STUDENT ACHIEVEMENT USING PROJECT-BASED LEARNING ONE-TO-ONE TECHNOLOGY IN EIGHTH GRADE MATHEMATICS AND SCIENCE

by

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ABSTRACT

STUDENT ACHIEVEMENT USING PROJECT-BASED LEARNING ONE-TO-ONE TECHNOLOGY IN EIGHTH GRADE MATHEMATICS AND SCIENCE

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School districts throughout the nation spend hundreds of thousands of dollars on one-to-one technology for students in hopes of increasing academic achievement. This study examined student achievement, via project-based learning and common based assessments, of students who used one-to-one technology in eighth grade compared to students who did not use one-to-one technology in eighth grade. Utilizing mixed methodology the quantitative part of this study included data from common based assessments in mathematics and science. The teachers' and students' perspective of student achievement after using one-to-one technology, through project-based learning, in eighth grade is the qualitative component to this study. Using two separate components, this research was conducted in a large, suburban school district in southeast Texas. First, archival data of CBA scores were gathered from the suburban school district for students who used one-to-one technology in eighth grade and students who did not use one-to-one technology in eighth grade. The results were analyzed via factorial analysis of variance (ANOVA) which determined if there was a statistically significant mean difference between the two groups and within groups. Second, student focus groups were conducted to investigate student belief in the relationship project-based learning through the use of one-to-one technology had on student achievement. Finally, teacher perspectives on self efficacy of implementation of one-to-one technology, through the use of project-based learning was gathered.

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CHAPTER I:

STATEMENT OF PROBLEM

In K-12 education, leaders have given teachers educational instructional technology to enhance learning for all students. Texas and its school districts have created strategic plans that incorporate students and teachers using educational technology (Texas Education Agency [TEA], 2006, 2014). Professional development opportunities are created to grow technologically enriched teachers. However, just because teachers have the educational technologies readily available, this does not mean they have used educational technologies to increase student achievement (Montrieux, Raes, & Schellens, 2017). Teachers, even with professional development, have still utilized the technology as a reproductive technology (Privateer, 1999). Reproductive technology refers to ways in which basic information is shown repeatedly through various media to various learners. Therefore, even though the students have used educational instructional technology, they are similar to the students before technology was implemented in brick and mortar educational facilities (Bailey, Goodman, & McCormick-Lane, 2015, Montrieux et al., 2017).

Topic

Education is a topic that has been a consistently discussed subject in the United States. Rural and urban areas have been constructing brick and mortar schools for centuries and continue construction to keep up with the U.S. population. If one walked into a brick and mortar educational facility 50 years ago, and then walked into an educational facility in the present, one would not see a drastic difference in the way

teachers educate U.S. children (Costa, 2012). However, the world outside of a brick and mortar educational facility is rapidly changing with technology advancements. Therefore, technology in the United States remains in its infancy when compared to the general history of U.S. education. In the United States, children have grown up in a new world of technology. Everywhere, some sort of technology is used in this country—from the cars driven to the parks that children enjoy. Even sporting events are enriched with instant replays, and these are now used to ensure all calls are correct in the sport by utilizing technology. Therefore, one must apply the concept of technology in education to enhance student achievement levels.

Problem

One problem is the need to embrace ever-changing technology successfully by employing educational technology, such as project-based learning, at the eighth grade level educational environment without foregoing student achievement. The influence of one-to-one technology must be further researched to determine if a statistically significant difference exists in student achievement compared to students who do not have access to one-to-one technology (Jones, 2013). One-to-one technology refers to every student having his/her own laptop provided by the district/school to use at school, home, and in the classroom, thereby enhancing project-based learning. District leaders spend a lot of time and resources (e.g., spending money on the technology itself, supporting infrastructure, enhancing professional development, etc.) to provide one-to-one technology (TEA, 2006, 2014). Therefore, this research aided school district leaders

in determining if the one-to-one technology, through project-based learning, had a statistically significant influence on student achievement.

Evidence

In the United States, students have faced changes in the ways in which they learn and retain information. These changes meant one must understand ways in which students currently engaged with learning new information to understand student achievement levels. Therefore, student engagement was one way to increase student achievement. To increase student engagement, educators needed to reach the students through what interested them, such as technology. Hence, technology represented one way of getting students involved in learning to increase student achievement (Montrieux et al., 2017), thereby making this study necessary to increase the knowledge available on this subject.

Deficiencies

Most researchers, who have studied instructional educational technology, have focused on post-secondary institutions, such as universities and colleges (Jones, 2013; Picciano & Seaman, 2007). This researcher added to the limited research on instructional educational technology in the eighth grade setting. Understanding the importance of effective instructional educational technology at an eighth grade level might add significant value to instructional technology research.

Significance/Audience

The significance of this study increased awareness on the effectiveness of the hundreds of thousands of dollars district leaders spend on instructional educational

technology. This study continued research advancements on instructional educational technology from a quantitative perspective regarding student achievement levels and a qualitative perspective that used student and teacher perspectives at the eighth grade level. Current research has lacked mixed methods studies on this specific subject, as stated by Jones (2013). Moreover, this study was intended for the audience of district administrators, such as superintendents, associate superintendents, curriculum instructional specialist, chief financial officers, and board members. Additionally, this study was intended for the audience of eighth grade campus level administrators, such as principals, assistant principals, campus curriculum instructional specialists, teachers, and students. Therefore, these audience members should find this information valuable to enhancing their knowledge of instructional educational technology, making this study valuable to U.S. society by adding positive social change.

Purpose of the Study

The purpose of the study was to determine if one-to-one technology, using project-based learning in an eighth grade environment, increased student achievement levels on common based assessments (CBA) in mathematics and science. This study determined whether a statistical significance existed in student achievement levels between classes that used one-to-one technology through project-based learning versus classes that did not use one-to-one technology at two different schools. Additionally, to make this study as comprehensive as possible, students and teachers gave their perspectives about using one-to-one technology.

Research Questions

This research addressed the following research questions:

1. Does project-based learning in an eighth grade environment increase student achievement in mathematics and science CBAs using one-to-one technology compared to an eighth grade environment without one-to-one technology?
2. Is there a difference in teachers' sense of self-efficacy regarding project-based learning using one-to-one technology?
3. What are eighth grade student perceptions on project-based learning through the implementation of one-to-one technology and its relationship to their achievement on their mathematics and science CBAs?
4. What are eighth grade teacher perceptions on project-based learning through the implementation of one-to-one technology and its relationship to their students' achievement in mathematics and science CBAs?

Key Terms

Blended Learning. Blended Learning refers to a classroom that uses 21st century instructional practices but maintains essential face-to-face interactions (Imbriale, 2013).

Common Bases Assessments (CBA). CBA is a standardized assessment created by the district to be given to every student in every school (Brewer, 2012).

Instructional technology. Instructional technology refers to "the theory and practice of design, development, utilization, management, and evaluation of processes and resources for learning" via instructional technology (one-to-one technology) (Seels & Richey, 1994, p. 2).

One-to-one technology. One-to-one technology means every student has his/her own technology device (laptop, iPad, etc.) in the classroom and at home.

Project-based learning (PBL): PBL involves one learning basic disciplinary concepts within the context of real-world problems that students find relevant to their everyday life (Rogers, Cross, Gresalfi, Trauth-Nare, & Buck, 2011).

Conclusion

Research is lacking about ways in which eighth graders use one-to-one technology in mathematics and science classrooms. One-to-one technology research in mathematics and science classrooms usually focuses on studying the occurrence at the post-secondary/higher education level (Jones, 2013); however, little research has occurred on lower grade levels, such as at the eighth grade level. Therefore, this study was conducted to fill this gap and add to the knowledge of using technology through project-based learning at the eighth grade level. To fulfill this goal, this study used the data collected from one-to-one technology, as implemented through project-based learning, to determine whether a statistically significant difference existed in student achievement and the perceptions of students who have used one-to-one technology. Teachers' self-efficacy was also discussed, as well as their perceptions of one-to-one technology using project-based learning.

CHAPTER II:

REVIEW OF THE LITERATURE

Researchers have demonstrated effective instructional educational technology is necessary throughout primary and secondary grade levels and the higher education environment (de la Varre, Keane, & Irvin, 2010.) Most research conducted on instructional educational technology has focused on post-secondary institutions, such as universities and colleges (Picciano & Seaman, 2007). Universities and college leaders need to investigate adequate strategic planning for effective instructional educational technology; the same can be said about K-12 education (Privateer, 1999). The leaders of the educational world, as well as most other professions, misunderstand the focus of technology (Znamenskaia, 2010). Technology should help increase creativity and cognition, not just be used to reproduce the same concepts. Even though modern students have used educational technology, they remain similar to students before technology was implemented in brick and mortar educational facilities (Bailey et al., 2015).

Teachers can use instructional technology to blend education system needs to continue to challenge and hold the interest of U.S. children (North Carolina Department of Education, 2016). Instructional technology can come in various forms. One form of educational technology is online learning. Online learning occurs when the instructor presents all the material in a web browser format outside the traditional classroom (de la Varre et al., 2010; North Carolina Department of Education, 2016). Students log into a learning system to learn new concepts taught by the instructor. The students then complete and turn in assignments online. Communication with the instructor is primarily

via email or the learning system's communication forum. This type of educational technology has drastically changed the U.S. educational system by extending brick and mortar schools into homes, libraries, and across seas for anyone who cannot attend such a traditional school. Researchers have completed numerous research studies on the overall concept of online learning for secondary and postsecondary education (de la Varre et al., 2010). However, this type of learning is not typically observed in elementary grades, as well as eighth grade (Picciano & Seaman, 2007).

The creation of an additional form of educational technology, called blended learning, is better suited for eighth grade in the United States. Blended learning is a classroom that uses 21st century instructional practices, while maintaining essential face-to-face interactions (Imbriale, 2013). Blended learning is diverse, and instructors can implement it in numerous ways. However, instructors have struggled with deciding when and how much technology integration should be used with elementary and eighth grade students. Therefore, finding the right blend of online and traditional learning is the key to successful learning, especially within mathematics and science classrooms (Jones, 2013; State Government of Victoria/Department of Education and Early Childhood Development, 2012).

Researchers have also studied ways in which one can measure successful learning. Under the U.S. Every Student Succeeds Act (ESSA), all students must take standardized testing, which test students' knowledge levels of the content they were taught in school (United States House of Representatives, 2001, 2009, 2016). Despite this mandate, standardized testing remains a controversial form of assessing students'

knowledge (Linn, 2010; McGuinn, 2016). Therefore, in addition to standardized testing, some educational facility leaders have used project-based learning (PBL) to determine which is more beneficial to students. PBL refers to one learning basic disciplinary concepts within the context of real-world problems that students find relevant to their everyday life (Rogers et al., 2011).

Having instructors find the right blend of mixing technology and project-based learning without sacrificing the content is difficult, especially in mathematics classrooms (Jones, 2013). Therefore, more research is needed concerning blended learning at the eighth grade level throughout all content areas, but mostly in the mathematics and science classrooms (Jones, 2013). This researcher found it beneficial to ascertain whether implementation of one-to-one technology, which used blended learning and project-based learning within an eighth grade mathematics and science classroom, could help increase student achievement. This research could be the key to overall improvement of student achievement.

Technology is conventionally used as a repetitive tool, which means it repeats the same information from another source (Cascaval, Fogler, Abrams, & Durham, 2008; Prestridge, 2014). Privateer (1999) argued higher education needed to utilize instructional technology to foster or invent new ideas/concepts, not to repeat the same information. The same can be said for K-12 students. Students must have the opportunity to create original ideas/projects, rather than using the technology given to them to reproduce what they just learned from teachers. Moreover, strategic planning to implement this new "inventing" educational technology is the key for its success in higher education

(Privateer, 1999). The future of higher education rests on this strategic path of intelligence-driven educational technologies, a nonnegotiable path that must be taken by higher education. This path in higher education can advance society.

The nation's leaders understand the need to continue to push education, so U.S. society can compete with other nations. Educational research is a key topic in most political debates. One current topic is the various types of learning environments offered to today's students. Therefore, this literature review investigates the multiple forms of learning environments and teachers using technology integration. Additionally, this literature review will also reveal the gaps in the research, as most research has been completed at the higher education level (Privateer, 1999).

Instructional technology is used to blend U.S. education system needs to continue to challenge and hold the interest of the higher education population, which continues to grow substantially (Prestridge, 2014). However, one could question whether students would prosper when technology education was repeatedly used as a machine to provide the same information. Moreover, one could question whether higher education students were as competitive as other nation's higher education students based on technology use, especially in K-12 education.

