

Lehmann, E. (2006).; *Elements of large sample theory* New York: Springer.

Levine, A. (2006). Stranger than fiction: Arthur Levine's educating school teachers: The basis for a proposal. *Journal of Teacher Education, 58*(3), 195-201.

Lewis, C. (2015). Preservice teachers' ability to identify technology standards: Does curriculum matter? *Contemporary Issues in Technology and Teacher Education, 15*(2), 235-254. Association for the Advancement of Computing in Education (AACE).

Leye, V. (2007). UNESCO, ICT corporations and the passion of ICT for development: Modernization resurrected. *Media, Culture & Society*, *29*(6), 972-993.

Lison, C. (2012). The scholarship of teaching and learning. *Journal of the Scholarship of Teaching and Learning*, *7*(2), 1 – 21.

Liu, S. (2011). A multivariate model of factors influencing technology use by preservice teachers during practice teaching. *Educational Technology & Society, 15*(4), 137-149.

Mady, C., & Muhling, S. (2017). Instructional supports for students with special education needs in French as second language education: A review of Canadian empirical literature. *Journal of Education and Learning v 6* (3) Retrieved from https://www.google.com/search?q=E-Inclusion+in+Early+French+Immersion+Classrooms%3A+Using+Digital+Technologies+to+Support+Inclusive+Practices+that+Meet+the+Needs+of+All+Learners&ie=utf-8&oe=utf-8

Maciver, D., Hunter, C., Adamson, A., Grayson, Z., Forsyth, K., & McLeod, I. (2017)

Supporting successful inclusive practices for learners with disabilities in high schools: A multisite, mixed method collective study. *Disability and Rehabilitation.* Retrieved from http://dx.doi.org/10.1080/09638288.2017.1306586

Maende, J., & Opiyo, D. (2014). Mainstreaming ICT in education: A step towards sustainable national ICT competency framework for teachers (ICTCFT). *International Journal of Management Research and Reviews.* May, pp 557-663. Retrieved from http://search.proquest.com.ezp.waldenulibrary.org/central/docview/1545869479/18BF8FFC068A45B2PQ/4?accountid=14872

Malcolm-Bell, A. (2010). A mixed methods study of technology integration in rural primary and secondary high schools in Jamaica (Doctoral dissertation). ProQuest Dissertations and Theses database. (UMI No. 3403023).

Marra, R., & Bogue, B. (2006). *A critical assessment of online survey tools.* Retrieved from http://www.engr.psu.edu/awe/misc/researchpagepdfs/126-marra-criticalsurvey.pdf.

McKinley, B. (2014). *The relationship of faculty demographics and attitudes towards technology integration* (Doctoral dissertation). Retrieved from ProQuest Dissertations and Theses database. (UMI No. 3610201).

McTighe, J., & Brown, J. (2010). Differentiated instruction and educational standards: Is détente possible? *Theory into Practice*, *44*(3), 234–244.

Means, B., Roschelle, R., Penuel, W., Sabelli, N., & Haertal, G. (2004). Technology's contribution to teaching and policy: Efficiency, standardization, or transformation? In R. E. Floden (Ed.), *Review of research in education* (Vol. 27). Washington, D.C.: American Educational Research Association.

Miller, L., Naidoo, M., van Belle, J., & Chigona, W. (2006). School-level adoption factors in the western Cape schools. *Fourth IEEE International Workshop on Technology for Education in Developing Countries*, 57-61.

Miller, L, & Lovler, R. (2017). *Foundations of psychological testing: A practical approach* (5th ed.). Thousand Oaks, CA: Sage.

Mintz, J., & Wyse, D. (2015). Inclusive pedagogy and knowledge in special education: addressing the tension. *International Journal of Inclusive Education* 19:11, pages 1161-1171.

Mishra, P., & Koehler, M. (2006). Technological pedagogical content knowledge: A framework for teacher knowledge. *Teachers College Record, 108*(6), 1017-1054.

Moseley, D., Higgins, S., Bramald, R. Hardman, F., Miller, J., Mroz, M., & Stout, J. (1999). *Ways forward with ICT: Effective pedagogy using information and communications technology in literacy and numeracy in primary Schools*. Retrieved from http://www.ncl.ac.uk/ecls/research/project_ttaict/

Mousa, C., & Barrett-Greenly, T. (2015). Bridging the app gap: An Examination of a professional development initiative on mobile learning in urban schools. *Computers and Education, 88:*1-14.

