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Effects of Online Parental Remediation in Alternative School Mathematics

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Effects of Online Parental Remediation in Alternative School Mathematics

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Kennesaw State University

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A Dissertation

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Acknowledgements

I want to thank my family for putting up with all the days and long nights I spent working on this project. I would also like to thank my committee...Dr. Stockdale, Dr. Driver and Dr. Johnson... for helping me complete this adventure and obtain my doctorate. It has taken me a few more years than I had planned but I believe the end product was well worth the work and time it took to complete. I especially want to thank Dr. Stockdale for providing me with all the support and suggestions that helped guide me through this long and arduous process. I am not sure how I would have completed this endeavor without her continuous support and assistance whenever I had a question.

Dedication

I first began this project for my wife and children. I wanted to be a good role model and set a good example for them to always strive for in their education, careers, and lives. I want them to know that they can do or be whatever they want as long as they are dedicated, persevere, and work hard—shoot for the moon!

The morning of the day I was to take the entrance exam before beginning this program; I was visiting my brother who was a great guy and an excellent writer. He was giving me advice on improving my writing skills so that I might get a higher score. Sadly, he suffered a heart attack and passed away that morning before I left to take the test. I miss him dearly. That is why I dedicate this work to my little brother—Malcolm Wiley Rogers.

Abstract

The focus of this non-experimental correlation designed study was to investigate the relationships between the use of teacher-made instructional videos for online parental remediation in algebraic content and parental self-efficacy and students' mathematical achievement in alternative education. The population of this study consisted of a group of 28 parents and their children who were students enrolled in an alternative school in the Southeastern United States. Multiple forms of data were analyzed that included information gained from surveys, website analytics, student assessments and parent interviews. The analyses of the data found that most parents did watch the videos and the intervention did support parental self-efficacy in mathematics. However, there was no strong correlation between the use of the videos and student achievement. The pre- and post-assessments of the control and experimental phases were not significantly different. Therefore, more research is needed on web-based parental remediation using teacher-made instructional videos and its relationship with student achievement.

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Chapter One: Introduction

Education is the most powerful weapon which you can use to change the world.

—Nelson Mandela (1990)

According to the Global Partnership for Education (2017), the United Nations General Assembly formally adopted the 2030 Agenda for Sustainable Development in which leaders suggested that education is the single most important thing that can help eliminate the world's various inequalities and help ensure a successful life for everyone. Unfortunately, many of United States high school students have continued to have difficulty in completing this education and need assistance as they are in danger of dropping out of school (McKee & Caldarella, 2016). Alternative education programs are designed to meet the academic, emotional, and behavioral needs of students who do poorly in the traditional school setting. Nonetheless, dropout rates have remained a problem (McFarland, Stark & Cui, 2016). As suggested by Genao (2014), a reform of alternative education programs is required to effectively engage youth who are traditionally referred to those types of learning institutions. Consequently, improvements are necessary in the instructional capacity of alternative schools to help at-risk students be more successful.

This study investigated a potential method for improving the instructional strategies of math teachers with the implementation of teacher-made videos designed for online parental remediation in algebraic content. Mathematics is an important area of focus because as cited by Bancroft, Bratter, and Rowley (2017), "...math is considered a substantial barrier to entry into STEM education and employment (Sells, 1973; Charles and Bradley, 2009)" (p. 320). Bancroft et al. also claimed that success in math is a significant factor in students' continued involvement in higher-level math and science. It is especially important for students to become skillful with

algebraic operations because as cited in Lee, Ng, and Bull (2018), “Algebra is often regarded as a gateway to learning higher mathematics (National Mathematics Advisory Panel, 2008)” (p. 1758).

Previous studies on the correlation between high school math completion and college success have shown positive, statistically significant relationships between completion of higher level math courses and college enrollment, persistence, and completion (Stoker, Mellor, Regional Educational Laboratory Southwest, National Center for Education Evaluation and Regional Assistance, & SEDL, 2018). This has particular significance to the future success of many students because as cited in Harackiewicz, Rozek, Hulleman, and Hyde (2012):

The pipeline leading students toward careers in science, technology, engineering, and mathematics (STEM) begins leaking in high school, when some students choose not to take advanced mathematics and science courses. Only 12% of U.S. students take calculus, 56% take chemistry, and 29% take physics (National Science Board, 2004). High school course choices have significant implications for academic and career trajectories (Simpkins, Davis-Kean, & Eccles, 2006), and it is essential to mobilize all potential resources for motivating adolescents to take courses that will best prepare them for their future. (p. 899)

A potential resource for increasing student motivation, as well as achievement, may be parental involvement. Extant research on parental involvement in education has highlighted its significance to student achievement (Jeynes, 2016). Moreover, as suggested by Mistretta (2013), parents need to be taught how to support their children at home. In alignment with these findings, this research focused on identifying components of a healthy system in alternative education and examined the effect of a teacher’s use of digital videos for online remediation on

parental self-efficacy for supporting their child in mathematics and student achievement in an alternative school. The information gained from this study has potential to support the enhancements of both parental engagement and the academic performance levels of future students in alternative education.

Statement of the Problem

Ten years ago Carver and Lewis (2010) asserted that there were 646,500 adolescents attending alternative schools and programs for at-risk students in 2007–08 yet; 17% of those students dropped out of school and 5% were transferred to a criminal justice facility. Carver and Lewis also noted that 57% of districts with alternative schools and programs for at-risk students indicated that continual academic failure was a reason for enrollment in alternative education. In addition, Carver and Lewis indicated that there were 10,300 district-administered alternative schools and programs for at-risk students in the United States.

More recently and more specific to the location of the present research, according to the Georgia Department of Education (2018), there were 437 alternative educational settings (AES) in the state of Georgia. Notably, AES have been found by previous research to disproportionately exhibit poor academic performance and disruptive behavior as cited in Schwab, Johnson, Ansley, Houchins, and Varjas (2016):

Although the purpose of AES varies, the typical AES population is comprised of a disproportionate number of students who: (a) live in poverty, (b) have a disability, (c) experience language barriers, (d) earn poor grades, (e) have poor school attendance, and (f) frequently engage in disruptive behaviors (Becker, 2010; Carver et al., 2010). These issues combined with other family problems increase the odds that alternative school students may have poor academic and behavior skills (Becker, 2010). (p. 194)

All this information highlighted a need to discover new methods for improving the achievement levels and success rate of future students in alternative education.

Alternative education exists due to traditional public education's failure of meeting the intensive needs of the student population in high danger of failing school (Edgar-Smith & Palmer, 2015). Alternative schools support troubled learners by instituting practices such as smaller class sizes, more one-on-one time with the teacher, and various other methods; however, many alternative students continue to have difficulty learning and have a substantially increased probability of school failure (Herndon & Bembenutty, 2017). Moreover, previous research indicated enrollment in a behavior focused alternative school may decrease a student's performance level and increase their chance of a premature exit from school (Wilkerson, Afacan, Perzigian, Justin, & Lequia, 2016).

And a possible contributing factor to the deficient performance in alternative education is that the parents of at-risk students tend to have less involvement in their children's education (Coates, 2014). Less parental involvement can have a harmful effect on student achievement as studies have shown that the structure provided by parents contributes significantly to children's grades in mathematics (O'Sullivan, Chin & Fish, 2014). Elliott and Bachman (2018) noted that correlations between parents' attitudes and children's math skills may be attributable to parents with better math skills sharing more positive attitudes about math and having children with stronger math skills. Feasibly, online learning may provide several methods for improving the performance of students (and perhaps parents) in alternative education. As stated in Flynn (2016), "There are online tools that seem to help at-risk students succeed, even if they are having some learning challenges with the course material" (p.3).

To encourage more parental engagement and help at-risk students be more successful, this study was designed to investigate the feasibility of improving student performance in alternative education by implementing online parental remediation with the intent of increasing parental knowledge, self-efficacy and involvement in their children's learning. Parents were given an invitation to participate in educational and meaningful activities via the Internet in the form of several teacher-made instructional videos over material covered in their children's 9th grade algebra class. The parents provided various data which was then analyzed and thus helped determine the impact of the web-based parental remediation on their self-efficacy as well as the students' performance and achievement levels in mathematics. The overall goal of this research was to ultimately improve the teaching and learning in alternative education and help ensure that all students have an equal opportunity for a successful education.

Research Questions

Previous research has shown that parental engagement and the implementation of technology in the classroom are supportive of student achievement (Devlin and McKay, 2016; Hammond, et al., 2014; Kim and Lee, 2011). However, there has been little or no research that systematically relates parent's mathematical self-efficacy and student achievement of mathematics in alternative education to teachers' implementation of web-based technology, i.e., digital videos as instructional resources for online parental remediation. Therefore, to help fill the gap in literature and to potentially discover better methods for improving the performance and achievements of students in alternative education, this study examined the effectiveness of online learning for parental remediation. Using a quantitative methodology with a non-experimental correlational design, the research questions this study sought to answer were as follows:

1. What effect does online parental remediation have on parental interaction and support for mathematics in an alternative school?

- a. Does participation in online parental remediation significantly improve parental self-efficacy in their ability to support their child in mathematics?

H_0 There is no significant correlation between the participation of online parental remediation and parental self-efficacy in their ability to support their child in mathematics.

H_1 There is a significant correlation between the participation of online parental remediation and parental self-efficacy in their ability to support their child in mathematics.

- b. Is there a relationship between parental demographics (specifically amount of mathematics courses, age, and gender) and their use of online parental resources?

H_0 There is no significant correlation between parental demographics (specifically amount of mathematics courses, age, and gender) and their use of online parental resources.

H_1 There is a significant correlation between parental demographics (specifically amount of mathematics courses, age, and gender) and their use of online parental resources.

- c. Does participation in online parental remediation significantly improve students' mathematical achievement in alternative education?

H_0 There is no significant correlation between participation in online parental remediation and students' mathematical achievement in alternative education.

- H*₁ There is a significant correlation between participation in online parental remediation and students' mathematical achievement in alternative education.
2. How do parents of alternative students utilize online instructional videos in support of their children's learning of mathematics?
 - a. How often do parents watch the instructional videos?
 - b. Do parents watch videos alone, with the students or both?
 3. What are the motivating factors that encourage or discourage parental utilization of online instructional videos for support of students in alternative education?