In K-12 education, teachers have received educational technology through various means, such as e-rate grants and foundation grants, to enhance learning for all students (Pasadena Independent School District, 2018). Districts create strategic plans that place educational technology in the hands of students and teachers. Professional development opportunities are created to develop technologically enriched teachers. However, just

because teachers have the educational technologies readily available, does not mean they have used the educational technologies to increase student achievement. Teachers, even with professional development, have still utilized the technology as a reproductive technology (Privateer, 1999). Reproductive technology refers to ways in which basic information is shown over and over through various media to various learners.

Leaders of district and campus based strategic plans need to focus on using invention or intelligence-driven educational technology. Acquiring the funding and getting the technology in the hands of students is only half the battle. Therefore, getting the students to invent new ideas/concepts and explore learning is the key for the United States to stay in a competitive position within the world (Prestridge, 2014).

When students first enter a higher education college/university, many lack the common core standards needed to be successful in higher education. Cascaval et al. (2008) claimed higher education leaders sought to aid in retention and success by initiating foundational level courses within colleges/universities. As with other courses in an educational learning environment, college/university leaders have integrated technology in these foundational courses.

Researchers added to the body of research by searching to determine if technology positively affected student learning (Krentler & Willis-Flurry, 2010). These researchers pointed out that although using technology in the classroom was widespread, limited empirical research existed about the effectiveness and influence it had on academic achievement. The researchers stated that more research was necessary,

concerning the effectiveness of students using technology to enhance their learning (Krentler & Willis-Flurry, 2010); therefore, this study serves to meet that need.

Common Formative Assessments

Common formative assessments became known worldwide when two British researchers, Paul Black and Dylan Wiliam (1998), claimed that when formative assessments were implemented properly, students could grasp the content at a higher level of achievement. They researched formative assessments and concluded the highest growth in student achievement occurred through formative assessments. Since then, common formative assessments—those created by the district's curriculum specialist in all four core areas—have become popular throughout many districts in numerous states (DuFour, DuFour, Eaker, & Many, 2010).

Similar to in technology, assessments come in many different variations; therefore, one explanation does not equate to a universally accepted definition of formative assessments (Popham, 2008). A common formative assessment is defined as an assessment used during an instructional sequence, which a teacher gives to all students in the same grade level within the district, and the results are used to reteach knowledge to students, which can enrich their learning experiences (Popham, 2008). In more recent research, common formative assessments mean teachers can assess student learning by using the same assessment and criteria for grading (DuFour et al., 2010). Additionally, three things most occur for the assessment to be formative:

> (1) the assessment is used to identify students who are experiencing difficulty;
>
> (2) those students are provided additional time and support to acquire the intended skill or concept; and,

> (3) the students are given another opportunity to demonstrate that they have learned. (DuFour et al., 2010, p. 63)

The three things listed above are the key for formative assessments to be beneficial. Formative assessments are an instructional tool that should aid the teacher and the student in identifying areas of weakness and/or strengths within the content. Because formative assessments measure student achievement, formative assessments were used in this study to determine if one-to-one technology helped increase student achievement.

Popham (2008) Principle

The Popham (2008) principle involves one teaching for learning not teaching for teaching. There are many ways to evaluate student learning (e.g., teachers using daily assignments, tickets out, formative and summative assessments, etc.). The United State, through ESSA, requires assessments to measure student learning (U.S. House of Representatives, 2016). These high stakes exams have been the driving force for states to make reforms continuously that change what teachers teach and to measure how well students have retained the taught content. The process of formative assessments should inform the student about his/her learning progress and direction, thereby enabling him/her to become actively involved and to make decisions and take ownership of his/her work. Lessons are student learning based, instead of teacher based, to enhance student achievement, which is the goal of teaching (Popham, 2008). Effective use of instructional technology is a tool that can aid in this goal of student achievement. Table 1 displays the timeline for the state of Texas in response to ESSA requirements (TEA, 2014).

Table 1

Timeline of Texas Changes in Mathematics and Science Standards and High-Stakes Exams

Year	Standards Reforms	Assessment Reforms
1996	Introduction of Texas Essential Knowledge and Skills (TEKS)	
2001	No Child Left Behind	
2002-2003		Texas Assessment of Academic Skills (TAAS) replaced by Texas Assessment of Knowledge and Skills (TAKS)
2005-2006	Modification of math TEKS	
2008-2009	Modification of math TEKS	
2010-2011	Modification of math TEKS	
2011-2012	Modification of science TEKS	TAKS replaced by State of Texas Assessment of Academic Readiness (STAAR)
2013-2014	Modification of math TEKS	

Accountability systems have led to increased research on high-stakes exams (Schiller & Muller, 2003). Findings indicated that high-stakes exams had little effect on course taking but revealed increased differences based on socioeconomic status—larger gaps existed in states with more frequent testing due to lower initial placements (Schiller & Muller, 2003). An additional study exposed a negative effect on high school completion but a positive effect on college continuation due to high stakes testing (Daun-Barnett & St. John, 2012). In addition, Musoba (2011) found that high school exams did not significantly affect college readiness; she postulated that these exams were likely assessing outdated standards, and therefore decreasing expectations of students. Additionally, research showed that as a result of high stakes exams in science, science teachers actually taught less science (Anderson, 2012). What is generally considered

good science teaching—project-based learning, inquiry-based instruction, and less teacher-centered classrooms—is often lost in one attempting to achieve greater scores on high stakes exams (Goetz Shuler, Backman, & Olson, 2009; Good & Lavigne, 2017; Kersaint, Borman, Lee, & Boydston, 2001; Lee & Luykx, 2005). One way to combat this problem is to tell the students what content knowledge they need to understand better.

Instructional Technology

Instructional technology is defined as "the theory and practice of design, development, utilization, management, and evaluation of processes and resources for learning" (Seels & Richey, 1994, p. 2). Teachers have used various forms of instructional technology daily. There are many forms of instructional technology, including one-to-one technology, laptop carts, and computer labs. Moreover, educational facilities with one-to-one technology provide students with their own technology devices (laptop, iPad, etc.) for use in the classroom and at home. For one-to-one technology programs, the students have access to the technology device at all times. At home, the students can continue to learn and complete various assignments assigned by their teachers on these devices.

Every student has a technology device he/she can use while in the classroom with the instructional technology of *laptop carts* (Reichert & Mouza, 2014). Laptop carts are normally shared among a team of teachers. The teachers plan a lesson by incorporating instructional technology using the laptops in the laptop cart as a supporter to the lesson. The teachers can sign up students for the carts by using a shared calendar to ensure other teachers are not booking the laptop cart on the same day that teacher has planned to use the technology to support the lesson in the classroom (Reichert & Mouza, 2014).

Communal computer labs, located within an educational facility, are available for students before/after/during school (Reichert & Mouza, 2014). These labs give the students the opportunity to use technology devices, which are loaded with specific educational technology programs (Reichert & Mouza, 2014). Additionally, these labs have security filters in place, which can prevent the student from accessing harmful materials. These labs are an alternative to the more expensive one-to-one technologies and laptop cart technology (Reichert & Mouza, 2014). Teachers can still give the students instructional technological activities to help support learning, even if they do not have a technology device at home due to these communal computer labs. Collaboration with other students and classes are also a benefit of communal computer labs (Reichert & Mouza, 2014).

Archiving Lectures

Foundational courses have been created for math, reading, and writing in higher education. Leaders at the University of Colorado at Colorado Springs have conducted research to determine if archiving lectures would help increase student success (Rose & Ray, 2011). This blended form of technology integration allows students to view the lesson multiple times. The first view is face-to-face in the actual learning environment. The lesson is videoed, while the professor lectures. This video is uploaded to multiple media for the students to view. If the students have a hard time completing an assignment or studying for an assessment, then they can view the lecture on the video (Rose & Ray, 2011).

The results have that the archived lessons did increase student success; as an additional finding, these also improved the overall experience of the student's learning environment (Cascaval et al., 2008; Rose & Ray, 2011). In this instance, the technology did not act as an extension of the instructor. Instead, the students used it to learn by repeating the lectures to see if they could hear new information. Therefore, many researchers have sought to determine the type of technology integration that can best aid a learning environment for students (Hartschuh, 1999; Hauck, 2006; Kazu & Demirkol, 2014; Smith, 2014).

Encapsulated Presentation

Another form of instructional technology is used through one applying integrated technology by presenting of a new form of blended learning called *encapsulated presentation*. Encapsulated presentation is a simultaneous presentation of face-to-face and online learning environment (Rose & Ray, 2011). The resulting classroom is an online class environment, where the only time the instructor would step in is in a student's time of need. Therefore, a student arrives at his/her regularly scheduled classes and uses the online learning environment to learn that day's concept, while the instructor is only in the classroom to monitor the learning environment (Rose & Ray, 2011). If a student has a question about what is being presented through the online learning environment, he/she can ask the instructor for clarification (Rose & Ray, 2011).

This type of learning environment gives the students the best of both worlds. The students can learn at their own paces, while having the support of the teacher. In this instance, the learning environment blends an online lesson with providing in-classroom

support, possibly in the form of new content, from the instructor. Rose and Ray (2011) confirmed that more research on learning environments, such as encapsulation presentation, must be completed, as well as additional research on videoing lectures.

Flipped Classrooms

Flipped classrooms refer to videoing the lectures while students are not present; in these classrooms, the lecture is seen outside of the actual face-to-face setting (Strayer, 2012). In the face-to-face setting, teachers only use learning activities to reinforce the concept observed in the flipped lesson outside of the classroom. Research results showed students found value in increased cooperation; however, the students were not impressed with the overall learning environment of learning new concepts through the flipped lecture (Strayer, 2012). All new concepts were only taught through the flipped lecture. Students came together and produced products based on what they learned in the flipped lecture. This research differed compared to most other literature because a new concept was initially taught through the technology integration. All other reviewed literature showed technology integration being used as a review tool (Cascaval et al., 2008; Privateer, 1999; Rose & Ray, 2011).

Student Achievement

As previously stated, most literature on technology integration centers around teachers using technology integration as a review tool. Additionally, most research studies have only included higher education (Picciano & Seaman, 2007). These aspects left a significant gap in the literature regarding technology integration in diverse learning environments within the K-12 educational setting, especially in eighth grade. Moreover,

modern students who use technology remain similar to students from the past regarding learning in school, as education has not evolved much from the past despite so many technological advances (Bailey et al., 2015). Therefore, this research aimed at filling the gap of technology integration within diverse learning environments at the eighth grade level. Discovering what types of learning environments, along with the type of technology integration, could increase student success might increase understanding about ways in which teachers could keep U.S. students actively engaged in school enough to master academic standards.

Theoretical Framework

This study explored one-to-one technology in an eighth grade environment and its relationship to student achievement on common-based assessments in mathematics and science. The results were analyzed using Bandura's (1994, 2010) self-efficacy theory. This theory's core belief stands on the foundation of human motivation, performance accomplishments, and emotional well-being. For example, the theory shows that unless people believe they can produce desired effects by their actions, they have little incentive to undertake activities or to persevere in the face of difficulties (Bandura, 1994, 2010). Based on this theory, this study was framed using the students' and teachers' perceptions on one-to-one technology.

Conclusion

Most research on educational instructional technology has been conducted at the postsecondary/higher education level (Jones, 2013). Therefore, more research was needed to determine if one-to-one technology has increased student achievement levels at the

eighth grade level. Student achievement can be measured by various means; however, in this study, common-based assessments in mathematics and science were used.

CHAPTER III:

METHODOLOGY

Overview of the Research Problem

In K-12 education, teachers have received educational technology through various means to enhance learning for all students. District leaders have created strategic plans that place educational technology in the hands of students and teachers. Professional development opportunities are created to develop technologically enriched teachers. However, just because teachers have the educational technologies readily available, this does not mean they have used those educational technologies to increase student achievement. Teachers, even with professional development, have still utilized the technology as a reproductive technology (Privateer, 1999). Reproductive technology refers to ways in which basic information is shown repeatedly through various media to various learners. Therefore, even though modern students use educational technology, they are students from before technology was used in brick and mortar educational facilities (Bailey et al., 2015).

In K-12 education, the problem was the need to successfully embrace the ever-changing technology and employ educational technology without foregoing prosperous learning in eighth grade educational environments. Therefore, the purpose of the study was to determine if one-to-one technology, using project-based learning in an eighth grade environment, increased student achievement on common based assessments (CBA) in mathematics and science. This chapter will explore the methodology used to explore this purpose statement.