Mumtaz, S. (2000). Factors affecting teachers' use of information and communications technology: A review of the literature. *Journal of Information Technology for Teacher Education, 9*(3), 319-342.

Muthen, L., & Muthen, B. (2012*). MPlus User's Guide. Seventh Edi*tion: Los Angeles, CA.

Naranjo, J., Frizelle, S., & Duesbery, L. (2016). Connecting research to practice in online teacher education and special education: Teacher perceptions of linking professional learning with the daily work of inclusive teaching. In G. Chamblee & L. Langub (Eds.), *Proceedings of Society for Information Technology & Teacher Education International Conference 2016* (pp. 5353-5355). Chesapeake, VA: Association for the Advancement of Computing in Education (AACE).

National Education Association. (2012). *Preparing 21st century students for a global society.* Retrieved from http://www.nea.org/assets/docs/A-Guide-to-Four-Cs.pdf

Newhouse, P. (2002). *The impact of ICT on learning and teaching: A literature review for the Western Australian Department of Education.* Retrieved from http://www.principals.in/uploads/pdf/ICT/ICT.pdf

Norman, D. (1993). *Things that make us smart: Defending human attributes in the age of Human machines.* Cambridge, MA: Perseus Books.

Norwich, B. (2014). How does the capability approach address current issues in special education needs, disability and inclusive education field? *Journal of Research in Special Educational Needs, 14*(1), 16-21.

Nussbaum, M. (2002). Capabilities and disabilities: Justice for mentally disabled citizens. *Philosophical Topics, 30*(2), 133-165.

Oosterlaken, I., & van den Hoven, J. (Eds). (2012). *The capability approach, technology and design.* New York, NY: Springer.

Papamitsiou, Z., & Economides, A. (2014). Learning analytics and educational data mining in practice: A systematic literature review of empirical evidence. *Educational Technology & Society, 17*(4), 49-64. Retrieved from http://ifets.info/

Papert, S. (1997). Bridging the gap: Technology trends and use of technology in schools. *Educational Technology and Society, 16*(2), 59-68.

Papert, S. (2002). *Mindstorms: Children, computers and powerful ideas* (3rd ed.) New York, NY: Basic Books.

Parette, H., Hourcade, J., Nichole, M., Boeckmann, N., & Blum, C. (2008). Using Microsoft® PowerPoint™ to support emergent literacy skill development for young children at-risk or who have disabilities. *Early Childhood Education Journal, 36*(3), 233–239.

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), 1-22.

Pea, R. (2004). Vygotsky's Zone of proximal development and problem-based learning: Linking a theoretical concept with practice through action research. *Teaching in Higher Education, 8*(2).

Perles, K. (2015). Mainstreaming vs Inclusion in special education: What's the difference? Retrieved from Wisconsin Education Association Council http://weac.org/articles/specialedinc/

Phillips, W., Alfred, K., Brulli, A., & Shank, K. (1990). The regular education initiative: The will and skill of regular educators. *Teacher Education and Special*

Education, 13(3-4), 182-186.

Prensky, M. (2010). *Teaching digital natives: Partnering for red learning*. Thousand Oaks, CA: Corwin.

Privitera, G. J. (2018). *Statistics for the behavioral sciences* (3rd ed.). Thousand Oaks, CA: Sage.

Reindal, S. (2008). Disability, capability, and special education: Towards a capability-based theory. *European Journal of Special Needs Education, 24*(2), 155-168.

Ribiero, S. (2016). Developing intercultural awareness using digital storytelling. *Language and Intercultural Communication*, *16*(1), 69-82.

Rosenzweig, K. (2009). Are today's general education teachers prepared to meet the needs of their inclusive students? *NERA Conference Proceedings 2009.* Retrieved from http://digitalcommons.uconn.edu/nera_2009/10.

Rosseel, Y. (2012). Lavaan: An R package for structural equation modeling. *Journal of Statistical Software*, *48(2),* 1-36.