Purpose and Significance of Study

The results of this study are supportive of teacher practices in alternative education because future teachers and leaders may use the information to be better able to design and prepare more effective curricula in alternative education. Teachers may be better able to collaborate with parents and increase the instructional capacity of teachers in alternative education. The knowledge provided through this study of the use of online learning for parental remediation may ultimately improve academic performances in alternative education and help at-risk students complete their high school education—thus providing them with a better opportunity for a successful life.

To better prepare alternative students for a 21st Century workforce and help them reach their full potential, teachers must discover new and innovative methods for improving the teaching and learning in alternative education. Creating more opportunities in the areas of parental involvement and technology (i.e., online learning) has been found to be important because they are essential resources for improving student achievement (Devlin & McKay, 2016; Hammond, Zielezinski & Goldman, 2014; Kim & Lee, 2011). Therefore, this study examined

the efficacy of using web-based applications for parental remediation to improve parental self-efficacy and involvement in alternative education. The hypothesis was that it would help improve the parents' self-efficacy in solving math problems as well as their involvement with their children's education, and thus benefit the self-efficacy, performance and overall success of at-risk students in alternative education.

Local Context

This study focused on students enrolled in an alternative school in middle Georgia. During the initial stages of this investigation, the researcher conducted a pilot study at an alternative school in the southeastern United States which indicated a high need for improvements in the content area of mathematics. Further investigation in this pilot required the collaboration of other teachers at the school as well as the facilitation of meetings and discussions where the researcher created an agenda, monitored time, listened, and helped move the discussions through the data process as it related to grade level content, individual and group academic needs. One consensus among the group of teachers was that a lack of family support likely contributed to the low academic achievement.

At the time of this research, the mission of the alternative school was to successfully transition students to their traditional home school setting. The school's vision was to educate students socially and academically. The purpose of the school was to recognize individual differences and to provide a positive learning experience for students to acquire academic, vocational, social, and life skills. The school district was supportive also in that it was committed to providing a quality-learning environment and providing all resources necessary for a superior, ongoing program designed to meet the needs of all students and employees.

The School Improvement Plan (SIP) listed certain goals, objectives and initiatives to help students be prepared for a 21st century workplace. Some of the initiatives listed included the following four action statements: Increase the ability of all parents to support their student's academic growth. Review and utilize effective student achievement pyramids of intervention based on identified student needs. Implement processes to promote positive student engagement and provide high quality instruction that is aligned with the state standards through differentiated instruction, feedback, increased rigor, and data driven instruction.

One important initiative listed in the SIP of the alternative school was to increase the ability of all parents to support their student's academic growth. This was imperative because the ability of parents to participate is conducive to school improvement as numerous studies have shown that parental engagement is important to student success. As stated in Sukys, Dumciene and Lapeniene (2015), "Teachers and parents should work together to determine the educational objectives of children with SEN, collaborating on choosing and implementing educational strategies" (p. 328). The significance of parental involvement to the relationship of student achievement has been well documented (Olmstead, 2013). Therefore, it was an essential element to the success of this study.

Review of Relevant Terms

Alternative education. Alternative Learning Environment (ALE) that includes educational activities that fall outside the traditional K–12 curriculum. It involves an educational setting intended to accommodate the educational, behavioral, and/or medical needs of students that are not successful in a traditional school environment.

At-risk students. Students who are not likely to finish high school or who are apt to graduate considerably below potential.

EDpuzzle. A website that allows for the hosting of videos online and enables students to watch and engage with the videos and provides a method for teachers to gather significant data throughout lessons.

Online learning. Web-based learning applications (lessons, worksheets, graphic organizers, videos, etc.) for students/parents that are completely online and available 24 hours per day.

Parental involvement. Parent or guardian of a student taking an active role in the lessons of the student.

Parental remediation. The action of remedying parents misunderstanding or lack of knowledge of mathematical subject matter by teaching and/or re-teaching them the content using instructional videos and/or other resources.

Pre-assessment. Test given at the beginning of study to determine a base level assessment of student knowledge.

Post-assessment. Test given at the end of the study to determine increase in student knowledge.

Qualtrics. Subscription software for collecting and analyzing data for market research, customer satisfaction and loyalty, product and concept testing, employee evaluations and website feedback. Provides a free online survey tool built for multiple uses in educational research.

Technology. Computer, Internet or other technical electronic devices which are implemented by parents and students to help increase their engagement, comprehension and achievement in education.

Organization of Study

This study is organized into five chapters which are presented herein. Chapter 1 includes the introduction and consists of the statement of the problem, research questions, purpose and significance of study, local context, review of relevant terms, and organization of study. Chapter 2 contains the literature review section which includes an introduction, search description, theoretical framework, review of literature themes, and the summary and implications of literature review. The methodology of this research and description of the research questions, research design, research setting, research participants, access to site, instrumentation, data collection and analysis procedures, validity of interpretation, limitations and delimitations and ethical considerations are presented in Chapter 3. A detailed description of the data analysis regarding the impact of parental remediation in mathematical content via the internet on student performance in alternative education is contained in Chapter 4. Lastly, Chapter 5 presents discussion, conclusions, and implications of this research and includes the following sections: discussion of findings; limitations of findings; researcher comments; relationship of findings to previous literature; implications for future practice in local context; implications for future research.

Chapter Two: Literature Review

This chapter begins by presenting a search description that details the methods used by the researcher while investigating relevant information connected to the present study. The following review of literature focuses on the theoretical framework and supporting studies related to parental self-efficacy, adult learning and technology acceptance models. Then, this literature review examines at-risk students, mathematical alternative education, parental involvement and effective technology. Altogether, the purpose of the literature review was to consider previous research relevant to the relationship between parental self-efficacy, technology implementation and the achievements of at-risk students in alternative education.

Research has highlighted the significance of parental involvement and the implementation of technology on the engagement and academic levels of marginalized students in alternative education (Devlin & McKay, 2016; Hammond, et al., 2014; Kim & Lee, 2011). The literature from those studies described the importance of the individual relationships between parental involvement and technology implementation in the classroom with the engagement and academic levels of students. Each of these areas had a positive correlation with students' learning capacity as well as their ability to achieve success in academic and social areas.

In addition, McNeal (2014) found that parent/student discussion was correlated with improved educational expectations, absenteeism, homework, and truancy. Therefore, the rationale behind this study was to find a better method for augmenting the mathematical achievements of students in alternative education by improving parental self-efficacy and involvement in alternative education with the implementation of online digital videos for

remediation. Thus, the effects of parental remediation on parental self-efficacy and student achievement were the focus of this study and a major consideration of its design.

Search Description

In designing this study, the researcher first considered the overall dimensions of the low achievement levels in alternative education. Subsequently, a pilot study was conducted at an alternative school which highlighted low performance levels in math. It was important for the researcher to develop an overall strategy for this research. This included integrating the various parts of the study and mapping it out in a clear and reasonable process for the collection and analysis of data as well as the investigation and review of previous relevant literature.

The mapping out of the study was supportive of a better understanding of the relationship between the variables that were being investigated and helped the researcher identify topics to research. After identifying key aspects of the present study, the researcher then began to research previous literature. Throughout the process of the present study, the researcher identified themes and investigated, documented and organized applicable information.

The search engine provided by Kennesaw State University Library was primarily utilized by the researcher to identify an array of articles from multiple online journal sources such as ERIC, EBSCO, and ProQuest. The researcher used various search terms that included the following: “Alternative Education,” “Online Parental Remediation,” “Parental Self-Efficacy,” “Mathematical Performance in Alternative Schools,” “Parental Self-Efficacy,” “Parental Involvement,” and “Student Achievement.” Finally, inclusion-exclusion of articles was decided based on relevance and age of material. Figure 1 displays the relationships found in this study.

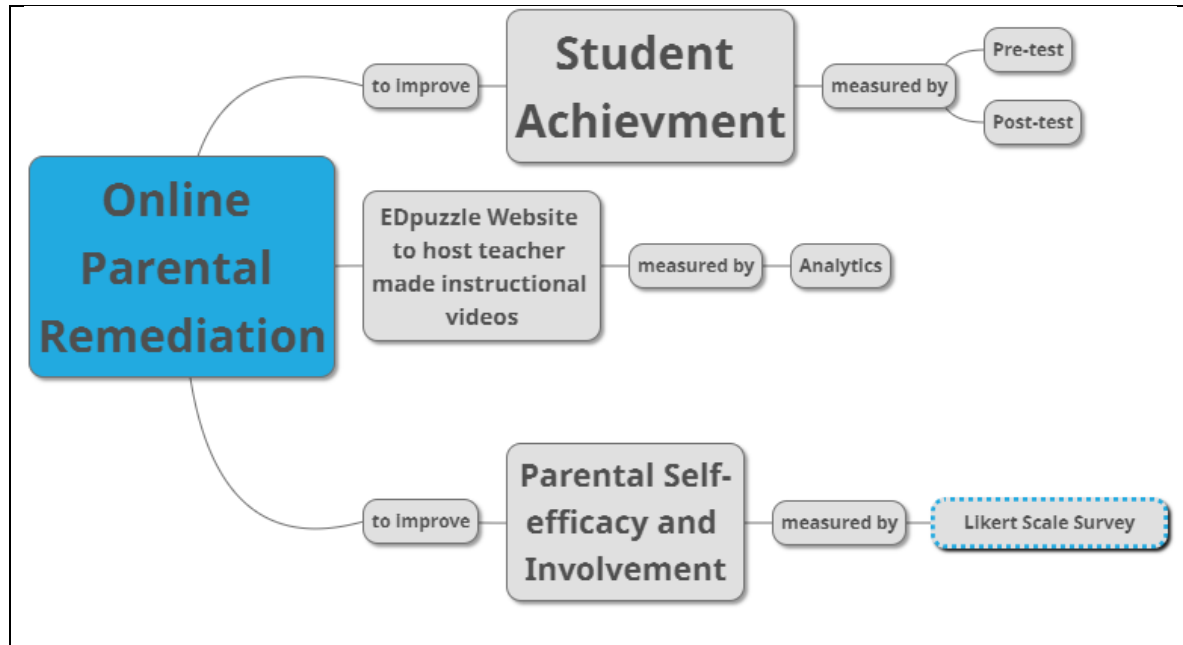


Figure 1: Design of research

Theoretical Framework

Constructivism. The strategies incorporated within this study are based on constructivism and may provide resources that help to improve future parental self-efficacy and engagement in alternative education. As suggested by Fernando and Marikar (2017), a constructivist learning theory suggests that learning is an active experience, and learning is socially and culturally rooted. The researcher of the present study included both in the design of this research. Accordingly, Vygotsky's social development theory, one of the foundations of constructivism (David, 2014), was also heavily reflected in the framework of this study as it investigated the effects of online parental remediation.