Operationalization of Theoretical Constructs

This quantitative research contained a dependent and independent variable. Common based assessment scores were the dependent variable and were analyzed for the same students and in multiple content areas: mathematics and science. The independent variables were the mode of instruction, i.e. one-to-one technology in the classroom and ways in which the type of technology was used. Project-based learning was the constant variable. The construct of self-efficacy was measured and compared for teachers, using interview questions as well as a questionnaire.

Research Purpose and Questions

The purpose of this study was to determine if one-to-one technology, via project-based learning, produced a statistically significant difference in student achievement on CBAs in eighth grade mathematics and science classrooms. This study addressed the following research questions:

1. Does project-based learning in an eighth grade environment increase student achievement in mathematics and science CBAs using one-to-one technology compared to an eighth grade environment without one-to-one technology?
2. Is there a difference in teachers' sense of self-efficacy regarding project-based learning using one-to-one student technology?
3. What are eighth grade student perceptions on project-based learning through the implementation of one-to-one technology and its relationship to their achievement on their mathematics and science CBAs?

4. What are eighth grade teacher perceptions on project-based learning through the implementation of one-to-one technology and its relationship to their students' achievement in mathematics and science CBAs?

Research Design

This research study used an explanatory sequential mixed methods design; it involved collecting quantitative data first, and then explaining the quantitative results with in-depth, qualitative data. In the first research question, which formed the quantitative part of the study, mathematics and science CBA data from the previous year were obtained from a school that employed educational technology in eighth grade to assess whether project-based learning that used one-to-one technology related to student achievement compared to the same previous year mathematics and science CBA data obtained from a school that did not used educational technology in eighth grade.

The second, qualitative phase of research was conducted as a follow up to the quantitative results to help explain those quantitative results. This phase included a teacher survey, where the teachers answered questions regarding Bandura's (1994, 2010) theory of self-efficacy. Additionally, student focus groups were held to answer the last two research questions regarding student and teacher perceptions of one-to-one technology. All qualitative data was collected in retrospect. Meaning when the teachers where interviewed and the student focus groups were held, they were asked to think back to the year the quantitative data was obtained which was the year the teachers taught the focus group students, which was the students' eighth grade year. In this exploratory

follow-up, the students' and teachers' perceptions were used to conclude this well-rounded research, as suggested by researchers (Creswell & Plano Clark, 2018).

This research method was chosen due to the lack of quantitative data on one-to-one technology and student achievement in math and science in eighth grade, as stated by Jones (2013). Jones (2013) stated that more research was needed on this subject and suggested applying mixed methods to the same topic that she studied in her dissertation to enhance the available research. Therefore, this researcher chose to apply mixed methods to add to the available research on this subject. Moreover, there were qualitative studies completed on one-to-one technology; however, very few mixed methods studies were conducted, especially in the middle school grade levels.

Population and Sample

The population of the Educational Technology School District consisted of approximately 55,000 students and 3,650 teachers. Of the 55,000 students about 76.9% were economically disadvantaged. The ethnicity breakdown for the 55,000 students were as follows: Hispanic 82%, African American 7%, Caucasian 7%, Asian 3%, and other 1%.

To find a sample of this population for the quantitative portion of this mixed methods study, the researcher chose a school that used educational technology in eighth grade and a school that did not use technology in education in eighth grade (i.e., noneducational technology). The sample for the school that used educational technology had approximately 940 students. Of the 940 students, 11% were economically

disadvantaged. The ethnicity breakdown for the 940 students were as follows: Hispanic 50%, African American 14%, Caucasian 13%, Asian 9%, and Other 65%.

The sample for the school that did not use educational technology had approximately 998 students. Of the 998 students, 15% were economically disadvantaged. The ethnicity breakdown for the 998 students were as follows: Hispanic 50%, African American 5%, Caucasian 13%, Asian 4%, and other 76%. The quantitative data derived from students' scores in both schools using their CBA scores. Therefore, this study did not use random selection; instead, it utilized a purposeful sample, which was based on the researcher's discretion (Creswell & Plano Clark, 2018).

One teacher was interviewed from each of the content areas in which this research focused: mathematics and science. The teachers were matched based on effectiveness (assistant principal ratings/instructional evaluator) to eliminate other variables that could contribute to an increase in student achievement. The students interviewed were from a class that used educational technology in eighth grade; they were formed into two groups: two students from mathematics and two students from science. Interviews were collected in a focus group setting to make the students feel comfortable. Getting the students' retrospect feedback on the one-to-one technology that was implemented on project-based learning assignments provided well-rounded results.

Instrumentation

This instrument was validated by a panel of experts. The CBAs were based on STAAR questions. The STAAR's reliability coefficients are .88 for math and .86 for science which are considered good (TEA, 2016). Additionally, a self-reported

questionnaire called the Texas Teacher STaR Chart was analyzed. This chart was used as a teacher tool for planning and self-assessing to assist in measuring students' improvement levels in learning through technology. This tool also aided in developing professionals and providing researched-based instructional technology goals (TEA, 2006). The self-efficacy of the teachers were measured by interviews; however, a follow up Likert scale questionnaire was added, after the interviews to clarify findings. The questionnaire was modified from previous surveys from Goodman (2016), Jones (2013), and Mourned and Bielefeldt (1999; see Appendix E).

Data Collection Procedures

In the spring semester and with the required appropriate approval from the IRB and CPHS from the participating school district and university, the researcher met with the researcher's dissertation committee from the university and communicated via multiple avenues with the district's IRB approval board, to review the purpose of the study, instrumentation used, and data collection procedures employed in this study. Parental consent and assent forms were signed and returned to the researcher prior to any data collection.

Student achievement data (CBA scores) were retrieved from the participating school district and then compared for both the treatment group, the educational technology campus classes in eighth grade, and the comparison group, the noneducational technology campus classes in eighth grade mathematics and science. These classes in eighth grade had similar demographics, with one of the few differences being the use of one-to-one technology at one school and not the other (see Figures 1

through 3 for STaR Chart data). The study was created with the dependent variable being the assessments used to measure achievement, proficiency, and competence, of those eighth grade mathematics and science students, and the independent variable was the use/no use of one-to-one technology in implementing project-based learning. District and school demographic data were gathered from the U.S. Department of Education, National Center for Education Statistics (NCES, 2016) for both classes in eighth grade.

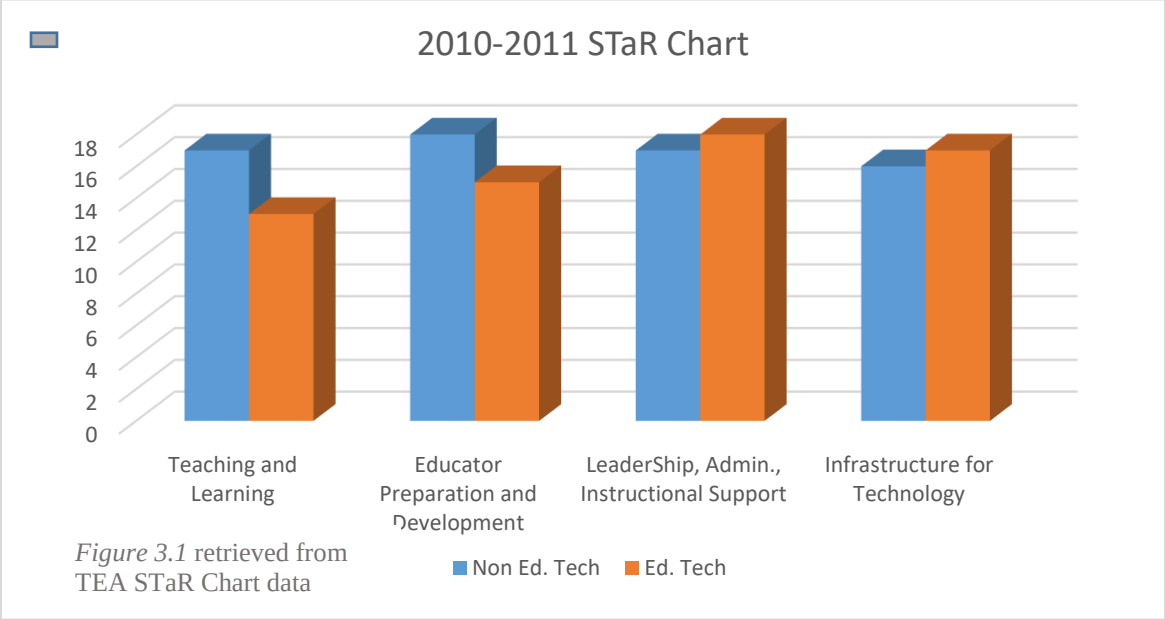

Figure 3.1 retrieved from TEA STaR Chart data

Figure 1. The Texas Education Agency (TEA, 2011) 2010 to 2011 STaR Chart. Note. Data are drawn from TEA, 2011.

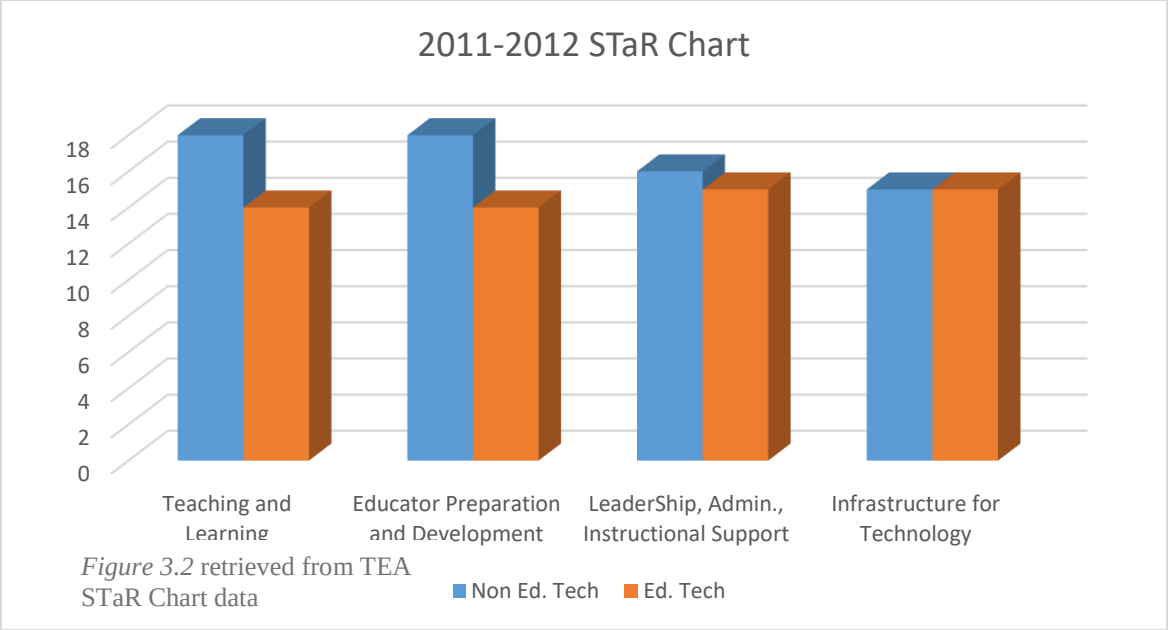

Figure 2. The TEA (2012) 2011 to 2012 STaR Chart. Note. Data are drawn from TEA, 2012.