Rupley, W., Paige, D., Rasinski, T., & Slough, S. (2015). Multi-touch tablets, e-books, and an emerging multi-coding/multi-sensory theory for reading science e-textbooks: Considering the struggling reader. *Journal of Education and Training Studies, 3*(4), 1-8.

Scherer, R., Rohatgi, A., & Hatlevik, O. (2017). Students' profiles of ICT use: Identification, determinants, and relations to achievement in a computer and information literacy test. *Computers in Human Behavior*, *70*, 486-499.

Shumway, J., Moyer-Packenham, P., Baker, J., Westenskow, A., Anderson-Pence, K., Tucker, S., Boyer-Thurgood, J., & Jordan, K.(2016). Using open-response fraction items to explore the relationship between instructional modalities and students' solution strategies. *International Journal of Education in Mathematics, Science and Technology*, *4.2. 112-132*

Ryan, C., & Bauman, K. (2016, March). *Educational attainment in the United States: 4.2* 112-132.

Santi, G., & Baccaglini-Frank, A. (2015). Forms of generalization in students experiencing mathematical learning difficulties. *PNA*, *9*(3), 217-243.

Schacter, J. (1999). *The impact of educational technology on student achievement: What the most current research has to say*. Santa Monica, CA: Milken Exchange on Educational Technology.

Scrimshaw, P. (2004). *Enabling teachers to make successful use of ICT*. Coventry, UK: British Educational Communications and Technology Agency (BECTA).

Scriven, M. (1991). *Evaluation thesaurus* (4th ed.) Newbury Park, CA: Sage.

Sen, A. (2000). *Development as freedom.* New York, NY: Random House.

Sessions, L., Kang, M., & Womack, S. (2016). The neglected “R”: Improving writing instruction through iPad apps. *TechTrends*, *60*(3), 218-25.

Simonson, M., Smaldino, S., Albright, M., & Zvacek, S. (2012). *Teaching and learning at a distance: Foundations of distance education* (5th ed.). Boston, MA: Pearson. Sivin-Kachala, J., & Bialo, E. (2009). The effects and uses of educational technology in learning and teaching. *SLMQ, 17*(1).

Spector, J. (2012). *Foundations of educational technology*. New York, NY: Routledge.

Starr, L., (2011). *Integrating technology in the classroom: It takes more than just having computers.* Retrieved from http://www.educationworld,com/a_tech/ Tech/tech146.shtml.

Steiner, D., & Mendelovitch, M. (2017). "I'm The Same Teacher": The attitudes of science and computer literacy teachers regarding integrating ICT in instruction to advance meaningful learning. *EURASIA Journal of Mathematics, Science and Technology Education, 13*(5), 1259-1282. DOI: 10.12973/eurasia.2017.00670a

Thompson, C., & Davis, S. (2013). Predictive relationships among the uses of technology in elementary mathematics classrooms and student achievement: Graduate mathematics education students engaged in community-based observational research. In R. McBride & M. Searson (Eds.), Proceedings of Society for Information Technology & Teacher Education International Conference 2013 (pp.2466-2472). Retrieved from http://www.editlib.org/p48472

Thurow, M. (2002). Educating students with disabilities: Do you pass the test? *Principal Leadership*, *6*(4), 12-15.

Trilling, B., & Fadel, C. (2009). *21st century skills: Learning for life in our times*. Hoboken, NJ: Jossey-Bass.

Trucano, M. (2005). *Knowledge maps: ICTs in Education.* Washington, DC: InfoDev.

Turnbull, A. (2013). *Exceptional lives: Special education in today's schools* (7th ed.).

Upper Saddle River, NJ: Pearson.

Umrani, F., & Ghadially, R. (2003). Empowering women through ICT education: Facilitating computer adoption. *Gender, Technology and Development, 7*(3), 359-377.

U.S. Department of Education (2005). *Twenty-sixth annual report to Congress on the implementation of the Individuals with Disabilities Education Act.* Washington, D.C.: Author.

U.S. Department of Education. (2012). *Building the legacy: IDEA 2004*. Retrieved from http://idea.ed.gov/explore/view/p/%2Croot%2Cdynamic%2CTopicalBrief%2C20%2C

U.S. Department of Education. (2013). *Recognizing educational success, professional excellence, and collaborative teaching (RESPECT).* Washington, D.C.: Author.