Vygotsky emphasized the importance of culture and suggested that knowledge is constructed through experiences, social relationships, and interactions (Berkeley University of California, 2018). As cited by Kim (2014), Vygotsky suggested that the interaction with significant others and socially facilitated activities increase human consciousness, and stressed

the use of semiotic tools and language, through which external activities become internal psychological functions. Correspondingly, the two above-mentioned parameters “significant others” and “semiotic tools” were incorporated in this study with the inclusion of parents and computer-based technology.

As postulated by Swan (2005), “Constructionists maintain that computers have the unique capacity to represent abstract ideas in concrete and malleable forms” (p. 3). Similarly, this study’s use of computer technology as a tool for viewing instructional videos supported the parents’ development of knowledge by allowing tactile, visual and auditory interactions that cannot be accomplished in the real world (pause, rewind, replay, fast-forward). The implementation of technology (Internet, instructional videos and other computer-based resources) allowed the parents to repeat the process of interpretation, articulation, and re-evaluation until they were satisfied with their comprehension of the mathematical content.

Previous research on how young people and parents use online support suggests that support groups supplement professional assistance in relation to self-management (Kirk & Milnes, 2016). This suggestion relates to constructivist theories of learning in that the implementation of online videos to provide step-by-step instructions for solving math problems allows learners to be self-regulated and actively control their own learning process. Students and/or parents can proceed at their own pace to construct new meaning from their experiences which is within the context of a constructivist framework. The cognitive approach of using videos for online remediation allowed parents to pause, rewind and watch teacher modeling again and again to form a better understanding of the material and construct better intuitions for solving math problems.

This study also related to humanistic theory because as postulated by Chen and Schmidtke (2017), “Humanism focuses on the dignity, autonomy, freedom, integrity, well-being, equity, and potential of learners” (p. 119). Chen and Schmidtke suggested that when learners have control over their own learning, personal development and increased sense of social justice can help others grow and have beneficial effects on society. Altogether, the present study reflected humanistic qualities as the researcher facilitated the parental learning by providing a safe, non-threatening learning environment. The online remediation was an active process where the parents actively participated in the learning activities of watching the teacher-made instructional videos and had to make their own decision as to watch the videos. In addition, self-management was important because the amount of the videos which parents decided to watch was entirely their own responsibility.

Andragogy. Andragogy, Malcolm Knowles’ theory of adult learning, is also reflected in this study. Andragogy, as cited in Knowles, Swanson and Holton (2011), “is the single most popular idea in the education and training of adults” (p. 2). Andragogy is based on five assumptions: self-concept, adult learner experience, readiness to learn, orientation to learning, and motivation to learn (McGrath, 2009). McGrath suggested that andragogy examines how learning in the classroom can be made more attractive for adult students. Correspondingly, the researcher of the present study attempted to make learning more attractive to parents by providing them convenient access to the online teacher-made instructional videos.

According to Arghode, Brieger, and McLean (2017), andragogy is a humanistic model that proposes adults are self-directed learners who need some guidance at first but then grow to exhibit more independence in their learning. Arghode et al., described andragogy as follows:

While andragogy is attributed with helping educators and trainers understand adult learning (Knowles et al., 2014), it does not meet the criteria to be classified as a theory. Rather, it is a model under the theory of humanism that, according to Knowles (1980), is a set of principles applicable to most adult learning situations. Adults should feel “accepted, respected, and supported”, as there is “a spirit of mutuality between teachers and students as joint inquirers” (Knowles, 1980, p. 47). Gradually, as learning progresses, learners evolve from being dependent to independent learners. During this educational journey, learners need guidance that can be provided by instructors (Henschke, 2011). (p. 48)

Andragogy had relevance to the present study in that the utilization of the technological resources provided parents with an authentic leaning environment to mediate and support their problem solving and conceptual development. Parents were given the opportunity to work individually at their convenience as the videos and other resources were available 24 hours per day. Moreover, parents were provided the opportunity for additional support in the form of email communication if further questions arose and/or more coaching was needed. Altogether, the incorporation of computer-based technology and parental involvement related to a paradigm rooted in constructivism and humanism which contributed more prudence to the credibility of this study on parental self-efficacy and student achievement in alternative education.

Self-efficacy. As cited by Waterwall, Fuller, and Budden (2017), “The concept of self-efficacy, stems from social cognitive theory and refers to an individual’s confidence in performing a specific task (Bandura, 1977)” (p. 190). According to Ozerbas and Erdogan (2016), self-efficacy has effects on cognitive, motive, emotional and selective processes. Parental self-efficacy, as suggested by Jones and Prinz (2005), refers to the parent’s belief about

his/her ability to parent successfully. And as claimed by Pressman, Sugarman, Nemon, Desjarlais, Owens, and Schettini-Evans (2015), when parents feel greater self-efficacy, they also report greater home-based involvement.

The construct self-efficacy was significant to the present study because, as suggested by Chang, Liu, Sung, Lin, Chen and Cheng (2014), online learning performance can be improved if learners are confident in their ability to learn computer skills or willing to spend time learning such skills. Similarly, as suggested by McGregor and Knoll (2015), the formation of parental attitudes towards homework is influenced by parental self-efficacy which can be influenced by numerous factors including the level of the skills, knowledge, and confidence they have. Parents who believe they do not have the skills and abilities to comprehend and solve mathematical problems will likely have negative feelings about participating with homework. To counter the low self-efficacy some parents may have regarding their participation with homework in math, the present study investigated a potential strategy for improving parental involvement with the use of technological resources.

Another reason self-efficacy was important to the present study is stated by Venskus (2017), "The development of self-efficacy is reliant on varied experiences and, in particular, on performance accomplishments as well as verbal persuasion, vicarious experiences, and physiological state" (p. 14). It was important to monitor the possible increases in self-efficacy of the participants because as claimed by Venskus, "Increases in self-efficacy are associated with higher levels of performance" (p. 15). Also, other research has shown that high self-efficacy beliefs led to better homework performances and higher grades (Welch, 2013). As suggested by Bandura (2012), self-efficacy is developed through mastery experiences, social modeling, and persuasions. Thus, this study attempted to deliver a systematic strategy for increasing

opportunities for parents to master experiences in math via online remediation to improve their self-efficacy.

As proposed by Gonida and Cortina (2014), self-efficacy as far as perceptions of the competence to do class work and respective homework may help to determine the involvement parents adopt while assisting their children in homework. Parents who feel competent regarding academic matters tend to be more involved in their children's education; however, even if parents value education and realize the importance of parental support, they may not participate in their children's education if they do not feel capable of teaching their children (Yamamoto, Holloway, & Suzuki, 2016). Subsequently, this may have significant consequences as students are susceptible to poor academic achievements if they are unable to turn to their parents for assistance (Martinez, 2011). To address this issue, as suggested by Whitaker and Dempsey (2013), teachers should create homework assignments that prompt students to involve parents in meaningful ways and encourage them to be active participants in students' learning activities. In alignment with that premise, this research attempted to discover an effective approach for increasing parental involvement by creating a meaningful way for parents to take an active part in their children's education.

Parental Acceptance Models. The theories related to parental acceptance of the use of technology as an educational resource was important to this study; specifically, the parental acceptance of computer technology such as laptops, smartphones and iPads for access to instructional videos and other resources. There are several theories related to people's utilization of technology and the factors that influence the acceptance of technology by the intended user. Some of these include the diffusion of innovations theory, the technology acceptance models (TAM) (Davis, 1986), the hedonic-motivation system adoption model (HMSAM) (Lowry,

Gaskin, Twyman, Hammer & Roberts, 2013). Although there are many theories related to people's adaption of technology, the researcher felt that the HMSAM was the most applicable to the present research as it may help explain the interconnections of parents' motivations and utilization behavior regarding the web-based technology implemented in this study.

According to Ma, Sian Lee, and Hoe-Lian Goh (2014), the diffusion of innovations theory provides a systematic explanation of how an innovation is communicated through various channels in a social system. As suggested by Peres (2010), diffusion of innovations describes the growth of new products and services driven by interactions among consumers. In general, it seeks to explain how, why, and at what rate innovative ideas and technology spread among a population. As suggested by GÜNDÜC (2018), the diffusion of innovation has been successfully used for decades in ascertaining the conditions and dynamics of the spread of new ideas and/or products among the populations of different societies. As cited by GÜNDÜC:

The first mathematical model of the diffusion of innovation was introduced by Bass in 1969 [6]. Its success in explaining the spread of technological household goods opened a new era. Since then the advances in mathematical modeling of the diffusion of innovation made the subject more interesting and relatively more accurate predictions possible. (p. 1465)

Although diffusion of innovations has been used in describing and understanding the process of acceptance, adoption, and expansion of innovations in technology, Technology Acceptance Model (TAM) has been the most efficient and utilized model (Akgün (2017). As suggested by Akgün, TAM's main purpose is to explain people's behavior in adopting innovative and/or knowledge-based technology and as such has emerged as a scientific paradigm to investigate education technology acceptance of students and teachers.

While TAM has been highly studied and considered efficient, it has been criticized by some researchers for its questionable heuristic value as well as its limited explanatory and predictive power (Chuttur, 2009). According to Chuttur, there are skepticisms regarding the application and theoretical accuracy of the model. As cited in Benbasat and Barki (2007):

Unfortunately, we believe that, in spite of its significant contributions, the intense focus on TAM has led to several dysfunctional outcomes: 1) the diversion of researchers' attention away from important phenomena. First, TAM-based research has paid scant attention to the antecedents of its belief constructs: most importantly, IT artifact design and evaluation. Second, TAM-based research has provided a very limited investigation of the full range of the important consequences of IT adoption, 2) TAM-based research has led to the creation of an illusion of progress in knowledge accumulation, 3) The inability of TAM as a theory to provide a systematic means of expanding and adapting its core model has limited its usefulness in the constantly evolving IT adoption context, 4) The efforts to "patch-up" TAM in evolving IT contexts have not been based on solid and commonly accepted foundations, resulting in a state of theoretical confusion and chaos. (p. 212)

Benbasat and Barki also suggest that the evolution of technology within the context of a global setting has caused PU and PEOU cease to be the sole salient beliefs. In addition, they assert that the security and lower risk provided by remaining within a dominant paradigm have made researchers complacent concerning the status quo. As cited in Lowry et al., (2013), "To better address the various intrinsic motivations associated with system use and acceptance, Agarwal and Karahanna (2000) proposed the construct cognitive absorption (CA)—a deep state of involvement with software systems stemming from intrinsic motivation" (p. 618). Subsequently,

an alternative model to TAM, called the hedonic-motivation system adoption model (HMSAM) was proposed.