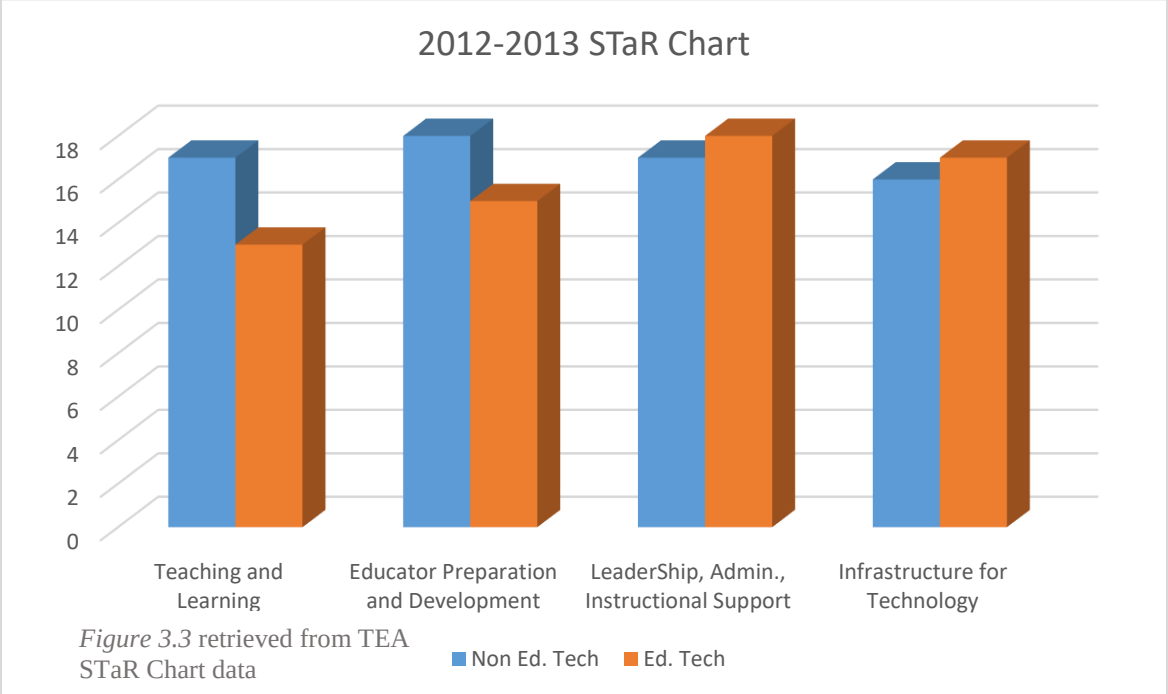

Figure 3. The TEA (2013) 2012 to 2013 STaR Chart. Note. Data are drawn from TEA, 2013.

Data Analysis Procedures

Quantitative

First, student achievement data were uploaded into SPSS for further analysis. To answer Research Question 1, the researcher conducted factorial ANOVA to determine if there was a statistically significant mean difference in student mathematics and science achievement between those students in the educational technology eighth grade campus classes and student's mathematics and science achievement in noneducational technology eighth grade campus classes. The independent variable (e.g., use of one-to-one laptops) was categorical and divided into two groups: (a) students participating in the educational technology eighth grade campus classes and (b) students in the noneducational technology eighth grade classes who did not use one-to-one laptops. The dependent variable was student achievement in mathematics and science, as measured by CBAs. For this study, a statistical significance value of .05 was used.

Qualitative

The researcher used emergent thematic coding for qualitative data analysis. This process allowed the researcher to consider what categories emerged from the data after reviewing the data from the interviews multiple times, as suggested by researchers (Taylor-Powell & Renner, 2003). From emergent thematic coding, the researcher separated the findings into categories and subcategories, thereby leading to identifying themes and patterns in these data.

Validity

Participant validation was used after each interview was conducted by sending the transcripts of the interviews to the interviewees. This process allowed the interviewees to verify that all information was valid, revise the information, and/or add to the information as needed. Additionally, the researcher used bracketing during the data collection process to reduce potential bias. Bracketing involved documenting the researcher's experiences with the study's topic and ways in which these experiences could influence bias during data collection and analysis. Triangulation of themes was used from the interviews/focus groups and surveys. Finally, the researcher used peer reviews, such as asking a field expert to audit the decision points throughout the process and checking with a field expert about interpretation of the data.

Privacy and Ethical Considerations

Prior to the research study in the field and data collection, the researcher obtained approval from the University of Houston-Clear Lake Committee for the Protection of Human Subjects (CPHS). The participating low socioeconomic, high English language learner school district, called the Educational Technology School District, took place at two eighth grade campus classes: One school used educational technology, and one did not use educational technology. These campuses were contacted via the schools' Internal Review Board (IRB) for approval of this research. The participants' identities were protected by the use of pseudonyms. The CPHS form and IRB form are located in the appendices of this research project.

Research Design Limitations

Limitations included that the study might only be applicable to the sample and populations identified in this study. Therefore, future researchers should use caution when generalizing to other populations. Additionally, for a given survey, a limitation was that it was a self-reported measure. Researchers have found two main problems with self-reporting data: The reporters did not always tell the truth because they reported what they thought the researcher wanted to see, and the reporter tended to report more heavily on what they considered positive attributes (Cook & Campbell, 1979).

Specifically, in the qualitative data portion of this research, information was obtained in retrospect. This involved memory recall from previous years, relying on memory from teacher and student perceptions can be a limitation. The sampling population in the qualitative population was smaller than the researcher anticipated, therefore the qualitative data on student perceptions was limited. Additionally, for qualitative purposes, only one teacher per subject area, math and science, were interviewed.

Teacher professional development also needs to be taken into consideration. For the individual subject areas, math and science, each could have received different types of professional development on implementation of one-to-one technology. Support systems throughout the year also had to be taken in to consideration, was one subject receiving more support, than the other.

Conclusion

This was a mixed method research study to determine the statistical significance, if any, with one-to-one technology and student achievement by comparing two similar demographical eighth grade classes, one school used one-to-one technology, while the other school did not. The researcher also used interviews from the teachers from both schools' eighth grade classes, and then used interviews with students who used one-to-one technology, which provided well-rounded findings for the study. The results of this study are outlined in Chapter IV.

CHAPTER IV:

RESULTS

Participant Demographics

The population was students and teachers who have experienced eighth grade science and math in a school with educational technology (one-to-one) and a school without educational technology. To find a sample of this population for the quantitative portion of this mixed methods study, the researcher chose a school that used educational technology in eighth grade and a school that did not use technology in education in eighth grade (i.e., noneducational technology). Therefore, this study did not use random selection; instead, it utilized a purposeful sample.

The qualitative data derived from a sample of two teachers from a school that used educational technology and their interviews: the science teacher, Mrs. Stephens, and the math teacher, Mrs. Austin (both pseudonyms). The teachers were matched based on effectiveness (assistant principal ratings/instructional evaluator) to eliminate other variables, which could contribute to an increase in student achievement. All qualitative data were collected in retrospect. Meaning when the teachers where interviewed and the student focus groups were held, they were asked to think back to the year the quantitative data was obtained which was the year the teachers taught the focus group students, which was the students' eighth grade year. Other qualitative data derived from students who experienced using educational technology in eighth grade; they were formed into two groups: two students from mathematics and two students from science. Interviews were collected in a focus group setting, containing all four students, to make the students feel

comfortable. Getting the students' feedback on the one-to-one technology implemented on project-based learning assignments provided well-rounded results.

The quantitative data were derived from students' scores in both schools using their CBA scores. Therefore, the students from both schools made up the sample for the quantitative data. Table 2 displays the demographical data from students in a school with educational technology mathematics and science classes and a school with noneducational technology, did not use one-to-one technology in mathematics and science classes (U.S. Department of Education, National Center for Education Statistics, 2016).

Table 2

Demographic Data for Educational Technology in Eighth Grade and Noneducational Technology in Eighth Grade (2015 to 2016 School Year)

Eighth Grade	Amer Ind/Alaskan		Asian/ Pacific Islander		Black		Hispanic		White		Two or More Races		Free Lunch		Reduced Lunch		Total Students
Ed Tech	1	0%	88	9%	134	14%	470	50%	120	13%	611	65%	91	10%	14	1%	939
Non-Ed Tech	3	0%	38	4%	46	5%	499	50%	132	13%	759	76%	142	14%	10	1%	998

Research Question 1

Research Question 1 stated the following: Does project-based learning in an eighth grade environment increase student achievement in mathematics and science CBAs using one-to-one technology compared to an eighth grade environment without one-to-one technology? The first part examined from this question was PBL in an eighth grade environment and whether it increased student achievement in *science* CBAs using one-to-one technology compared to an eighth grade environment without one-to-one technology. To answer this part of the question, CBA scores were analyzed using factorial analysis of variance (ANOVA). The Levene's test was not significant, indicating that the homogeneity of variances assumption was met. The main effects for campus, ethnicity, SES, and gender were examined, as well as the interactions thereof. Only the main effects for campus and ethnicity were statistically significant at the .05 significance level.

The ANOVA test regarding the main effect of the campus yielded an *F* ratio of $F(1, 239) = 18.8$, $p < .05$, eta squared = 0.082. These results indicated that the mean score was significantly greater for the school that used educational technology compared to the one that did not use educational technology. The ANOVA test on the main effect of ethnicity was not significant $F(3, 239) = 4.4$, $p > .05$, eta squared = 0.059.

This finding indicated a student attending the science class at the school with educational technological capabilities for project-based learning through one-to-one technology (i.e., see Ed Tech Campus in Table 3) had an increased chance of student achievement on CBAs, compared to a student in the science class that used project-based

learning at the school that did not use technology in education (i.e., see Non-Ed Tech Campus in Table 3).

Table 3

Science: Descriptive Statistics Dependent Variable: Student Percent Score Final CBA

Campus	Ethnicity	Mean	Std. Deviation	N
Non-Ed Tech	Other	71	14.9	4
	Black	61.2	13.6	7
	White	53.8	12.5	26
	Hispanic	54.1	14.8	88
	Total	55.0	14.5	125
Ed Tech	Other	77.8	11.6	17
	Black	67.8	10.1	11
	White	77.2	9.1	13
	Hispanic	70.0	12.2	74
	Total	71.7	12.0	115
Total	Other	76.5	12.2	21
	Black	65.2	11.7	18
	White	61.6	15.9	39
	Hispanic	61.3	15.7	162
	Total	63.0	15.7	240

Note. Other category was combined Asian, Native American, and two or more races.

The second part of Research Question 1 studied whether PBL in an eighth grade environment increased student achievement in *math* CBAs using one-to-one technology compared to an eighth grade environment without one-to-one technology. The students' CBA scores were analyzed using factorial analysis of variance (ANOVA). The Levene's test was significant, thereby indicating that the homogeneity of variances assumption was not met. Therefore, these results should be reviewed with caution. The main effects for campus, ethnicity, SES, and gender were examined, as well as the interactions thereof. Just like in science, only the main effects for campus and ethnicity were statistically

significant at the .05 significance level, $F(1, 192) = 38.8$, $p < .05$, eta squared = 0.178, thereby indicating the mean score was significantly greater for the school that did not use educational technology compared to the school that did use educational technology. The ANOVA test on interactions of ethnicity yielded an F ratio of $F(3, 192) = 5.7$, $p < .05$, eta squared = 0.088, thereby indicating the mean change score was significant at the schools that did not use educational technology compared to the schools that did use educational technology depending on ethnic group. For example, a student attending the math class at the school that did not use educational technology with project-based learning had an increased chance of student achievement on CBAs compared to a student in the math class using project-based learning through one-to-one technology at the school that used educational technology (i.e., Ed Tech Campus in Table 4).

Table 4

Math: Descriptive Statistics Dependent Variable: Student Percent Score Final CBA

Campus	Ethnicity	EcoDis.	Mean	Std. Deviation	N
Non-Ed Tech	Other	Yes	86.1	11.2	7
		No	82.7	12.0	9
		Total	84.2	11.4	16
	Black	Yes	78.3	11.5	3
		Total	78.3	11.5	3
	White	Yes	93.0	.0	2
		No	82.5	9.9	18
		Total	83.6	9.9	20
	Hispanic	Yes	81.0	10.5	27
		No	79.7	10.9	24
		Total	80.4	10.6	51
	Total	Yes	82.3	10.6	39
		No	81.2	10.6	51
		Total	81.7	10.6	90
Ed Tech	Other	Yes	69.1	20.6	8
		No	84.1	12.8	7
		Total	76.1	18.5	15
	Black	Yes	49.0	22.8	11

(continued)

Campus	Ethnicity	EcoDis.	Mean	Std. Deviation	N
		No	50.2	15.6	4
		Total	49.4	20.6	15
	White	No	58.0	22.0	6
		Total	58.0	22.0	6
	Hispanic	Yes	53.0	19.8	36
		No	59.5	18.2	31
		Total	56.0	19.2	67
	Total	Yes	54.6	21.1	55
		No	62.1	19.7	48
		Total	58.1	20.7	103
Total	Other	Yes	77.0	18.5	15
		No	83.3	12.0	16
		Total	80.3	15.5	31
	Black	Yes	55.3	24.0	14
		No	50.2	15.6	4
		Total	54.2	22.1	18
	White	Yes	93.0	.0	2
		No	76.4	17.2	24
		Total	77.6	17.1	26
	Hispanic	Yes	65.0	21.5	63
		No	68.3	18.3	55
		Total	66.6	20.0	118
	Total	Yes	66.1	22.2	94
		No	72.0	18.3	99
		Total	69.1	20.5	193

Research Question 2

The second research question stated the following: Is there a difference in teachers' sense of self-efficacy regarding project-based learning using one-to-one technology? While conducting interviews to determine the math and science teachers' sense of self-efficacy, the researcher needed to seek clarification after the interview. Therefore, a Likert scale questionnaire was used as a follow up tool to make sure the information was recorded correctly. Through the interview and questionnaire, the researcher found the math teacher, Mrs. Austin, had a very low sense of self-efficacy (25% or below) regarding implementation of project-based learning using one-to-one

technology. However, the science teacher, Mrs. Stephens, had a very high sense of self-efficacy (from 76% to 99%) regarding implementation of project-based learning using one-to-one technology.