U.S. Department of Education. (2015). *Building the legacy: 2004*. Retrieved from http://idea.ed.gov/

U.S. Department of Education. (2016). *New law: Every Student Succeeds Act. (504 Plans).* Retrieved from http://www.ed.gov/essa.

Valcke, M., Sang, G., Rots, I., & Hermans, R. (2010). Taking prospective teachers' beliefs into account in teacher education. In E. Baker, B. McGraw & P. Peterson (Eds.), *International encyclopedia of education* (3rd ed; pp. 622-628). Oxford, UK: Elsevier.

Van Laarhoven, T., Kos, D., Weichle, K., Johnson, J., & Burgin, X. (2014). Comparison of video modeling and video feedback to increase employment-related social skills of learners with developmental disabilities. *DADD Online Journal, 1*(1), 69-90.

Vaughn, S., Bos, C., & Schumm, J. (2007). *Teaching students who are exceptional, diverse, and at-risk in the general education classroom* (4th ed.) New York, NY: Pearson.

Vygotsky, L. (1978). Interaction between learning and development. In Gauvain & Cole (Eds.), *Readings on the development of children*. New York, NY: Scientific.

Wallace, T., & Georgina, D. (2014). Preparing special education teachers to use educational technology to enhance student learning. *International Association for Development of the Information Society, 11th International Conference.*

Wenger, E. (1998). *Communities of practice: Learning, meaning, and identity.* Cambridge, UK: Cambridge University Press.

Wejekumar, K., Meyer, B., & Lei, P. (2013). High-fidelity implementation of web-based intelligent tutoring system improves fourth and fifth graders content area reading comprehension. *Computers and Education, 68*: 336-379.

Wenglinsky, H. (1998). *Does it compute? The relationship between educational technology and student achievement in mathematics*. Princeton, NJ: ETS Policy Information Center.

Wheelock, A., & Merrick, S. (2015). *5 virtual worlds for engaged learning.* Retrieved from https://www.iste.org/explore/articleDetail?articleid=395

Winn, W. (2002). Current trends in educational technology research. The study of learning environments. *Educational Psychology Review, 14*(6), 331-351.

Wisconsin Education Association Council. (2014). *Special education inclusion.* Retrieved from http://weac.org/articles/specialedinc/

Worrell, J. (2008). How secondary schools can avoid the seven-deadly school “sins of of inclusion.” *American Secondary Education*, *36*(1), 43-56.

Yell, M., Rogers, D., & Rogers, E. (1998). The legal history of special education: “What a long, strange trip it's been!" *Remedial and Special Education*, *19*(4), 219-228.

Yell, M., & Shriner, J. G. (1996). Inclusive education: Legal and policy implications. *Preventing School Failure, 40*(3), 101-116.

Yen, W. (1984). Effects of local item dependence on the fit and equating performance of the three-parameter logistic model. *Applied Psychological Measurement, 8*, 125-145.

Yilmaz, A. (2011). Detecting and tracking the action content. In T. Gevers and A. Ali Salah, *Computer analysis of human behavior: Advances in pattern recognition* (pp. 41-68). New York, NY: Springer Verlag.

Yumurtaci, O. (2017) A Re-evaluation of mobile communication technology: A theoretical approach for technology contemporary digital learning. *Turkish Online Journal of Distance Education 18* (n1) Article 15, pp213-223.

Young, C., & Bush, J. (2004). Teaching the English language arts with technology: A critical approach and pedagogical framework. *Contemporary Issues in Technology and Teacher Education, 4*(1), 1-22.

Young, A., Reiser, R., & Dick, W. (1996). Do superior teachers employ systematic instructional planning procedures? A descriptive study. *Educational Technology*

Research and Development, 46(2), 65-78 doi: 10.1007/bf02299789.

Zigmond, N., & Baker, J. (1995). Concluding comments: Current and future practices in inclusive schooling. *The Journal of Special Education, 29*(2), 245-250.

Zheng, Y. (2012). Evaluating emerging ICTs: A critical capability approach to technology. In *The technology approach, technology and design*. New York, NY: Springer.