As these theories have evolved, HMSAM has unified many of the existing models and is widely accepted in the information systems (IS) research community. HMSAM is based on a composite construct of intrinsic motivation (Stanciu, 2017a). Stanciu (2017b) claimed that the hedonic aspect may be more common to family members and more pervasive in its manifestation than the utilitarian aspects emphasized in other theories, and that individuals' behavior with digital environments may be significantly subjected to familial influences. Notably, and of particular relevance to the present study, Stanciu (2017b) also proposed that training increases the acceptance of technology by improving an individual's computer self-efficacy.

Praveena (2018) found that hedonic motivation has a significant positive influence on people's intention to use technology and is the strongest predictor of continuance intention. Figure 2, as adapted from Stanciu (2017a), illustrates how HMSAM suggests that the constructs of *perceived usefulness, curiosity, joy and control* are contributing factors to acceptance of technology. These constructs contributed more prudence to the overall design of the present study in that it is common knowledge that most parents have a natural love for their children and want them to be successful. In addition, parents had control over the teacher-made instructional videos and were able to watch/rewatch at their leisure in pursuit of hedonic outcomes; i.e., improved mathematical understanding and achievement for themselves and their children.

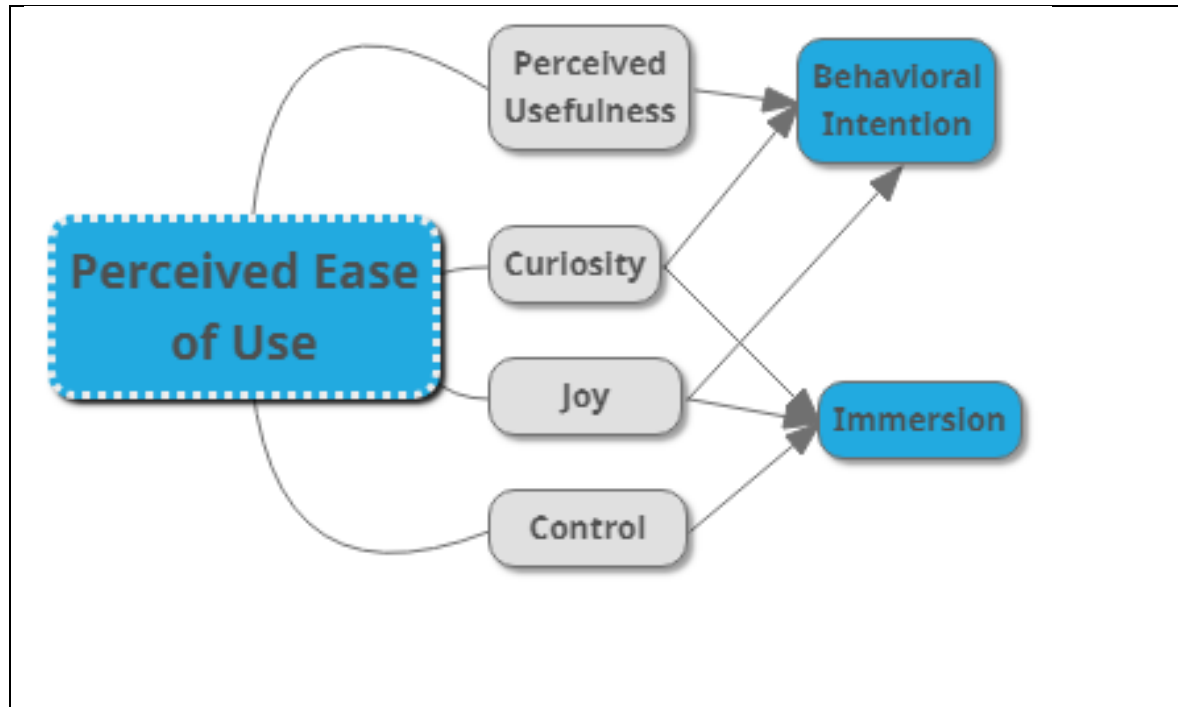


Figure 2: The final HMSAM as adapted from Stanciu, 2007.

Review of Literature

At-risk students and alternative education. At the time of research, there were 98,271 public elementary/secondary schools in the United States, of which 5,698 are alternative programs (U.S. Dept. of Education, 2015). Alternative education programs have been broadly defined as educational activities that fall outside the traditional K–12 curricula and frequently serve students who are at risk of school failure (Porowski, O’Conner, & Luo, 2014). Although intended to meet the needs of at-risk students, alternative schools have exhibited graduation rates that are substantially low (U.S. Dept. of Education, 2015). This indicated a need for teachers and leaders in alternative education to improve the teaching and learning therein.

Every Student Succeeds Act (ESSA), signed by President Obama on December 10, 2015, defines low-graduation-rate high schools as schools that enroll 100 or more students and have graduation rates of 67% or less. Per the U.S. Department of Education (2015), 57% of

alternative schools in the United States are classified as being low-graduation-rate high schools and have only a 52% graduation rate. To increase the graduation rates in alternative education, it is important to discover new and innovative methods for increasing the performance of at-risk students. This study sought to determine if online parental remediation is an effective method for improving parental self-efficacy and student achievement in alternative education.

According to U.S. Dept. of Education (2015), statistics regarding the public elementary and secondary education show that much of the alternative school's student population is African-American and have a low socioeconomic status (SES). These two major and specific subgroups are mainly conjunctive at the school (site of research) and present themselves with their own sets of challenges which may help to explain the inequalities evidenced by the Black-White Achievement Gap.

A low SES may help explain, as suggested by McDonough (2015), when compared to whites, blacks tend to be less upwardly mobile and more downwardly mobile for both math and reading. It may also clarify the higher likelihood of enrollment in an alternative school for minorities. Figure 3, as adapted from Vanderhaar et al., (2014), showed that minorities have a historically significant higher probability of being placed in an alternative school than white students.

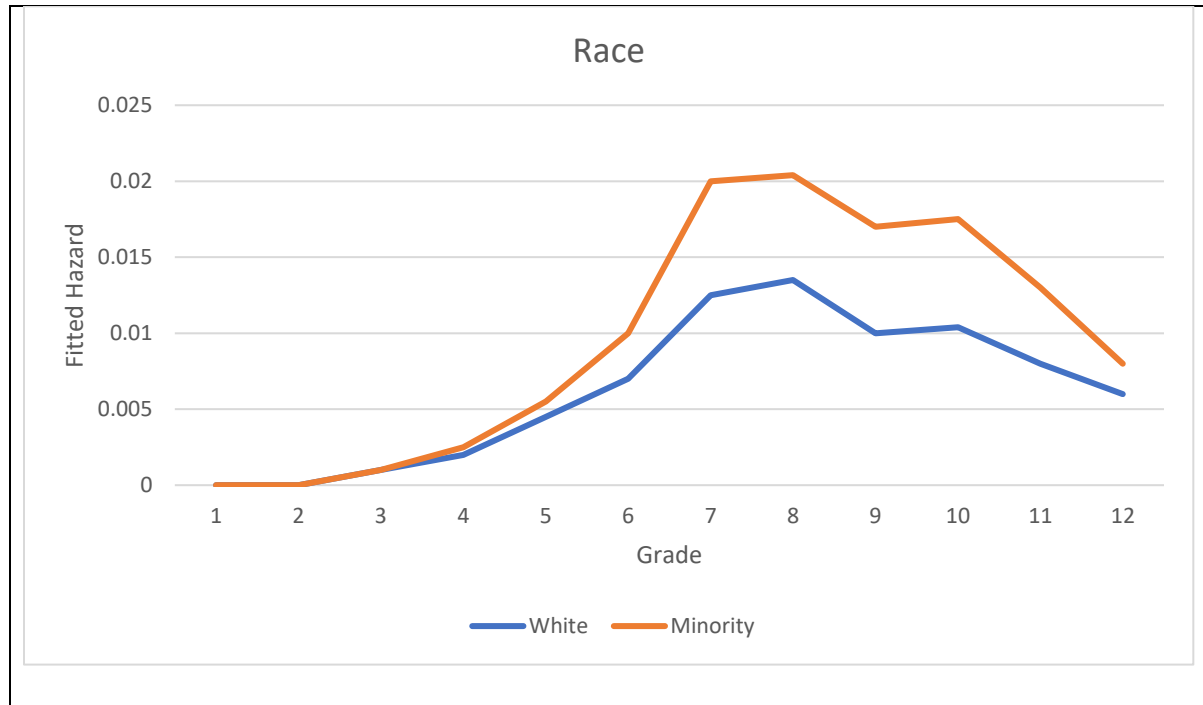


Figure 3: Risk of attending alternative school adapted from Vanderhaar et al., (2014)

A low SES tends to have a negative effect on student academic achievement, especially in alternative education where students already have a high potential for being unsuccessful in education (Capuzzi & Gross, 2014). Everyone deserves an equal opportunity for a successful life, and for that to happen there must be equity in educational opportunities for all students. Therefore, future educators should attempt to discover methods to help close these achievement gaps and provide more relevant and responsive learning opportunities—especially for students in alternative education.

The goal of alternative education is to offer support to troubled students who are not able to adjust to the regular school setting and thus require assistance that is more intensive. Alternative schools are beneficial for some marginalized students that so desperately need extra support with their academic learning in to order help ensure a successful education. However, previous research is indicative of the fact that students in alternative school settings have a lower

performance level and are more likely to drop out before completing their education (Wilkerson, et al., 2016).

Another negative consequence of enrollment in alternative education is that it may increase the student's probability of future incarceration. As stated in Vanderhaar, Munoz, and Petrosko (2014), "The punitive nature of placement into disciplinary alternative schools coupled with the strong law enforcement presence in them may construct one possible route through the "school-to-prison" pipeline" (p. 5). Therefore, it is imperative to improve the teaching and learning in alternative education and reduce the high rate of failure among the disenfranchised students. Consequently, better methods of teaching and learning must be found and implemented to improve the success rate in alternative education and help to increase the achievement levels of the students therein.