Research Question 3

The third research question stated the following: What are eighth grade student perceptions on project-based learning through the implementation of one-to-one technology and its relationship to their achievement on their mathematics and science CBAs? While conducting the focus groups, the researcher started the sessions by making assurances of confidentiality, as well as moderating the discussion and prompting more discussion when needed. This researcher stated the following:

> I want to know what you think about project-based learning? And project-based learning, remember the definition on top, was the learning of basic disciplinary concepts within the context of real-world problems [that] the students can find relevant to your everyday life. Specifically, I'm referring to the project-based learning as being the learning of basic concepts within the context of real-world problems the students find relevant to their lives. Remember, all those times we worked on labs in your science class and your math class to find real-world solutions to real-world problems. How did you think the project-based learning helped you with your growth, with your student achievement growth, [and] with making connections to [the] real-world?

Throughout the focus group sessions, multiple themes emerged. The top five emergent themes are discussed in this dissertation.

Prepare for the Future

One common theme, observed through thematic coding of the focus group transcripts, was the knowledge gained during the students' eighth grade year to prepare them for the future, both academic future and real-life future. The students' statements and discussions are discussed in detail in the following paragraphs. Josie (personal

communication, January 10, 2018) stated, “I feel like it kind of got us prepared because now we have to use it more often, and so it's helpful now because we know what we're doing.” She followed up by explaining that while looking back (now that she was a senior), she could definitely see the benefit throughout her freshman, sophomore, junior, and senior year, especially while she filled out her college applications.

Another student, Jose (personal communication, January 10, 2018), had a similar but different take on how project-based learning with implementation on one-to-one devices helped him prepare for the future:

> It did prepare us. At the same time, it also showed us how difficult technology could be and how you have to be patient with it and try to learn and understand how to use it further to benefit you.

This naturally led to a fluid discussion between students; however, one particular student’s statement seemed original. Leah (personal communication, January 10, 2018) stated, “And just, it can also help us in the future workplaces with the advanced technology they have now to help us.” In prompting her to expand, she explained almost every job in the workplace had some sort of technology and technology applications for one to work effectively. Because the one-to-one technology initiative did not continue into the high school grade levels, gaining the knowledge in the eighth grade helped her learn how to use the technology through project-based learning or real-life skills/situations. Therefore, the technology helped her seem more knowledgeable compared to the other applicants and workers who did not have access to the one-to-one technology. An additional theme, which emerged out of the focus group transcripts, was ease of access to the technology, as discussed in the next subsection.

Ease of Access to Technology/Leveled the Playing Field

When the researcher asked what their student perceptions were about using the one-to-one technology in the classroom, the theme of access and leveling the playing field emerged. Jamie stated the following:

> I thought the computer in the classroom was very helpful because it gave us access to Internet. Some people didn't have cellphones back then. It gave us opportunity to get better access to things that we normally wouldn't have before this one-to-one technology. I thought it was very helpful and helped us improve our resources technology wise and try to figure out how to do technology because the future is technology, so I figured that was very helpful for us. (Jamie, personal communication, January 10, 2018)

Another student, Josie agreed, "It really gave others the resource to have the laptops that many would normally not ever have had a chance to have and still don't have laptops or computers at home." Abby added the following:

> And, I'm a perfect example because I didn't really like to use it just Because of weight purposes (it was heavy), but for knowledge it was needed, so that was okay. But, I know now since we don't have that access to it, that it has been a struggle for some things to get done, but everybody should have experience with it and hands on, if you need it. I feel like it's a choice, as well, to get one. (Abby, personal communication, January 10, 2018)

A discussion ensued regarding the student demographic population and the lack of access to the needed technology which thereby led back to the previous emergent theme, preparing the students for their future, which was discussed first. It ended with Jose stating, "Hey, while you're here getting your education, we'll help you out and you can learn the skills needed for the future (by giving you a one-to-one technology device). Because as Jamie said, technology is our future."

Ease of Use

The researcher asked if it was difficult to use one-to-one technology devices or if they already knew how to use everything when they first received the device. Ann (personal communication, January 10, 2018) stated,

> I felt like the laptop wasn't that difficult to use. The different programs in the laptops I did struggle with, but the teacher helped me and came and progressively I got better at using the laptop and I would recommend using the laptop more if we use it in a class project I would rather use a laptop as I learned how to use it more.

Matt also stated something similar:

> I know I didn't struggle with the laptop, like she (Ann) said it was harder to use the programs (applications) within it because I did have some computers at home and I had access to computers, Internet, technology at home, but it was just the problems using the applications and learning how to navigate throughout the entire process.
>
> (Matt, personal communication, January 10, 2018)

Most of the discussion, from the students' perspective gave the researcher the impression the laptop was easy to use, figuring out the applications (anywhere from office products to specialized per content area) which the teachers asked the students to use were where the students had trouble with ease of use of the one-to-one devices.

Focus and Motivation

Focus and motivation was spoken about a lot in the focus groups. The researcher tried to separate project-based learning and one-to-one technology by asking specific questions; however, because these were so integrated within the classroom, as the students talked about one, they also talked about the other. Jose stated,

> I know that it was exciting to actually get new equipment to have it for yourself for school. I know it did help me focus more because I was excited to use the computers and it did help me retain more information.
>
> I guess it also makes it easier by it being having just right there in front of you. You have the earphone on, all the distractions are going by, you're focused. You can hear more clearly. If you need to repeat it, you can repeat it and I think that helped to.

Leah stated,

> You keep us more focused than being on our phone (as opposed to using one-to-one devices). We always want to get distracted on our phone by a message or Snapchat or something, so I think the laptops would benefit because it's just you and the laptop.

After more discussion, Jose finished the conversation by stating,

> And you could also shut down the noise within the classroom because if somebody else chooses not to focus or do their work, it doesn't have to affect you in a negative way, but I know if somebody's being too loud I can't focus on my work.

Content Specific: Math and Science One-to-one Technology Usage

The researcher first asked about the students' math classes. Every student remembered and spoke about one particular project-based learning project with one-to-one technology integration. Jose explained it the best:

> For my math class, I know we had this project where we were able to go online and look up careers and career choices. After we made a career choice we made a budget, and we added everything up, and we had to figure out how much we had to make to live in a stable, above poverty level income. I feel like that did help us a little bit because you saw this, and you realize, "Hey, I need this. I need to do this," and it made you think ahead for your future and just know how far you have to go to succeed.

Leah added, "We had to look up how much groceries cost and apartment roommates and stuff, so we had to divide our money up for that too." However, when the researcher prompted for more discussion, the students said even though they used the

one-to-one devices in math, they did not use them as much as a learning tool, more as a review.

Next, the researcher asked the students about their science classroom. All the students had a completely different response. Ann said the following:

> I feel like we used the laptops the most in science. We would get on Gizmo (virtual labs) and do these little labs and I felt like that was very helpful because usually people can't really see what the teacher's doing when they're doing their little thing, but on the computer, you can actually see and label everything and tells you what they're doing. So I feel like the computer in science was very helpful for everybody because we were on there all the time. I believe that everybody was getting good scores on all of their tests and everything on the little Gizmos labs.

Matt added the following:

> And also with that, when our science teacher was just like, "Okay, go ahead look it up online yourselves," we didn't have to constantly bother our teachers like, "Hey, can you describe this? Can you explain this again?" If we needed help we could always go online to see it. And some people, they have to see it to understand it and to actually do it and to learn. I feel like having it right in front of me was helpful because I kind of like hands-on and to be able to click, move it here, it helped me with retaining that knowledge.

All the students responded in a positive manner when speaking about project-based learning via the use of one-to-one technology in their science class.

Research Question 4

Research Question 4 stated the following: What are eighth grade teacher perceptions on project-based learning through the implementation of one-to-one technology and its relationship to their students' achievement in mathematics and science CBAs? When the math and science teachers were asked questions about their perspectives, only two common themes emerged, while mainly opposite perceptions were evident. The two common themes were the following: the skill level of using academic

technology, in which the students began the school year, and the skill level of using academic technology, in which the students ended the school year.

Skill Level of Using Academic Technology at the Beginning of the Year

The science and the math teacher at the educational technology campus classes both agreed only between 50% to 75% of the students knew how to use technology for academics when entering eighth grade. For example, one teacher stated the following:

> The students know how to use gaming technology, but they don't know how to open a Word document, a Microsoft Office product, save a file, edit a file, create a presentation. Basically, everything we have to do on a daily basis. The students think they know how to work technology, but what they really knew how to do, in the beginning, was gaming technology. (Mrs. Stephens, personal communication, January 10, 2018)

Mrs. Austin added the following:

> We had to teach not only our content, all those math TEKS, but also build on their knowledge of gaming technology skills and apply those to academic technology. It was very difficult to teach the content and teach them how to do the basic computer skills that I thought, honestly, they would all come into the eighth grade already knowing how to do. (Mrs. Austin, personal communication, January 10, 2018)

Skill Level of Using Academic Technology at the End of the Year

The science and the math teacher at the educational technology campus classes both agreed 76% to 99% of the students knew how to use technology for academics before leaving the eighth grade. Mrs. Stephens and Mrs. Austin shared the perspective that with repetitive use of the one-to-one device, most students were proficient in academic technology usage by the time they left the eighth grade. One teacher stated the following:

> They (the students) were able to quickly breeze through a lesson and I stopped having to worry so much about being a computer teacher and was able to focus on

> my science content. Now that is not to say there were still not issues with the academic technology side, but the students were able to figure it out and ultimately kept them more engaged and excited. (Mrs. Stephens, personal communication, 2018)

One noncommon theme that was notable when looking at the quantitative results was the response from the math and science teacher when asked about their perspectives. They were questioned about whether they felt teaching project-based learning through one-to-one technology helped raise student achievement compared to in previous years, where they only taught project-based learning without the one-to-one technology. Mrs. Stephens, the science teacher, said she saw student achievement growth in 100% of her students while teaching project-based learning through using one-to-one technology. Mrs. Austin, the math teacher, said she saw student achievement growth in only 26% to 50% of her students while teaching project-based learning through using one-to-one technology.

CHAPTER V:

SUMMARY, IMPLICATIONS, AND CONCLUSIONS

Introduction

One must further research the influence of one-to-one technology to determine if a statistically significant difference exists in student achievement compared to students who do not have access to one-to-one technology (Jones, 2013). Therefore, this study was conducted to fill this gap and add knowledge about using technology through project-based learning at the eighth grade level. To fulfill this goal, this study used the data collected from one-to-one technology, as implemented through project-based learning, to determine whether a statistically significant difference existed in student achievement and the perceptions of students who have used one-to-one technology, in retrospect, from their eighth grade year. Teachers' self-efficacy was also discussed, as well as their perceptions of one-to-one technology using project-based learning.

This research study used an explanatory sequential mixed methods design; it involved collecting quantitative data first, and then explaining the quantitative results with in-depth, qualitative data. In the first research question, which formed the quantitative part of the study, mathematics and science CBA data were obtained from a school that employed educational technology in eighth grade to assess whether project-based learning that used one-to-one technology related to student achievement compared to the same previous year's mathematics and science CBA data obtained from a school that did not used educational technology in eighth grade.

The second, qualitative phase of research was conducted as a follow up to the quantitative results to help explain those quantitative results. This phase included a teacher survey, where the teachers answered questions regarding Bandura's (1994, 2010) theory of self-efficacy. Additionally, student focus groups were held to answer the last two research questions regarding student and teacher perceptions of one-to-one technology. All qualitative data were collected in retrospect. Meaning, when the teachers were interviewed and the student focus groups were held, they were asked to think back to the year the quantitative data were obtained, which was the year the teachers taught the focus group students, the students' eighth grade year. In this exploratory follow-up, the students' and teachers' perceptions were used to conclude this well-rounded research, as suggested by researchers (Creswell & Plano Clark, 2018).