Zhou, L., Smith, D., Parker, A., & Griffin-Shirley, N. (2011). Assistive technology competencies of teachers of students with visual impairments: A comparison of perceptions. *Journal of Visual Impairment & Blindness, 105*(9), 553-547.

Appendix A

Permission Letters

Research Request Form | 2015

Bay District Schools
1311 Balboa Ave.
Panama City, FL 32401

Date 6-02-2017

Submit this form (with the chapters 1-3 of dissertation) to BDS Research Chair: Dr. Caryl Van de Boe via email at vandeca@bay.k12.fl.us.

1) Researcher information:

Name Patricia Marcino
Address 62 Park Pl Panama City Beach, FL 32413
Phone number 850-387-8066

2) Research Information:

Research Study type: ___ Qualitative X Quantitative ___ Mixed

Data Retrieval:
___ State-wide (list type)
___ County-wide (list)
___ Cumulative folder (information sought)
___ Survey (type)
X Other (list) FSA data (archived)

Project Study Title or Problem: How ICT can impact student achievement for ESE Inclusion Students

Purpose of Study: To determine whether ICT can be used as a resource for ESE Inclusion Students to improve academic achievement

Relevant Information:

3) Procedure:

Schools used in study: 21 elementary (Bay county) No. of students: 210
Grade levels used in study: 5th grade
Sampling population used: ESE inclusion
Sampling Method: archived data
School time involved: 0
Study or test administered: 0 Date of testing 2014-2016
Test administration time needed: 0
Administration process: X groups (list) do not have list yet
___ individually (list)

Results of Study: x will be made ___ will not be made available

Patricia Marcino
Applicant Signature

Dr. Carol Watson
Major University Professor
Carol Watson

IRB University Chair

Official BDS Office Only

Research Chair, Bay District Schools

Superintendent of Bay District Schools

lmca/klr

Research Request Form | 2015

Bay District Schools
1311 Balboa Ave.
Panama City, FL 32401

Date 6-02-2017

Submit this form (with the chapters 1-3 of dissertation) to BDS Research Chair: Dr. Caryl Van de Boe via email at vandeca@bay.k12.fl.us.

1) Researcher information:

Name Patricia Marcino
Address 62 Park Pl Panama City Beach, FL 32413
Phone number 850-387-6066

2) Research Information:

Research Study type: ___ Qualitative x Quantitative ___ Mixed

Data Retrieval:
___ State-wide (list type)
___ County-wide (list)
___ Cumulative folder (information sought)
___ Survey (type)
x Other (list) FSA data (archived)

Project Study Title or Problem: How ICT can impact student achievement for ESE Inclusion Students

Purpose of Study: To determine whether ICT can be used as a resource for ESE Inclusion Students to improve academic achievement

Relevant Information:

3) Procedure:

Schools used in study: 21 elementary (Bay county) No. of students: 210
Grade levels used in study: 5th grade
Sampling population used: ESE inclusion
Sampling Method: archived data
School time involved: 0
Study or test administered: 0 Date of testing 2014-2016
Test administration time needed: 0
Administration process: x groups (list) do not have list yet
___ individually (list)

Results of Study: x will be made ___ will not be made available

Patricia Marcino
Applicant Signature

Major University Professor

IRB University Chair

Official BDS Office Only

Caryl Van de Boe AuD, CCC-A
Research Chair, Bay District Schools

Superintendent of Bay District Schools

lmcd/tlr

Appendix B

2010-2011 Reliability of Math CBAT made with FCAT Test Maker Item Bank

Math CBAT made with *FCAT Test Maker* items						
Grade Level	N			Reliability (K-R20)		
	Test 1	Test 2	Test 3	Test 1	Test 2	Test 3
3	985	980	1028	0.76	0.80	0.85
4	1030	1059	1089	0.81	0.84	0.88
5	1026	1057	1081	0.78	0.85	0.87
6	1080	1088	1092	0.84	0.83	0.86
7	1088	1090	1100	0.82	0.83	0.87
8	1095	1083	1101	0.80	0.83	0.86

2010-2011 Reliability of Reading CBAT made with FCAT Test Maker Item Bank

*2010 -2011 Correlation of CBAT to FCAT Scores**

Correlation of CBAT Reading Scores with FCAT Reading Scores			
Grade	**Math**	**Reading**	**Science**
3	0.81	0.84	
4	0.83	0.83	
5	0.85	0.82	0.80
6	0.76	0.80	
7	0.78	0.81	
8	0.73	0.80	0.80
9		0.73	
10		0.70	

Appendix C

Reliability Analyses

Reliability analyses conducted by Florida Department of Education (FDE) to establish reliability/validity for the state assessment.