Online learning may be a supportive tool in that endeavor. According to Means (as cited by Gitlin & Hodgson, 2016), online learning refers to "learning facilitated and supported through the use of information and communications technology" (p.1). The United States Department of Education has recognized the value of online learning and founded the Center on Online Learning and Students with Disabilities (COLSD). The purpose of the COLSD is to help special needs students with disabilities to have equal opportunity and access to online learning (Basham, Carter, Rice & Ortiz, 2016). Similarly, online learning has potential to become an important asset for improving the parental self-efficacy, student achievement and graduation rates in alternative education programs. The information presented in the present study may help future alternative students to have better opportunities for success rather than some being categorically relegated to being at-risk of school failure.

Since the 1980s, students in danger of failing in their education have been generally categorized as “at risk” (Capuzzi & Gross, 2014). Ironically, the labeling of students “at-risk” may itself be a significant part of the problem (Endo, 2017). The negative connotation may influence students’ self-efficacy and hinder their learning which thus perpetuates a systematic injustice in education. After all, every student has the potential for being at-risk of failing in their education, especially if not provided the things they need to be successful. Nonetheless, the term continues to be used when describing troubled students such as when, as cited by Capuzzi and Gross (2014), Minga (1988) defined the term “at-risk” to be as follows:

At-risk youths are children who are not likely to finish high school or who are apt to graduate considerably below potential. At-risk factors include chemical dependence, teenage pregnancy, poverty, disaffection with school and society, high-mobility families, emotional and physical abuse, physical and emotional disabilities and learning disabilities that do not qualify students for special education but nevertheless impede their progress.

(p. 14)

As suggested by Capuzzi and Gross (2014), there is no denying that risk exists. The issue is creating healthy systems that invite youth to participate in meaningful activities rather than repairing individuals who have been overcome and damaged by risks. Accordingly, a shift in the paradigm of education has been proven necessary to help improve the opportunities for success of all students—particularly the marginalized students enrolled in alternative secondary education programs.

The demographics of alternative schools often include culturally diverse, low socio-economic backgrounds with students who often demonstrate aggressive and disobedient behaviors (Perzigian, Afacan, Justin, & Wilkerson, 2017). Many students in alternative

programs have learning disabilities and are at risk of not completing their education (Wilkerson, et al., 2016). Students at-risk of school failure often achieve low levels of academic achievement (Chen, Yang, & Wang, 2013). Frequently, they are unsuccessful in traditional school settings and transfer to alternative education programs (Edgar-Smith & Palmer, 2015).

A considerable number of these students are diagnosed with emotional distress, social anxiety, and depression; consequently, they are often low performers in school and have few accomplishments (Chen, Yang, & Wang, 2013). As stated by Van Acker (2007), “The display of antisocial behavior by children and youths in America is recognized as one of the most pressing concerns facing educators today” (p.5). It is important for troubled students to have access to an education that ensures they have a chance for a better life. Sadly, this not always the case, as marginalized students often tend to go underserved (Wilkerson, et al., 2016).

According to Van Acker (2007), these students are at an elevated risk for school failure or display significantly challenging behaviors. Consequently, they are usually gathered together and sent to alternative schools where deficient performance endures. Students exhibiting antisocial behavior and attending alternative schools have more absences, fewer credits per semester, and a lower graduation rate than students in a traditional school (Wilkerson, et al., 2016). As stated by Van Acker:

Placement of these children within the alternative school setting is thought to (a) protect the majority of the students from the dangerous behavior of the few and (b) provide a more intensive and meaningful educational program to these at-risk and targeted children and youth. (p.6)

Improvements in alternative education are needed as a significant number of these students are failing in their education. According to McKee and Caldarella (2016):

The United States has a high percentage of students dropping out of high school (Christie, Jolivet, & Nelson, 2007; Heckman & LaFontaine, 2010; Neild, Stoner-Eby, & Furstenberg, 2008). Approximately 10% of students entering high school eventually leave before graduation without a diploma or equivalency (U.S. Department of Education, 2007). (p. 1)

As suggested by Hoge and Rubinstein-Avila (2014), at-risk students may have special educational needs (SEN) and possess behavior problems and/or specific learning disabilities such as Oppositional Defiant Disorder (ODD) or Attention Deficit Hyperactivity Disorder (ADHD). Students suffering from these impairments or various other troublesome effects have significant potential for failing or dropping out of school (DePaoli, Fox, Ingram, Maushard, Bridgeland & Balfanz, 2015). As stated by DePaoli et al., “In 2013, the national average graduation rate for students with disabilities hit 61.9 percent—nearly 20 points lower than the average graduation rate for all students” (p. 48). This presents a substantial problem not only for students but for families and society as it has been estimated that dropouts cost taxpayers between \$320 billion and \$350 billion a year in lost wages, taxable income, health, welfare, and incarceration costs (Sanchez & Wetheimer, 2011).

As suggested by Edgar-Smith and Palmer (2015), the two most important concepts that establish a successful learning environment are students’ sense of membership in the school community and their perceptions of support from important people within the school. And as cited in Huat and Gorard (2015):

Schvaneveldt (2000) examined parental involvement in children's academic activities and parental regulation of adolescents' behaviors in 8th grade and their links to academic achievement in 10th grade. This US study used data drawn from the National Educational Longitudinal Study (NELS) which included 13,116 participants, who were compared by gender, ethnicity and SES. The study claimed strong evidence that for all gender, ethnicity and SES groups, post-secondary educational attainment can be enhanced through greater parental discussion of academic activities with their child during early adolescence. Greater parental discussion was significantly and positively associated with greater academic achievement during middle adolescence, which was then linked to greater post-secondary attainment. (p. 355)

This highlighted the importance of a positive student/parent/teacher relationship in supporting students to be successful in their education. Increasing parental involvement in their children's education would be a step towards improving that relationship and establishing a high-level alternative school.

The establishment of a high-level alternative school has been found to be possible and can produce higher levels of education for marginalized students (Hodgman, 2016). Studies have shown that high-quality alternative schools staffed with well qualified educators have shown positive results. As suggested by Hodgman, students were less likely to exhibit poor behavior in the class room, truancy decreased, and expulsions were decreased while academic achievement increased. Less disciplinary issues would translate to more time in the classroom for students which would help to increase their chances for a successful education.

The academic success of disenfranchised students has been greatly improved while attending a high-quality alternative school (Hodgman, 2016). Hodgman also asserted that

students in high-quality alternative schools have reported having a closer relationship with teachers than they had in their traditional school. Students attending high-quality alternative schools also report having more personal responsibility and better relationships with other students than they had in the traditional school setting (Aron, 2006). Additionally, Hodgman noted that students attending high-quality alternative schools have also reported being more interested in graduating. Therefore, every alternative school should strive to become high-quality to improve the achievement levels of alternative students.

Another positive result of a high-quality alternative school is that students have a better chance of succeeding and becoming a productive citizen, thus shutting down the "school-to-prison pipeline" and avoiding confrontations with the criminal justice system (Hodgman, 2016). As cited in Hodgman, "The cost benefits associated with these programs are potentially great as they could save taxpayer dollars by helping students avoid the criminal justice system even though costs associated with alternative education vary from program to program (Settles & Orwick, 2003)" (p. 34). Accordingly, all alternative programs should attempt to reach the level of the "high-quality" alternative school so that all students enrolled in such programs will have better opportunities for success.

Mathematical alternative education. A study by Beken, Williams, Combs, Slate and John (2009) found that at-risk students in academic alternative schools performed significantly lower in math than at-risk students in the traditional high school setting. As proposed by Beken et al., additional understanding is needed to improve the academic performance of at-risk students. This supported the practicality of the present study which investigated a method for improving the mathematical achievements of students enrolled in an alternative education program.

In a study by Herndon, Bembenutty and Gill (2015), enrollment in a disciplinary alternative school was found to have a negative correlation with the students' math performance. Herndon et al., examined individual differences in academic performance, violence, willingness to delay gratification, and substance abuse of alternative school students. Herndon et al., also found self-regulatory skills of students to have a significant role in their achievement levels as it helped them to successfully adapt to academic, social and environmental challenges. This corresponds to the previously mentioned constructivist and humanistic aspect of the present study—self-management.

Accordingly, it is important for teachers in alternative education to teach practical social skills to disciplinary students and find methods of bolstering their self-regulatory skills. As stated by Herndon et al., (2015):

Self-regulation training in the classroom involves building a child's intrinsic motivation through a classroom culture of focused yet enjoyable achievement. Examples include incorporating relatable accomplished peers as tutors, creating indirect competition through the usage of progress boards, and rewarding students with classroom privileges like a knowledgeable partner to work and converse with rather than a purely extrinsic motivator like candy. (p.48)

This related to the present study as it attempted to support parents in becoming more knowledgeable in the mathematical content so that they would be better prepared to partner with their children in working on their homework.

Parental involvement in traditional education. Sirvani (2007) examined the effect of parental involvement on students' mathematics achievement and found that students in the

experimental group outperformed the students in the control group. Also, Núñez, Suárez, Rosário, Vallejo, Valle, and Epstein (2015) found that perceived parental homework involvement, and academic achievement were significantly related. Additionally, O’Sullivan et al., (2014) suggested that the potential benefits of mathematics learning at home through homework provides an opportunity for students to learn during non-school hours and highlights the potentially key role of parents in homework. Furthermore, the State of Georgia (2006) recognized the importance of parental involvement as stated in Georgia Code O.C.G.A. 20-2-735(e):

Parental involvement processes developed pursuant to this subpart shall be designed to create the expectation that parents and guardians, teachers, and school administrators will work together to improve and enhance student behavior and academic performance and will communicate freely their concerns about and actions in response to student behavior that detracts from the learning environment. (p.1)

The significance of parental help with home-based school work has also been recognized by President Obama as he posited in his State of the Union Address, as released by the White House, (2011):

And so the question is whether all of us — as citizens, and as parents — are willing to do what's necessary to give every child a chance to succeed. That responsibility begins not in our classrooms, but in our homes and communities. It's family that first instills the love of learning in a child. Only parents can make sure the TV is turned off and homework gets done. We need to teach our kids that it's not just the winner of the Super Bowl who deserves to be celebrated, but the winner of the science fair. (Applause.) We

need to teach them that success is not a function of fame or PR, but of hard work and discipline. (para. 34-35)

Furthermore, according to a study by Hart, Ganley, and Purpura (2016), parents who reported doing more general math activities in the home reported having children with higher math skills. This shed light on the high importance and need for increased parental involvement in the education of students to improve their learning and achievements.