The quantitative research contained a dependent and independent variable. Common based assessment scores were the dependent variable and were analyzed for the same students in multiple content areas: mathematics and science. The independent variables were the mode of instruction (i.e. one-to-one technology in the classroom) and ways in which the type of technology was used. Project-based learning was the constant variable. The construct of self-efficacy was measured and compared for teachers, using interview questions and the questionnaire.

Summary of Findings

The quantitative analysis of the data, which was conducted first, was completely accurate and corresponded to the follow-up qualitative data from both the student and teacher perspectives and the teacher self-efficacy questions. Quantitative data, which

were analyzed using factorial ANOVA, showed significant effects based on campus and ethnicity for science at the educational technology campus. The opposite was true for the quantitative data for math. Using the same factorial ANOVA, significant effects based on campus and ethnicity was found for the noneducational technology campus. The research was surprising: Math was statistically significant with the advantage being at the noneducational technology campus. However, the qualitative results gave the researcher the information needed to determine why science was more successful compared to math at educational technology campus. This information will be recapped later in this chapter, Chapter 5.

Self-Efficacy

Bandura's (1994, 2010) core belief theory stands on the foundation of human motivation, performance accomplishments, and emotional well-being. Unless people believe they can produce desired effects by their actions, they have little incentive to undertake activities or to persevere in the face of difficulties (Bandura, 1994, 2010). The science teacher, Mrs. Stephens, had a very high sense of self-efficacy. At the beginning of the year, Mrs. Stephens believed she could get 76% to 99% of her students to be successful using project-based learning through one-to-one technology devices compared to her previous year's students who were taught project-based learning but without the use of one-to-one technology devices. While the math teacher, Mrs. Austin, had a very low sense of self-efficacy. At the beginning of the year, Mrs. Austin believed she could get 25% or below of her students to be successful using project-based learning through

the use of the one-to-one technology devices compared to her previous years students who were taught by project-based learning but without one-to-one technology devices.

Through Bandura's (1994, 2010) paradigm of self-efficacy, the quantitative and qualitative findings of this research completely align. The science teacher believed she could achieve the desired effects in her students, and she and her students did. However, the math teacher did not believe she could achieve the desired effects in her students and she and her students did not.

The students from the focus groups identified five main concepts. Project-based learning through one-to-one technology helped them in eighth grade, as well as in their advanced grade levels. These concepts are discussed below.

Prepare for Future

Multiple students stated using project-based learning through one-to-one technology helped them in eighth grade, as well as future grade levels, and also for the workforce. Gaining the experience of one-to-one technology in eighth grade put the student ahead of other applicants in the workforce and increased success.

Ease of Access to Technology/Leveled the Playing Field

Some of the students did not have access to the technology; other students had access to technology at home. These different situations caused an unfair advantage for the students who had access to technology. When the district gave all students one-to-one laptops, the focus group students said it leveled the playing field, which gave those students, who did not have access to technology at home, an ease of access to technology.

Ease of Use

The students enjoyed the ease of use of one-to-one devices, especially in science. One example from the students included the ability to not continuously bother their teacher because they could look up the answer themselves. This aspect allowed them the freedom to review concepts, if needed, and to not make special arrangements for tutoring sessions. The students felt they learned and received improved student achievement in science.

Focus and Motivation

Each one of the students stated project-based learning through one-to-one technology helped keep them focused and motivated to complete their work. This finding was evident throughout the focus group sessions. Most students took advantage of the solace the one-to-one laptops gave them; when other students were not acting appropriately, they could tune everything out and focus on their own work, which helped them complete the work.

Content Specific: Math and Science One-to-One Technology Usage

As stated above, both quantitative and qualitative results show project-based learning through one-to-one technology increased student achievement in science. However, in math, the students remembered a project-based learning activity, via one-to-one technology, where there was not significant student achievement gained at the technology campus. However, in science, the students remembered many project-based learning activities, via one-to-one technology, where there was significant student achievement at the technology campus.

Skill Level of Using Academic Technology at the Beginning of the Year

The science and the math teacher at the educational technology campus classes both agreed only 50% to 75% of the students knew how to use technology for academics when entering eighth grade. Both teachers explained the students knew how to use gaming technology but not academic technology. Academic technology had to be taught, along with their subject and grade level TEKS.

Skill Level of Using Academic Technology at the End of the Year

While both the science and the math teacher at the educational technology campus, classes both agreed 76% to 99% of the students knew how to use technology for academics before leaving the eighth grade. However, they both did not agree on academic achievement with using project-based learning through one-to-one technology. The science teacher said she saw student achievement growth in 100% of her students, while teaching project-based learning through using one-to-one technology. The math teacher said she saw student achievement growth in only 26% to 50% of her students while teaching project-based learning through using one-to-one technology.

Implications and Recommendations

This study was intended for the audience of district administrators, such as superintendents, associate superintendents, curriculum instructional specialist, chief financial officers, and board members. Additionally, this study was intended for the audience of eighth grade campus level administrators, such as principals, assistant principals, campus curriculum instructional specialists, teachers, and students. Therefore, these audience members should find this information valuable to enhancing their

knowledge of instructional educational technology, making this study valuable to U.S. society by adding positive social change.

Implementation of project-based learning through one-to-one technology did have significant impact on student achievement in science. This finding occurred due to the collection of quantitative data and the qualitative data. Significant impact on student achievement did not take place based on these quantitative data and the qualitative data in math. The qualitative results might have not been as expected due to the low number used in the study: one science teacher and one math teacher.

These findings align to Bandura's (1994) self-efficacy theory. This theory's core belief is founded on human motivation, performance accomplishments, and emotional well-being. For example, the theory shows that unless people believe they can produce desired effects by their actions, they have little incentive to undertake activities or to persevere in the face of difficulties (Bandura, 1994, 2010). Based on this theory, this study was framed using the students' and teachers' perceptions on one-to-one technology. The science teacher's self-efficacy was very high, as evident in the interview, survey, and focus group. The math teacher's self-efficacy was low, as evident in the interview, survey, and focus group.

Recommendation for Future Research

Future research is needed in the application use in which teachers can implement instructional technology to blend U.S. educational systems' needs to challenge and hold the interest of U.S. children (North Carolina Department of Education, 2016). Per the findings of this research study, project-based learning through one-to-one technology did

hold the interest of the students and keep them engaged. Therefore, future research needs to be completed to determine what other instructional technology can keep the students level of engagement high.

Instructional technology can come in various forms. One form of educational technology is online learning. Online learning occurs when the instructor presents all the material in a web browser format outside the traditional classroom (de la Varre et al., 2010; North Carolina Department of Education, 2016). Future research needs to be completed to determine if online learning, through one-to-one technology, can be implemented effectively to help other special population students and/or special program students (e.g., special education students under section 504, home bound students, etc.).

Conclusions

District leaders spend a lot of time and resources (e.g., spending money on the technology itself, supporting infrastructure, enhancing professional development, etc.) to provide one-to-one technology (TEA, 2006, 2014). Therefore, this research aided school district leaders in determining if the one-to-one technology, through project-based learning, had a statistically significant influence on student achievement.

In the United States, students have faced changes in the ways in which they learn and retain information. These changes mean educators must understand ways in which students currently engage in learning new information, and therefore increase student achievement levels. Student engagement was one way to increase student achievement. To increase student engagement, educators needed to reach the students through what interested them, such as technology. Hence, technology represented one way of getting

students involved in learning to increase student achievement (Montrieux et al., 2017), thereby making this study necessary to increase the knowledge available on this subject. To accomplish this district must increase teacher professional development on implementation of using academic technology. Additionally, the professional development must be maintained throughout the school year, be content specific and incorporate creation of new concepts on the technology, not just using it as repetitive/review tool.

Most researchers, who have studied instructional educational technology, have focused on post-secondary institutions, such as universities and colleges (Jones, 2013; Picciano & Seaman, 2007). This research added to the limited research on instructional educational technology in the eighth grade setting. Understanding the importance of effective instructional educational technology at an eighth grade level added significant value to instructional technology research.

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APPENDIX A:

CPHS APPLICANT FORM

University of Houston Clear Lake

COMMITTEE FOR THE PROTECTION OF HUMAN SUBJECTS

Faculty/Sponsor Application for Investigation Involving Human Subjects

2700 Bay Area Blvd.
Houston, TX 77058-1098
281.283.3015 FAX 281.283.2143
uhcl.edu/research

DATE:	October 31, 2017
TITLE:	PBL using One-to-one Technology in eighth Grade Mathematics and Science and its Relationship to Student Achievement
PRINCIPAL INVESTIGATOR(S):	Dr. Gerald Schumacher
STUDENT RESEARCHER(S):	Holly Bailey
FACULTY SPONSOR:	Dr. Gerald Schumacher
PROPOSED PROJECT END DATE:	April 30, 2018
How will this project be funded:	Student

If grant, this project is: ____ **Pending** ____ **Funded – Federal** ____ **Funded – Other**

Grant title and/or contract number (if available): _____

All applicants are to review and understand the responsibilities for abiding by provisions stated in the UHCL's Federal-wide Assurance (FWA 00004068), approved by the Office of Human Research Protections (OHRP) on March 9, 2004: (a) The Belmont Report provides ethical principles to follow in human subject research; and (b) Federal regulations 45 CFR 46 and all of its subparts A, B, C, and D are the minimum standards applied to all of UHCL's human subject research.

See http://www.uhcl.edu/research -- Protection of Human Subjects, Federal-wide Assurance.

For questions, contact the Office of Sponsored Programs (OSP) at 281-283-3015 or sponsoredprograms@uhcl.edu

Principal Investigator (PI) / Faculty Sponsor (FS) Responsibilities Regarding Research on Human Subjects:

- PI / FS acknowledges reviewing UHCL's FWA (Federal-wide Assurance) approved by the Office of Human Research Protections (OHRP). PI / FS understands the responsibilities for abiding by provisions of the Assurance.
- The PI / FS cannot initiate **any** contact with human subjects until final approval is given by CPHS.

- Additions, changes or issues relating to the use of human subjects after the project has begun must be submitted for CPHS review as an amendment and approved PRIOR to implementing the change.
- If the study continues for a period longer than one year, a continuing review must be submitted **PRIOR** to the anniversary date of the studies approval date.
- PI / FS asserts that information contained in this application for human subjects' assessment is complete, true and accurate.
- PI / FS agrees to provide adequate supervision to ensure that the rights and welfare of human subjects are properly maintained.
- Faculty Sponsors are responsible for student research conducted under their supervision. Faculty Sponsors are to retain research data and informed consent forms for three years after project ends.
- PI / FS acknowledges the responsibility to secure the informed consent of the subjects by explaining the procedures, in so far as possible, and by describing the risks and potential benefits of the project.
- PI / FS assures CPHS that all procedures performed in this project will be conducted in accordance with all federal regulations and university policies which govern research with human subjects.

A. DATA COLLECTION DATES:

1. From: CPHS approval
2. To: April 30, 2018
3. Project End Date: April 30, 2018

B. HUMAN SUBJECTS DESCRIPTION:

1. Age range: 16-19
2. Approx. number: 2000
3. % Male: Approximately 50%
4. % Female: Approximately 50%

C. PROJECT SUMMARY:

Complete application using commonly understood terminology.

1. Background and Significance

Provide a **CONCISE** rationale for this project, based on current literature, information, or data. Include references as appropriate.

The purpose of the study is to determine if one-to-one technology, via project based learning, produced a difference in student achievement on common based assessments (CBA) in mathematics and science classrooms. This study will determine if there is a statistical significance in student achievement between the school who has and uses one-to-one technology versus the school who does not have or use one-to-one technology.

2. Specific Aims

Purpose, Hypotheses/Research Questions, Goals of the Project. **BRIEFLY** describe the purpose and goals of the project (include hypotheses or research questions to be addressed and the specific objectives or aims of the project. Describe or define terms or methods as needed for CPHS reviewer's understanding.

Research questions:

5. Does project based learning in an eighth grade environment increase student achievement on mathematics and science CBAs using one-to-one technology compared to an eighth grade environment without one-to-one technology?
6. Is there a difference in teachers' sense of self-efficacy regarding project based learning using one-to-one student technology?
7. What are eighth grade student perceptions on project based learning through the implementation of one-to-one technology and its relationship to their achievement on their mathematics and science CBAs?
8. What are eighth grade teacher perceptions on project based learning through the implementation of one-to-one technology and its relationship to their students' achievement in mathematics and science CBAs?

Definitions

Blended Learning: a classroom which uses 21st century instructional practices but maintains the essential face to face interactions (Imbriale, 2013).