2010-2011 Reliability of Math CBAT made with FCAT Test Maker Item Bank

Grade Level	*N*			Reliability (K-R20)		
	Test 1	Test 2	Test 3	Test 1	Test 2	Test 3
5	1026	1057	1081	0.78	0.85	0.87

2010-2011 Reliability of Reading CBAT made with FCAT Test Maker Item Bank

Grade Level	*N*			Reliability (K-R20)		
	Test 1	Test 2	Test 3	Test 1	Test 2	Test 3
5	1026	1045	1080	0.85	0.83	0.84

2010 -2011 Correlation of CBAT to FCAT Scores

Grade	Math	Reading
5	0.85	0.82

Tables

Table 1

Numbers of Valid and Missing Scores on ELA and Math Tests for Year One (2014-2015) and Year Two (2015-2016)

	Year One (No ICT)			Year Two (ICT)		
Tests	Valid	Missing	Total	Valid	Missing	Total
ELA	267	2	269	295	3	298
Math	266	3	269	287	11	298

Note. Year One is academic year 2014-2015; Year Two is academic year 2015-2016.

Table 2

School Types During Year One (2014-2015) and Year Two (2015-2016)

	Year One (No ICT)		Year Two (ICT)	
School Type	*f*	%	*f*	%
Type A Schools	104	38.7	100	33.6
Type B Schools	6	2.2	11	3.7
Charter Schools	9	3.3	19	6.4
Virtual Schools	1	0.4	0	0.0
Title 1 Schools	149	55.4	168	56.4
Total	269	100.0	298	100.0

Note. Year One is academic year 2014-2015; Year Two is academic year 2015-2016. Year Two percentages do not sum to 100.0% due to rounding.

Table 3

Descriptive Statistics on ELA Scores for Year One (2014-2015) and Year Two (2015-2016)

	Year One (No ICT)	Year Two ICT
n	267	295
Minimum	257	257
Maximum	359	356
M	304.94	304.69
Mdn	304.00	304.00
SD	17.06	19.25

Note. Year One is academic year 2014-2015; Year Two is academic year 2015-2016.

Table 4

Descriptive Statistics on Math Scores for Year One (2014-2015) and Year Two (2015-2016)

	Year One (No ICT)	Year Two (ICT)
n	266	287
Minimum	256	256
Maximum	361	375
M	305.88	306.40
Mdn	306.00	308.00

Note. Year One is academic year 2014-2015; Year Two is academic year 2015-2016.

Figures

Figure 1. Frequency histograms for ELA scores from years one and two

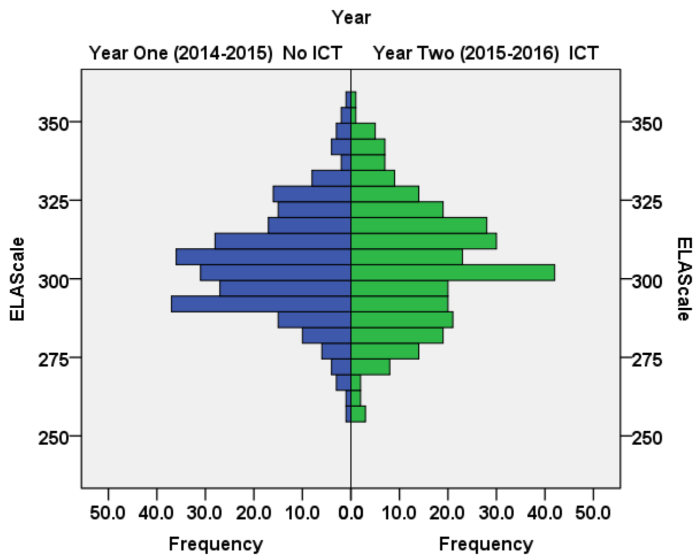

Figure 2. Frequency histograms for math scores from years one and two.