Homework has been defined as tasks assigned by teachers to be completed during non-school hours (Cooper, 2007). Also, a study by Jeynes (2012) found that parental involvement with homework yielded a statistically significant result. Correspondingly, as suggested by Wilder (2014), the relationship between parental involvement and academic achievement is positive, regardless of a definition of parental involvement or measure of achievement. However, as claimed by Patall, Cooper, and Robinson (2008), researchers have found both positive and negative effects of parental assistance with homework.

Previous research shows inconsistent relationships between parental involvement and the students' academic achievement and often asks why such inconsistencies occur (McNeal, 2014). According to Gonida and Cortina (2014), associations between parental involvement in homework and achievement as well as achievement-related outcomes are not consistently found in the empirical literature. As cited in Gonida and Cortina:

Despite the acknowledgement of the potentially different academic outcomes related to different types of involvement in students' homework, little research has been conducted to assess achievement-related motivational beliefs such as achievement goal orientations and academic efficacy as either outcomes of involvement or mediators of the relationship

between homework involvement and achievement (e.g., Ng, Kenney, Benson, & Pomerantz, 2004; Pomerantz, Ng, & Wang, 2006). (p. 377)

As suggested by Hart et al., (2016), the findings of research thus far concerning the role of the home math environment and children's math performance have been inconsistent. This was reiterated by Wilder (2014) in the following:

Although the overall effects of parental homework involvement on academic achievement were not significant, some of the components of parental involvement in homework did have a strong, positive impact. For example, enforcing rules regarding the homework (when and where it should be done) and providing direct aid to children had strong relationships with academic achievement. However, merely monitoring homework completion had a negative impact on homework completion rates. Finally, regarding the subject matter that parents provided tutoring for, the findings of the meta-analysis indicated positive, although non-significant, effects in verbal subject matter, and revealed contradictory outcomes in mathematics, therefore indicating a need for further research. (p. 386)

Parental involvement in alternative education. The establishment of a school environment that fosters more parental assistance with homework may be supportive of student achievement in alternative education. Previous literature has found positive results of parents' involvement in alternative education and claimed it had profound effects on their school interactions and engagement in their children's development (Adkins-Sharif, 2017). It is important for teachers in alternative education to give parents a voice as they can provide a better insight as to a child's abilities and particular areas of struggle. As stated by Adkins-Sharif:

One thing I learned fairly quickly in my position was that nearly every parent or caregiver had important insights on why their child struggled in academic settings. The problem was just that for too long, their perspectives were ignored, or weren't given enough weight to frame the discourse on what was needed to boost progress. (p. 35)

Family and community participation is an integral component to an effective alternative education program, and parents must be involved if improved performance is to occur (Murray & Holt, 2014). As cited in Murray and Holt:

Aaronson (1995) understands the need for participation choice by all stakeholders within the alternative program. Successful program completion is more likely to occur when students, along with their parents, and staff choose to participate in that setting. (p. 187)

Teachers in alternative education have a responsibility to include the parent in school activities as much as possible due to the positive impact of parental engagement. Studies have proven that parents will take more of a role in their children's education when given the correct encouragement by the educators (Sukys, et al., 2015). As cited in Sad and Gurbuzturk (2013), "Meeting the education needs of parents about various aspects of parental involvement (Gür & Kurt, 2011) seems half way to solution..." (p. 1009). Therefore, it has proven necessary for educators in secondary education to discover better methods for helping parents continue their support and participation in their children's schoolwork—this may be especially true for teachers of students in alternative education programs.

Web-based video technology may provide an alternative learning environment to utilize for improving parental engagement and student achievement, but previous research posits mixed results. As suggested by Lena (2013), Video technology has the ability to present the parent with

a sensory experience and visual reality that can induce memories and associations which facilitates the integration of procedural and declarative levels of information processing, making it possible to see and remember. Additionally, as stated by Stevens and Borup (2015), “Parents have the potential to be the key to overcoming key concerns about attrition and achievement in online settings. However, research has been silent as to how to engage parents more fully as learning coaches for their children” (p.96). Also, previous studies that investigated parents’ use of online communities have suggested that they play an important role in providing information, emotional and social support; nevertheless, they can produce negative emotions by the domination by mothers leading to fathers feeling marginalized (Kirk & Milnes, 2016). Also, as cited in Witt (2016), “Scholars should recognize the novelty effect of technology. Clark (1983) cautions that performance gains are often the result of the novelty of the new medium, and the gains often diminish when the newness wears off” (p. 489).

Due to the mixed results of research on the effects of parental involvement and collective utilization of online technology, further research on the topic was needed. Consequently, the present study was necessary to help fill the gap of literature and add to the knowledge concerning parental involvement with mathematics homework in alternative education and its effect on student achievement. This investigation has potential to help at-risk students become more successful in alternative education. This is a logical supposition because as stated by O’Sullivan et al., (2014), in regards to their study, “The findings of the present study may lead to developing potential interventions for helping low-income students succeed in school through effective parental involvement in mathematics homework” (p. 169). Likewise, the goal of this research was to support alternative students in becoming more successful as it investigated a new method for accommodating the needs of parents and improving their involvement with their children’s

mathematical education with the implementation of technology; i.e., an internet website used for hosting instructional videos in a digital format for parents to peruse at their leisure.

Effective technology. In the past, parental use of technology may have been more challenging, but as suggested by Organ (2015), technology has now made it possible for parents to connect with their children in more meaningful ways. As suggested by Quillen (2013), “Perhaps no single technology has brought a more profound change to some teachers' instructional practices than the evolution of digital video” (p. S8). As suggested by Quillen, some of the most commonly used tech resources are video, images, and articles on the Web.

Also, in a previous study that investigated the use of digital media at home to promote young children’s mathematics learning, Silander, Moorthy, Dominguez, Hupert, Pasnik, Llorente, and the Society for Research on Educational Effectiveness (SREE) (2016) found that parents in its intervention condition reported a higher frequency of joint parent-child technology use and reported significant increases in their confidence to support math learning for their children. Correspondingly, this study investigated the use of web-based technology with digital videos for enhancing parental self-efficacy and student achievement in alternative education. The implementation of web-based technology was practical because its use for parental remediation in mathematics encouraged more parental participation and thus may help to improve the achievement levels of future alternative students in mathematics. As cited in Silander et al., “Media resources tend to represent essential concepts and content as integral to the advancement of narratives and story lines in ways that support attention and benefit learning (Fisch, 2004; Linebarger, Kosanic, Greenwood, & Doku, 2004)” (p. B-1).

As stated by Xu (2016), “Remedial mathematics means the re-teaching or re-learning of high school mathematics (typically Algebra I and II and Geometry)” (p.19). The researcher of

the present study hypothesized that if parents were given the opportunity for remediation in mathematics then they would have more participation with their children's learning of math. In addition, as suggested by Chin (2016), many learners can comprehend and follow directions better on technology than they do through verbal and book instructions. Investigating possible relationships between online parental remediation with teacher-made instructional videos and parental self-efficacy as well as student achievement, this research examined the effect of implementing web-based technology with digital videos for online parental usage and self-efficacy.

Technology use in the classroom as an instructional strategy has been found to be supportive of students' academic learning and achievements (Devlin & McKay, 2016). In addition, it has been suggested that most students will show some improvement in their academics when strong parental involvement exists in their education (Ndebele, 2015). To discover methods for improving the academic achievement of students in alternative education, this study included both technology and parental involvement in its investigation. Parents were provided access to teacher-made instructional videos via web-based applications to help them be better prepared to assist their children with their education.

It has been shown that family educational culture and parental involvement of students living in economically disadvantaged homes tend to not be as strong as those that come from middle-class families (Coates & Phares, 2014). However, there may be potential for improvements in this area due to the recent proliferation of Smartphone technology. Recent and new innovative technologies such as the smartphone have opened new areas of technology to people who were once economically barred from participating. Online learning is one such area that is now available to people of all ages and circumstances. According to Liu and Cavanaugh

(2012), online learning is rapidly advancing in the United States. As cited in Liu and Cavanaugh:

The United States has experienced an extraordinary growth in online education at the K–12 level (the sum of primary and secondary education) since its emergence in the late 1990s: from single online course offerings to large virtual schools today. Thousands of students were attracted to online education because of the advantages it brings, such as flexible and expanded learning time, more educational opportunities, and increased access to resources (Cavanaugh, Gillan, Kromrey, Hess, & Blomeyer, 2004). (p.149)

A study on the effects of the implementation of parental online-remediation in mathematics was a logical proposal because according to File and Ryan (2014), during the year 2013, 83.8% of U.S. households owned computers, 78.5% had a desktop or laptop computer, and 63.6% had some form of handheld computer. According to Smith (2014), 64% of American adults are owners of a smartphone of some kind. As stated by Smith, “Nearly two-thirds of Americans are now smartphone owners, and for many these devices are a key entry point to the online world” (p. 1).

A study by Muir (2015) regarding the flipped classroom (an instructional strategy that reverses the traditional learning environment by delivering online instructional content outside of the classroom) found that an overwhelming majority of subjects (96%) agreed that online tutorials helped with their learning and helped them to learn a concept. As stated by Muir, “Overall, the study shows that the flipped classroom approach has merits in terms of creating an environment where students can be intrinsically and extrinsically motivated to achieve learning goals” (p. 451).

Additional research by Gazbare and Manisha (2017) also found that audio-video clips can be used to help improve student's practical skills. As suggested by Choi and Johnson (2007), visual information is more memorable due to the simultaneous processing of both auditory and visual information which increases comprehension and retention of the information. Additional research by Francis (2017) on the use of videos for teaching has also shown positive results. As stated by Francis, "After the video teaching program, the knowledge and practice of the fathers and mothers had improved" (p. 73). To better understand the potential of the implementation of technology for online parental remediation to improve the teaching-learning process in alternative education, this study implemented the use of web-based technology to host instructional videos and resources for parents to peruse and remediate their skills in mathematical content.