Common Based Assessments (CBA): a standardized assessment created by the district to be given to every student in every school (Brewer, 2012).

Project Based Learning (PBL): the learning of basic disciplinary concepts within the context of real-world problems that student find relevant to their everyday life.
(Rogers, Cross, Gresalfi, Trauth-Nare, & Buck, 2011).

3. Research Method, Design and Procedures
   (A) Provide an overview of research methodology and design; e.g., how the data are to be collected, analyzed, and interpreted.
   (B) Provide step-by-step description of procedures and how they are to be applied. Procedures are to begin from CPHS approval and end when data compiled and results reported. Possible information to include: What are participants asked to do? When and where are they to participate? How long will it take to

participate? Describe type of research information gathered from participants, i.e., data being collected.

Note that ethical responsibility of researcher to participant does not end until participant's information has been destroyed. Research documentation cannot be destroyed for up to three years after completion of a study.

Research Design

This research study will use an explanatory sequential mixed methods design, it involves collecting quantitative data first and then will explain the quantitative results with in-depth causal comparative qualitative data. In the first research question, one of the quantitative part of the study, mathematics and science CBA data will be collected, using archival data, from Educational Technology eighth Grade to assess whether project based learning using one-to-one technology relate to student achievement compared to mathematics and science CBA data collected from the Non-Educational Technology eighth Grade using factorial ANOVA. The second, qualitative phase will be conducted as a follow up to the quantitative results to help explain the quantitative results A teacher survey which the teachers will test Bandera's theory of self-efficacy will be administered. In this exploratory follow-up, the students' and teachers' perceptions will be used to conclude this well-rounded research. (Creswell, Plano, & Clark, 2011).

Data Collection Procedures

Upon approval from the IRB and CPHS from the participating school district and university, the researcher will, in the fall semester after receiving parental consent, assent forms and teacher consent forms, begin conducting focus groups sessions with the students from the Educational Technology eighth grade school, as well as interview and survey the math and science teacher from the Educational Technology eighth grade school. Additionally, the researcher will begin running statistical analysis (factorial ANOVA) with the archival data from Educational Technology eighth grade and Non Educational Technology eighth grade once the archival data is released to the researcher.

This study will be a mixed methods study due to only archival data will be used for the quantitative Research Question #1. Student achievement data (CBA scores) for both the treatment group, Educational Technology eighth Grade and the comparison group, Non Educational Technology eighth Grade. Both eighth grades had similar demographics, with one of the few differences being the use of one-to-one technology at one campus and not the other. The study was created with the dependent variable being the assessments to measure achievement, proficiency, competence, etc. of those eighth grade mathematics and science students and the independent variable was the use/no use of one-to-one technology

with implementation of project based learning. District and school demographic data was gathered from the National Center for Education Statistics (NCES) both eighth grades.

Data Analysis Procedures

Quantitative

First, student achievement data was uploaded into SPSS for further analysis. To answer research question #1, the researcher conducted factorial ANOVA to determine if there was statistically significant mean difference in student mathematics and science achievement between those students in Educational Technology eighth Grade and student's mathematics and science achievement in those students in Non Educational Technology eighth Grade.

The independent variable; use of one-to-one laptops, will be categorical and will be divided into two groups: (a) students participating in the Educational Technology eighth Grade and (b) students in the Non Educational Technology eighth Grade who are not participating in one-to-one laptops. The dependent variable are student achievement in mathematics and science as measured by CBAs. For the purpose of this study, a statistical significance value of .05 was used. (This data will be given to me after I receive final district approval)

Qualitative

The researcher used emergent thematic coding for qualitative data analysis, looking for what categories emerge from the data after reviewing the data multiple times (Taylor-Powell & Renner, 2003). From emergent thematic coding the researcher will separate the findings into categories and sub-categories, ultimately leading to the identification of themes and patterns in the data.

4. Instruments for Research with Human Subject

Indicate instruments to be used.

(A) Submit copies electronically, if possible.

(B) Submit copy of copyrighted questionnaire for CPHS review. Copy kept on file by CPHS.

(C) Examples of instruments are as follows: (1) Educational Tests, (2) Questionnaires/Surveys, (3) Psychological Tests, (4) Educational Materials, i.e., curriculum, books, etc., (5) Interview or Phone Script, or (6) human subjects recruitment advertisements.

Longitudinal Common Based Assessment Data, Implementation of One-to-one Technology with PBL Integration Survey (previously confirmed reliable and valid survey questions collected from the following sources):

Goodman, J. S. (2016). *A case study of teacher attitudes, belief systems, and behaviors associated with substantive student academic achievement in a charter school serving an economically disadvantaged urban population* (Doctoral dissertation). University of Houston Clear Lake, Houston, Texas.

Jones, M. B. (2013). *Technology integration in a one-to-one laptop initiative: A multiple case study analysis* (Doctoral dissertation). University of Houston Clear Lake, Houston, Texas.

Moursund, D., & Bielefeldt, T. (1999). *Will new teachers be prepared to teach in a digital age? a national survey on information technology in teacher education* (Master's thesis, International Society for Technology in Education, 1999) (pp. 1-60). Beverly Hills: Milken Family Foundation.

5. Human Subject Source and Selection Criteria

Describe the procedures for the recruitment of the participants. Indicate when human subject involvement is expected to begin and end in this project. Example information to include:

(A) Characteristics of subject population, such as anticipated number, age, sex, ethnic background, and state of health.
(B) Where and how participants are drawn for subject selection criteria. Coercion or undue influence needs to be considered and eliminated.
(C) How ensuring equitable subject selection.
(D) If applicable, criteria for inclusion and/or exclusion and provide rationale.
(E) Children are classified as a vulnerable population. See Subpart D, §46.401, of federal guidelines for additional safeguards aimed to protect the rights and welfare of these subjects.

Quantitative: Archival data from the district for both eighth grade schools: one eighth grade school using one-to-one technology and one eighth grade school not using one-to-one technology. One eighth grade Science teacher and one eighth grade Math teacher's student level data will be received for a three year time period (archival) for the years of 2012-2013, 2013-2014, and 2014-2015 for each of the two eighth grade schools.

Qualitative: Focus group participants will be recruited via a letter mailed to the students who were in attendance at the eighth grade schools who used one-to-one technology during the time of the requested archival data. Estimated student involvement is 5 to 7 students in each focus group, with at least 2 or 3 focus groups.

Teachers from the eighth grade school with one-to-one technology will complete a survey and will be interviewed. Once again, this is archival

data, so the teachers and students will have to think back to the years in question.

6. Informed Consent

For more details, see "Federal & University Guidelines" document, "Informed Consent" section.

(A) Describe procedure for obtaining informed consent.
(B) Use language that is appropriate for age or understandability of subjects.
(C) Attach informed consent page.
(D) If applicable, attach the following documents for review: (1) Parental permission form for participation of minors (under 18 years of age). (2) Assent form for children between ages 7 and 17: (2a) ages 12-17 must sign assent form; (2b) ages 7-11 must have witness sign attesting to child's positive assent.
(E) **Request CPHS waiver for documentation of informed consent, if appropriate**. Justification is required. See "Federal & University Guidelines."

Due to data for quantitative portion of research being archival data no informed consent is required. Student participating in the focus groups will be required to complete the Assent form for the ages of 12-17. Additionally, their parents are required to complete the Consent form for parental approval. Teachers participating in the study are required to complete the Informed consent form.

7. Confidentiality

Describe how data will be safeguarded: (a) how confidentiality maintained; use of personal identifiers or coded data; (b) how data collected and recorded; (c) how data stored during project; (d) who has access to data or participant's identifiers; (e) who is to receive data, if applicable; (f) what happens to data after research is completed.

Note that research documentation, including signed informed consent forms, are safeguarded for three years after completion of study for federal audit purposes. Faculty sponsors are responsible for safeguarding research documentation completed by students.

Data will be stored on the researchers' password protected desktop computer and backed up to an external hard drive. Student confidentiality will be maintained by removing personal identifiers (student id's), data will be collected from the district's student information system, researcher will be only person with access to data, and data will be stored in a locked file cabinet for five years after completion of research before being destroyed.

8. Research Benefits

Describe any anticipated benefits to subjects as well as reasonably expected general results.

Benefits from this study will enable the district, which spend an enormous amount of money and other resources on one-to-one technology, to gather

quality quantitative data and qualitative data on the effect of one-to-one technology and student achievement, if any.

9. Risks

Describe any foreseeable risks to the subjects, whether physical injury, psychological injury, loss of confidentiality, social harm, etc., involved in the conduct of the research. Explain precautions taken to minimize these risks. If there are any foreseeable risks, provide contact information of organization(s) for professional treatment.

Archived data will be used. Student identifying information will be masked.

10. Other Sites or Agencies Involved in Research Project

Indicate specific site if not UHCL, e.g., school districts or school, clinics.

(A) Obtain written approval from institution. Approval should be signed and on institution's letterhead. Other proof of documentation may be reviewed for acceptance by CPHS.

(B) Institution should include the following information: (B1) institution's knowledge of study being conducted on its site; (B2) statement about what research study involves; (B3) outline specific procedures to be conducted at site; and (B4) identify type of instrument(s) used to collect data and duration needed to complete instruments; (B5) statement that identities of institution and participants will be kept confidential; (B6) institution's permission granting the use of its facilities or resources; and (B7) include copy of Informed Consent document(s) to be used in recruiting volunteers from the institution.

(C) If at all possible, electronic copies of letter or other documentation are to be submitted with CPHS application.

(D) If letters are not available at time of CPHS review, approval will be contingent upon their receipt.

Please see approved site letter.

APPENDIX B:

TEACHER PARTICIPANT LETTER

Informed Consent to Participate in Research

You are being asked to participate in the research project described below. Your participation in this study is entirely voluntary and you may refuse to participate, or you may decide to stop your participation at any time. Should you refuse to participate in the study or should you withdraw your consent and stop participation in the study, your decision will involve no penalty or loss of benefits to which you may be otherwise entitled. You are being asked to read the information below carefully, and ask questions about anything you don't understand before deciding whether or not to participate.

Title: STUDENT ACHIEVEMENT USING PROJECT-BASED LEARNING ONE-TO-ONE TECHNOLOGY IN EIGHTH GRADE MATHEMATICS AND SCIENCE

Principal/Student Investigator(s): Holly Bailey, M.Ed.
Faculty Sponsor: Gary Schumacher, Ph.D.

PURPOSE OF THE STUDY

The purpose of this study is to determine if one-to-one technology, through the use of project-based learning, in an eighth grade environment increases student achievement on common based assessments (CBA) in mathematics and science.

PROCEDURES

1) Gain participants' agreement to join this study.
2) Interview participants before or after classes/work day or at a time of their choosing. Interview questions about perception on one-to-one technology in a math or science classroom and what they believe about its relationship to student achievement. Interviews should take no longer than 45 minutes and information will be recorded in a journal.
3) Survey participants. This will help determine type of implementation and amount of implementation. The survey should take no longer than 15 mins.

EXPECTED DURATION

The total anticipated time commitment will be approximately one hour.

RISKS OF PARTICIPATION

There are no anticipated risks associated with participation in this project.

BENEFITS TO THE SUBJECT

There is no direct benefit received from your participation in this study, but your participation will help the investigator(s) better understand teachers perceptions of technology implementation. Especially in the first years of implementation and the effect, from a teacher perspective, a technology initiative has on student achievement.

CONFIDENTIALITY OF RECORDS

Every effort will be made to maintain the confidentiality of your study records. The data collected from the study will be used for educational and publication purposes, however, you will not be identified by name. For federal audit purposes, the participant's documentation for this research project will be maintained and safeguarded by the Principal Investigator for a minimum of three years after completion of the study. After that time, the participant's documentation may be destroyed.

FINANCIAL COMPENSATION

There is no financial compensation to be offered for participation in the study.

INVESTIGATOR'S RIGHT TO WITHDRAW PARTICIPANT

The investigator has the right to withdraw you from this study at any time.

CONTACT INFORMATION FOR QUESTIONS OR PROBLEMS

The investigator has offered to answer all your questions. If you have additional questions during the course of this study about the research or any related problem, you may contact the Student Investigator, Holly Bailey, M.Ed. The Faculty Sponsor, Gary Schumacher, Ph.D., may be contacted.

SIGNATURES**:**

Your signature below acknowledges your voluntary participation in this research project. Such participation does not release the investigator(s), institution(s), sponsor(s) or granting agency(ies) from their professional and ethical responsibility to you. By signing the form, you are not waiving any of your legal rights.