The technology of online learning delivers a method for providing parental remediation to potentially increase parental and student self-efficacy as well as student achievement in alternative education. Math teachers in alternative schools need to know if parental online remediation is indeed an answer for improving the success of students in alternative education. As stated by Liu and Cavanaugh (2012):

Examining effectiveness of online courses is now possible due to the substantial population of online learners. The investigation of the factors that influence students' success in online learning at the K–12 level is beneficial to educators, researchers, virtual programmed leaders, course developers, policy-makers, and society at large. (p.149)

Accordingly, the present research investigated the efficacy of utilizing parental online-remediation for improving the self-efficacy of parents in mathematics and student achievement

in alternative education. There was potential for it to be especially beneficial in the high school setting because as suggested by Sad and Gurbuzturk (2013), parents are more likely to participate in the younger student's schoolwork but their involvement with homework decreases as the student grows older and schoolwork becomes more difficult.

Alternative education teachers have the responsibility of creating more opportunities for their students' success. The implementation of technology may be beneficial in that endeavor as it has been shown to be supportive of differentiated instruction and should be included as a key instructional strategy of all teachers--especially those in alternative education (Hammond, et al., 2014). Technology has been well established as being supportive of student performance and provides numerous opportunities for addressing the various learning styles such as the visual, auditory, kinesthetic and tactile modalities of at-risk students in alternative education (Devlin & McKay, 2016).

Technology has been advancing at a rapid rate and has proven to be helpful in many aspects of life. This has been especially true for the adolescent student. This information could be beneficial to their education if used correctly. Research has shown that at-risk students are more likely to choose technology courses when given the opportunity. And with the advent of social media, most adults and adolescents are knowledgeable of personal computers and/or smartphones.

Educators should endeavor to increase student engagement through students' interest in technology because as suggested by Bynum (2011), "In the current environment, computers, technology and social media dominate young peoples' world. According to Ziegler, many children today spend an inordinate amount of time looking into at least one, but sometimes multiple, computer screens" (p.1). Thus, computer technology is one area in which educators

should look to new research and implement new and improved strategies of its incorporation into learning for the development of “high-quality” alternative schools and increase the accomplishments of at-risk students.

As suggested by Ernst and Moye (2013), there is potential for technology to act as a vehicle for students to improve self-esteem, social skills, and ultimately fit in the school environment; furthermore, many students indicated that they would have failed in education if not for technology. This is news that all educators can use to enhance the interest and participation of students in the classroom. Teachers can use the interest the students have in today’s technology to improve the student’s chances of a successful educational experience.

It is important for educators to find ways of improving the learning experience for the student in the alternative school environment. Technology has proven to be a positive tool in this endeavor. There are numerous applications for technology to be incorporated in alternative education. These include graphing calculators, computers, Internet, Smart Board, clickers and many other new and forthcoming technical innovations. These instructional strategies have proven to be excellent ways of incorporating technology into the classroom. As stated in Watson and Watson (2011):

New approaches to instruction are increasingly being advocated in order to meet the needs of diverse learners. Educational researchers have identified the further development and application of computer-based instruction technologies for managing differentiated learning for all students as essential for shifting to a learner-centered paradigm of instruction in future schools. (p. 29)

Previous research has shown that students with disabilities are more satisfied with their online education experience than with traditional learning (Kim & Lee, 2011). The implementation of computer technology into the classroom has proven to be a useful strategy for students to improve their learning. This has been true for all areas of study, especially in mathematics. With the use of computers, researchers are finding students are exhibiting more interest in their school work. Per Hammond, Zielezinski, and Goldman (2014):

When students were given one-to-one laptop access as well as access to the internet at school, they made use of this opportunity at least several times a week, for purposes ranging from seeking background knowledge, facilitating “just in time” learning, and supporting research projects. In addition to the work the students were doing in math, the researchers noted that one-to-one laptop implementation increased students’ likelihood to engage in the writing process, practice in-depth research skills, and develop multimedia skills through interpretation and production of knowledge. (p. 110)

Exploring new methods for the implementation of technology into the classroom would be a step towards providing the students in alternative education with a much better chance of success. Teachers in alternative education may help improve their students’ performances by moving beyond the common methods of instruction with the use of computer and web-based technology to potentially and more effectively involve parents in students’ learning. Parental self-efficacy, engagement and involvement may benefit from the use of web-based technology.

Parental involvement is a crucial factor in the lives of all students with special educational needs (Sukys, et al., 2015). The special needs students have found the cyber setting more satisfactory than the normal setting which may be due to safety issues as well as well-being issues for the special needs student (Beck, Moranto, & Lo, 2014). Parents of at-risk students

have found cyber schools more satisfactory than the normal school setting for their children (Liu & Cavanaugh, 2012). Thus, the online setting may be a prudent method to help increase success in education and life in general for alternative school students.

Parents should therefore have an opportunity to participate in the online-learning activities such as used in this research. The present study examined a method of utilizing technology via the internet for hosting teacher-made instructional videos for online parental remediation. These teacher-made videos were used to help gauge their effect on the parents' self-efficacy and involvement with their children's education at an alternative school.

Summary and Implications of Literature Review

During the time of research for the present study, there were 98,271 public elementary/secondary schools operating in the United States, of which 5,698 were alternative programs (U.S. Dept. of Education, 2015). Previously mentioned research has shown that alternative school students have more absences, less credits per semester, and are less likely to graduate (Wilkerson, Afacan, Perzigian, Justin & Leauia, 2016). This indicated a need to find better methods of providing a high-quality education to these at-risk students to help ensure an opportunity for a successful life.

This research incorporated ideas and strategies that are research and evidenced based methods which have shown to increase parental self-efficacy and involvement and support the overall improvement of student achievements and success. However, the mixed results of previous research were indicative of the need for more research to be conducted on the subject. In this study, parents were given more and better opportunities to be involved in their child's education by participating in online-learning for remediation in mathematics via web-based applications.

Literature from other research was supportive in the development and implementation of this study on the impact of parental online-remediation in math. The review of literature found that there are important innovations in many areas that present a variety of methods for successfully raising the engagement and academic levels of the alternative student. It was important that these areas be explored further to develop new methods for improving the opportunities for success of at-risk students.

Innovations have proven to be important because they provide opportunities for enhancing parental involvement and opportunities for student success in alternative education which is in such dire need of improvements. Although alternative schools are designed for students that are unsuccessful in traditional school settings, most of the schools have had substantially low graduation rates. Potentially, the present research may support the discovery of new and innovative methods for improving the parental involvement and achievement levels of the marginalized students in alternative education.

The purpose of the literature review was to consider previous studies on parental involvement and the implementation of technology in alternative education. The review of literature found that these areas tend to produce a large effect on student performance and have a positive correlation with student achievements. In addition, communication between parents and teachers has shown to have a positive impact on student achievement levels.

The improvement of parental self-efficacy as well as the encouragement and facilitation of more parental involvement with student learning in alternative education was the focus of this research. The implementation of technology for online remediation allowed parents to have easier and continuous access to teacher-made math tutorials. The expectation was that it would

encourage them to participate more in their children's learning, and thus lead to better student performance and achievements in alternative education.

At-risk students have shown improvements in their level of interest, engagement and level of comprehension when using technology tools in the classroom (Bos, 2007). The engagement level of parents has also shown to play a role in the level of learning and adjustment of at risk students (Sukys, et al., 2015). Previous research has shown that parental involvement decreases in the higher grades; therefore, the need has been great for educators to inform and bring parents into the student's school studies (Sad & Gurbuzturk, 2013).

Parental involvement and technology have proven to be successful in helping at-risk students increase engagement in the classroom and advance to a higher level of academic learning (Devlin and McKay, 2016; Hammond, et al., 2014; Kim and Lee, 2011). As suggested by Sad and Gurbuzturk (2013), there has been a need for teachers to encourage parental involvement by making the parents aware their involvement is vital to the student's success in school. It has been shown to be beneficial for educators to involve the parents as much as possible and communicate the importance of knowing what is expected and how the parent can contribute (Sukys, et al., 2015).

Technology is advancing at an astonishing rate and becoming more cost-effective. Recent innovations such as the Smartphone may provide methods for improvements in alternative education. Computer-based learning may encourage more parental involvement and be supportive of student achievements. According to Hammond, Zielezinski, and Goldman (2014) technology (infrastructure providing access to digital learning resources) coupled with content (learning community including learning goals and learning activity) has shown to be

supportive of levels of engagement. Figure 4, adapted from Hammond et al., displays what they termed the digital learning ecosystem.

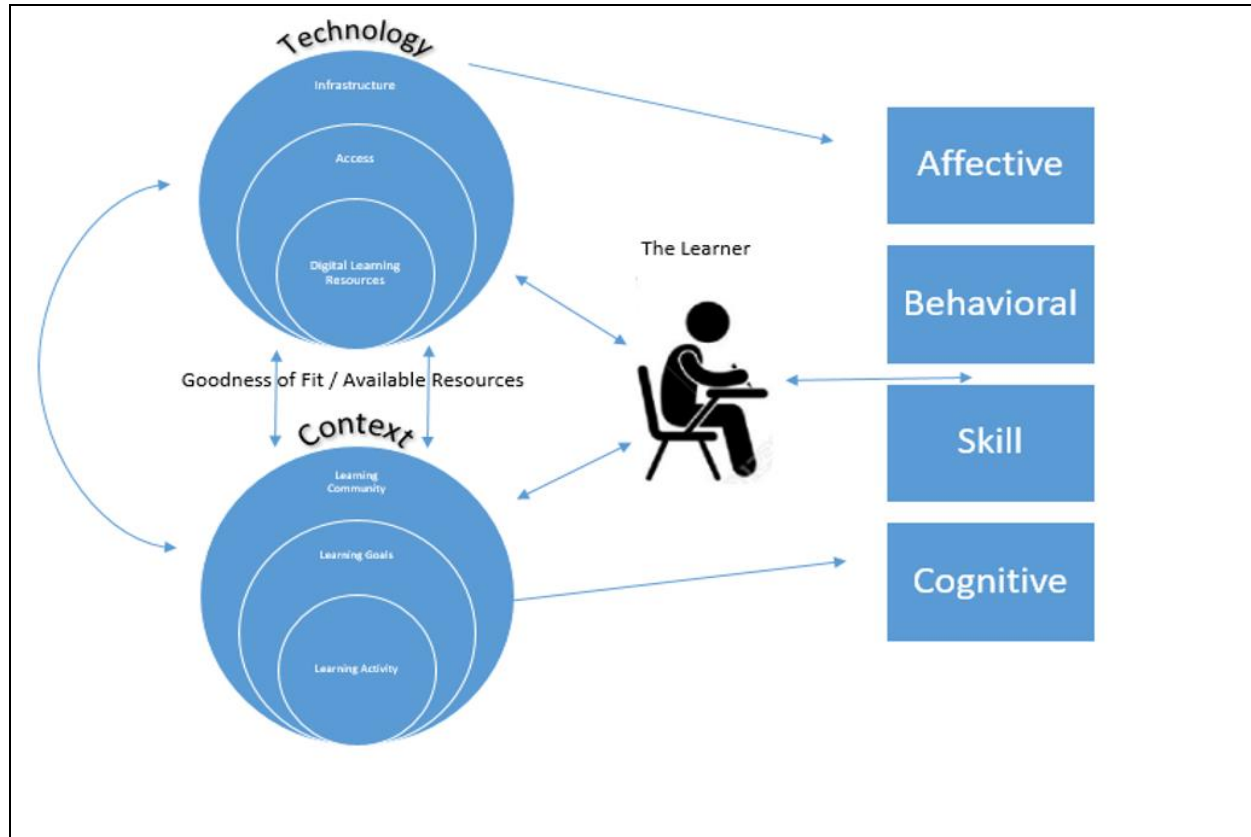


Figure 4: Digital learning ecosystem as adapted from Hammond et al., (2014).