The purpose of this study, procedures to be followed, and explanation of risks or benefits have been explained to you. You have been allowed to ask questions and your questions have been answered to your satisfaction. You have been told who to contact if you have additional questions. You have read this consent form and voluntarily agree to participate as a subject in this study. You are free to withdraw your consent at any time by contacting the Principal Investigator or Student Researcher/Faculty Sponsor. You will be given a copy of the consent form you have signed.

Subject's printed name: _____

Signature of Subject: _____

Date: _____

Using language that is understandable and appropriate, I have discussed this project and the items listed above with the subject.

Printed name and title: Holly Bailey

Signature of Person Obtaining Consent: _____

Date: _____

THE UNIVERSITY OF HOUSTON-CLEAR LAKE (UHCL) COMMITTEE FOR PROTECTION OF HUMAN SUBJECTS HAS REVIEWED AND APPROVED THIS PROJECT. ANY QUESTIONS

REGARDING YOUR RIGHTS AS A RESEARCH SUBJECT MAY BE ADDRESSED TO THE UHCL COMMITTEE FOR THE PROTECTION OF HUMAN SUBJECTS (281-283-3015). ALL RESEARCH PROJECTS THAT ARE CARRIED OUT BY INVESTIGATORS AT UHCL ARE GOVERNED BY REQUIREMENTS OF THE UNIVERSITY AND THE FEDERAL GOVERNMENT. (FEDERALWIDE ASSURANCE # FWA00004068)

APPENDIX C:

STUDENT ASSENT FORM

ADOLESCENT PARTICIPANT ASSENT FORM

You are asked to help me in the project described below. Your parents or guardian have given their okay, but you get to decide if you want to be in this study or not. You may stop or quit the study at any time by telling me, and it is okay. If you want to know more about the study, it is okay to ask questions.

Title of Study: STUDENT ACHIEVEMENT USING PROJECT-BASED LEARNING ONE-TO-ONE TECHNOLOGY IN EIGHTH GRADE MATHEMATICS AND SCIENCE

Principal Investigator:
Holly Bailey, Doctoral Student at University of Houston-Clear Lake

Faculty Sponsor:
Gary Schumacher, Ph.D.

ASSENT FORM

Purpose: The purpose of this study is to determine if one-to-one technology, through the use of project based learning, in an eighth grade environment increases student achievement on common based assessments (CBA) in mathematics and science.

Procedures: You will be asked to meet in a group with other students (called a focus group), with the principal investigator listed above, in a neutral public location, such as a coffee shop, and answer questions about one-to-one technology in math and science classrooms while you were in eighth grade. It will take about 30 minutes to an hour for the focus group to complete the interview.

I will do everything to make sure that you do not get hurt in any way. The focus group participants will be the only people who know what you say and do. If this information is shared with others, it will be combined with responses from all students interviewed and presented anonymously.

If you understand what you are being asked to do and you decide to help, you are asked to sign your name below.

Printed Name and Signature of Adolescent Date

Researcher's Signature Date

THE UNIVERSITY OF HOUSTON-CLEAR LAKE (UHCL) COMMITTEE FOR PROTECTION OF HUMAN SUBJECTS HAS REVIEWED AND APPROVED THIS PROJECT. ANY QUESTIONS REGARDING YOUR RIGHTS AS A RESEARCH SUBJECT MAY BE ADDRESSED TO THE UHCL COMMITTEE FOR THE PROTECTION OF HUMAN SUBJECTS (281-283-3015). ALL RESEARCH PROJECTS THAT ARE CARRIED OUT BY INVESTIGATORS AT UHCL ARE GOVERNED BY REQUIREMENTS OF THE UNIVERSITY AND THE FEDERAL GOVERNMENT. (FEDERALWIDE ASSURANCE # FWA00004068)

APPENDIX D:

PARENT CONSENT FOR STUDENT PARTICIPANTS

PARENTAL CONSENT FORM

Title of Study: STUDENT ACHIEVEMENT USING PROJECT-BASED LEARNING ONE-TO-ONE TECHNOLOGY IN EIGHTH GRADE MATHEMATICS AND SCIENCE

Principal Investigator: Holly Bailey, Doctoral Student
University of Houston-Clear Lake

Faculty Sponsor: Gary Schumacher, Ph.D.
University of Houston-Clear Lake

Your child is invited to participate in a research project. Your child's participation is entirely voluntary and you may choose that your child not participate. If you choose for your child to participate, or if you withdraw your consent and stop your child's participation in the study, your decision will involve no penalty or loss of benefits normally available for you or your child. If you have any questions about the study, please contact Holly Bailey at the phone number listed above.

The purpose of this research is to study student perceptions of using one-to-one technology, when your child was in eighth grade, in math and science classrooms. A description of the procedures is as follows: Your child will be asked to meet in a group with other students (called a focus group), with the principal investigator listed above, in a neutral public location, such as a coffee shop, and answer questions about one-to-one technology in math and science classrooms while they were in eighth grade. It will take about 30 minutes to an hour for the focus group to complete the interview.

The benefits of this research include providing valuable insight for school officials, administrators, teachers and support staff, so educators can better understand the perceptions of the students.

There are no risks expected as a result of your child's participation.

Any information obtained from this study will remain confidential. Your child's responses will not be linked to his or her name or your name in any written or verbal report of this research project. The data collected will be used for educational and publication purposes and presented in summary form. For federal audit purposes, the documentation for this research project will be maintained and safeguarded by the principal investigator or faculty sponsor for a minimum of three years after completion of the study. After that time, documentation may be destroyed.

SIGNATURES:

You are making a decision about allowing your child to participate in this study. Your signature below indicates that you have read the information provided above and have decided to allow your child to participate in the study. You are free to withdraw consent for your child to participate in this study at any time by contacting Holly Bailey at the phone number provided. You will be given a copy of this consent form for your records.

_____

Printed Name of Child

_____

Printed Name and Signature of Parent Date

_____

Signature of Investigator Date

THE UNIVERSITY OF HOUSTON-CLEAR LAKE (UHCL) COMMITTEE FOR PROTECTION OF HUMAN SUBJECTS HAS REVIEWED AND APPROVED THIS PROJECT. ANY QUESTIONS REGARDING YOUR RIGHTS AS A RESEARCH SUBJECT MAY BE ADDRESSED TO THE UHCL COMMITTEE FOR THE PROTECTION OF HUMAN SUBJECTS (281-283-3015). ALL RESEARCH PROJECTS THAT ARE CARRIED OUT BY INVESTIGATORS AT UHCL ARE GOVERNED BY REQUIREMENTS OF THE UNIVERSITY AND THE FEDERAL GOVERNMENT. (FEDERALWIDE ASSURANCE # FWA00004068)

APPENDIX E:

TEACHER QUESTIONNAIRE

Teacher Questionnaire

Directions:

Thank you for taking your time to complete this survey. Please complete this survey in retrospect, thinking back to the first year your students had one-to-one technology devices (laptops) in your classroom, school year 2013-2014.

Questions

1. How often did you have the students use the wide range of available information technologies on their one-to-one devices to construct and implement project-based learning (defined as: the learning of basic disciplinary concepts within the context of real-world problems that student find relevant to their everyday life) lessons/outcomes?

   ☐ 0% ☐ 1-25% ☐ 26-50% ☐ 51-75% ☐ 76-99% ☐ 100%

2. What percentage of your students, at the beginning of the year, had the ability to complete age-appropriate educational technology knowledge and skills task?

   ☐ 0% ☐ 1-25% ☐ 26-50% ☐ 51-75% ☐ 76-99% ☐ 100%

3. What percentage of your students, at the end of the year, had the ability to complete age-appropriate educational technology knowledge and skills task?

   ☐ 0% ☐ 1-25% ☐ 26-50% ☐ 51-75% ☐ 76-99% ☐ 100%

4. What percentage of your students, at the end of the year, showed mastery (i.e. learned to solve problems, accomplish complex tasks, and use higher-order thinking skills) in your subject areas' (math or science) educational technology rich environment?

   ☐ 0% ☐ 1-25% ☐ 26-50% ☐ 51-75% ☐ 76-99% ☐ 100%

5. What percentage of your students, at the end of the year, compared to other eighth grade students who did not have laptops in previous years, showed more academic achievement due to PBL and access to the laptops?

   ☐ 0% ☐ 1-25% ☐ 26-50% ☐ 51-75% ☐ 76-99% ☐ 100%

6. What percentage, at the beginning of the year, was your own attitude concerning the one-to-one laptops and student achievement? In other words, at what percentage did you believe the laptops would benefit the academic achievement of the students at the beginning of the year.

☐ 0% ☐ 1-25% ☐ 26-50% ☐ 51-75% ☐ 76-99% ☐ 100%

7. What percentage, at end of the school year, were your own attitudes concerning the one-to-one laptops and student achievement? In other words, at what percentage did you believe the laptops benefited the academic achievement of the students at the end of the year.

☐ 0% ☐ 1-25% ☐ 26-50% ☐ 51-75% ☐ 76-99% ☐ 100%

8. What percentage, at the beginning of the year, was your students attitude concerning the one-to-one laptops and student achievement? In other words, at what percentage did the students react positively to the one-to-one technology.

☐ 0% ☐ 1-25% ☐ 26-50% ☐ 51-75% ☐ 76-99% ☐ 100%

9. What percentage, at the end of the year, was your students attitude concerning the one-to-one laptops and student achievement? In other words, at what percentage did the students react positively to the one-to-one technology.

☐ 0% ☐ 1-25% ☐ 26-50% ☐ 51-75% ☐ 76-99% ☐ 100%

10. What percentage of growth did you see from the previous year, when teaching without the one-to-one technology, to teaching this first year, with the one-to-one technology?

☐ 0% ☐ 1-25% ☐ 26-50% ☐ 51-75% ☐ 76-99% ☐ 100%

References

Goodman, J. S. (2016). *A case study of teacher attitudes, belief systems, and behaviors associated with substantive student academic achievement in a charter school serving an economically disadvantaged urban population* (Doctoral dissertation). Retrieved from University of Houston Clear Lake, ProQuest Dissertations Publishing.

Jones, M. B. (2013). *Technology integration in a one-to-one laptop initiative: A multiple case study analysis* (Doctoral dissertation). Retrieved from University of Houston-Clear Lake, ProQuest Dissertations Publishing. (3578720)

Moursund, D., & Bielefeldt, T. (1999). *Will new teachers be prepared to teach in a digital age? a national survey on information technology in teacher education.* (Master's thesis, International Society for Technology in Education, 1999) (pp. 1-60). Beverly Hills: Milken Family Foundation.

APPENDIX F:

STUDENT FOCUS GROUP QUESTIONS

Research Question: What are eighth grade student perceptions on project-based learning through the implementation of one-to-one technology and its relationship to their achievement on their mathematics and science CBAs?

Definitions

Blended Learning: a classroom which uses 21st century instructional practices but maintains the essential face to face interactions (Imbriale, 2013).
Common Based Assessments (CBA): a standardized assessment created by the district to be given to every student in every school (Brewer, 2012).
Project Based Learning (PBL): the learning of basic disciplinary concepts within the context of real-world problems that student find relevant to their everyday life. (Rogers, Cross, Gresalfi, Trauth-Nare, & Buck, 2011).

1. Name
2. Age
3. Ethnicity

As mentioned before we began our interview and as explained in the papers I gave you, this study is focused on your eighth grade school year to gain student perceptions on project-based learning through the implementation of one-to-one technology and its relationship to your achievement on your mathematics and science CBAs? I am studying what students think about using project-based learning, through one-to-one technology, and if these things helped increased your success on math and science CBAs, so your student achievement.

4. I want to know what you think about project-based learning. Specifically, I am referring to project-based learning as being the learning of basic disciplinary concepts within the context of real-world problems that students find relevant to their everyday life. Basically, remember all those times, when you worked on labs or projects in Mrs. Stephen's and Mrs. Austin's class to find a solution to a real world problem.
5. I want to know what you think about one-to-one technology. Specifically, I am referring to one-to-one technology as being the laptop you used in eighth grade. Tell me what you thought about using the computer in the classrooms?
6. I want to know about your success in math. Specifically, I am referring to if you feel like project-based learning and/or one-to-one technology helped increase your CBA scores in Mrs. Austin's math class?

7. I want to know about your success in science. Specifically, I am referring to if you feel like project-based learning and/or one-to-one technology helped increase your CBA scores in Mrs. Stephen's science class?