Altogether, technology has shown potential to be supportive of parental self-efficacy and involvement with students in alternative education as well as student achievement. Previous research has shown that parental involvement in online classes for students has improved student achievement (Stevens & Borup, 2015). Technology has been found to substantially support the improvement of student performance in alternative education (Hammond. et al., 2014).

Therefore, this study incorporated technology as it investigated the impact of parental online-remediation with the use of teacher-made instructional videos on parental self-efficacy and student achievement in alternative education.

Chapter Three: Methodology

This purpose of this study was to investigate the effect that online parental remediation in mathematics (with the implementation of teacher-made instructional videos) has on parental self-efficacy and the mathematical achievement of students in alternative education. The present study implemented a quantitative methodology with a non-experimental correlational design with the use of data from parent interviews and surveys as well as demographic data in an attempt by the researcher to determine the efficacy of the web-based intervention. This chapter described in detail the methodology implemented to conduct the present research. The methodology is subsequently presented in the succeeding sections in the following order: research questions, research design, research setting, research participants, access to site, instrumentation, data collection and analysis procedures, validity of interpretation, limitations and delimitations and ethical considerations.

Research Questions

Previously mentioned research has well documented the importance of the integration of parental involvement and the use of technology with the high school curriculum (Núñez, Suárez, Rosario, Vallejo, Valle, & Epstein, 2015; Quillen, 2013). In the past, it may have been more difficult for some parents to utilize technology but that has changed over time (Organ, 2015). The now convenient accessibility of the Internet via Smartphones and other electronic devices may possibly allow access to previously barred opportunities for parental use of technology.

Therefore, the overall purpose of this study was to investigate the effectiveness of technology clips for improving the instructional practices and student success in alternative education with the use of technology. Specifically, this research sought to gain a better understanding of the effects of teachers' use of technology and the implementation of online

parental remediation with online teacher-made instructional videos upon parental self-efficacy and students' mathematical achievement at an alternative high school. Thus, this study focused on the following questions:

1. What effect does online parental remediation have on parental interaction and support for mathematics in an alternative school?

a. Does participation in online parental remediation significantly improve parental self-efficacy in their ability to support their child in mathematics?

H_0 There is no significant correlation between the participation of online parental remediation and parental self-efficacy in their ability to support their child in mathematics.

H_1 There is a significant correlation between the participation of online parental remediation and parental self-efficacy in their ability to support their child in mathematics.

b. Is there a relationship between parental demographics (specifically amount of mathematics courses, age, and gender) and their use of online parental resources?

H_0 There is no significant correlation between parental demographics (specifically amount of mathematics courses, age, and gender) and their use of online parental resources.

H_1 There is a significant correlation between parental demographics (specifically amount of mathematics courses, age, and gender) and their use of online parental resources.

c. Does participation in online parental remediation significantly improve students' mathematical achievement in alternative education?

- H_0 There is no significant correlation between participation in online parental remediation and students' mathematical achievement in alternative education.
- H_1 There is a significant correlation between participation in online parental remediation and students' mathematical achievement in alternative education.
2. How do parents of alternative students utilize online instructional videos in support of their children's learning of mathematics?
 - a. How often do parents watch the instructional videos?
 - b. Do parents watch the videos alone, with students or both?
 3. What are the motivating factors that encourage or discourage parental utilization of online instructional videos for support of students in alternative education?

Research Design

The present research implemented a quantitative methodology with a non-experimental correlational design. According to Rockinson-Szapkiw (2017), the purpose of a correlational research design is to examine the extent to which two or more variables relate to one another. The present study analyzed data from parent surveys, interviews and analytics as well as student assessments to investigate the relationship between parental online-remediation with teacher-made instructional videos and parental self-efficacy as well as student performance. A post-positivist approach was also incorporated by gathering and analyzing measurable data with an overall focus on parental involvement and technology implementation.

Fundamentally, this study examined the self-efficacy and technology usage of a group of 28 parents of alternative students (which served as both the control group and treatment group and contributed quantitative data for scientific analysis) as well as the mathematical achievement of their children. Consequently, a correlational design was prudent for the present study because

as suggested by Leedy and Ormrod (2010), correlational research is concerned with establishing relationships between two or more variables in the same population or between the same variables in two populations. As cited in Curtis, Comiskey and Dempsey (2016):

The importance of correlation research has been emphasized by authors such as Woodworth who published a book entitled *Experimental Psychology* in 1938 (Woodworth 1938) and Lee Cronbach who published an article entitled *The Two Disciplines of Scientific Psychology [sic]* (Cronbach 1957). (p. 2)

A correlational design was required for this study due to the investigation of the relationships as well as consequences of the practical and logistical constraints inherent to the alternative school (site of research); i.e., low student enrollment as well as the fluidity of rosters due to transfers and expulsions. Although not as strong a predictor as a purely experimental design, one advantage of this design is that it controls for various potentially confounding effects upon validity (history, maturation and regression) in the control group and treatment group since they consist of the same subjects and thus experience the same developmental processes regarding mathematics.

As suggested by Park and Park (2016), “Any serious methodological consideration of the framework of any science should, however, first consider the nature of the investigated phenomenon and thereafter address the question of which method is adequate to describe, explain, or understand the phenomenon” (p. 1). It is thus important to plan research so that it will provide the most reliable results. In designing this study, a plan with a focus on parental self-efficacy and student achievement was developed to include the integration of web-based computer technology that involves parents in students’ learning with an overall goal of improved student performance in math.

Data was collected regarding the parental use of the video hosting website, quantified survey data concerning parental self-efficacy, as well as data from students' performance on pre- and post-assessments. The participants served as a control group where they did not receive any intervention. The same parents served as the experimental group during the treatment phase of the study in which they did participate in online-learning in math.

A power analysis was utilized to determine the minimum required total sample size and per-group sample size that would suffice for the circumstances of this study. A statistical power analysis explores relationships among the following four components: power ($1-\beta$), test size or significance level (α), standardized effect size (ES), and the sample size (N). The power analysis for this study was computed for a Dependent *t*-Test using the inputs of the probability level, anticipated effect size, and desired statistical power level to compute the necessary sample size. This had significance for the present study because as stated by Balasubramanian, N., Shetty, A., TS, R., & Mani. (2017):

Power analysis is an essential procedure for researchers to use before conducting a main study. Researchers need to pay greater attention to statistical power analysis and have to take a serious risk when they design an interventional study with inadequate samples. In an underpowered study, the researcher may be testing a genuinely effective treatment but fail to recognize its efficacy. (p. 163)

According to a review of previous literature, an anticipated large effect size is expected (Burns, Kanive, & Degrande, 2010), and as such the number 0.8 was utilized for the anticipated effect size. Based on the data from the power analysis and due to convenience and consequences of such a small enrollment at the site of research, the control and experimental group of this study were composed of the same group of 28 parents (and their children who were math

students at an alternative school) who participated in online remediation of mathematical content with the use of teacher-made instructional videos. Table 1 presents the information from the power analysis.

Table 1

Summary of Power Analysis to Determine N for Large ES at Power=.80 for $\alpha= 0.05$

ES	0.8
Statistical power level	0.8
Probability level	0.05
Minimum total sample size (one-tailed hypothesis)	42
Minimum sample size per group (one-tailed hypothesis)	21
Minimum total sample size (two-tailed hypothesis)	52
Minimum sample size per group (two-tailed hypothesis)	26

Note: ES = anticipated effect size (Cohen's d)

Quantitative analysis was used to compare the differences of group performances between pre- and post-tests to interpret the change or gain scores. The Comprehensive Adult Student Assessment Systems (CASAS) (2017), suggests that students should be pre-tested as soon as possible upon entry into the program or before any substantial instructional intervention has occurred. It is also suggested by CASAS that post-tests be given at the end of a semester, term, quarter, or other substantial block of instruction to document learning gains. As stated by the Massachusetts Department of Elementary and Secondary Education (2014), “The time interval between tests must be explicit and intentional. It may be based on time (e.g., after ten weeks of instruction) or curriculum (e.g., after 25 lessons)” (p. 2). Accordingly, the time interval

between pre- and post-tests of this study was determined by students' progression through the district's curriculum map pacing guide.

The quantitative methodology supported a better understanding of a probable correlational relationship between parental knowledge and student behavior as well as academic performance. As stated by Cope (2014), "The perspectives of quantitative research are rigor and validity" (p. 89). Quantitative research also provides an efficient method to investigate a phenomenon both financially and timewise and is a valuable tool for policy analysis (McCusker & Gunaydin, 2015). In addition, the implementation of a quantitative method was beneficial to this study as it helped to realize a more accurate understanding of the experiment's impact on not only the parents' self-efficacy and involvement, but also the students' academic achievement by the scientific analysis of data from student performances.

Overall, the design of the present research focused on the improvement of parental self-efficacy and students' mathematical achievements in alternative education. The quantitative methodology with a non-experimental correlational design with the use of data from parent surveys, interviews, analytics as well as student achievement implemented an empirical process for data collection and analysis. Although it is not possible to prove causality, the present study investigated the possibility of any relationships between parental online-remediation, parental self-efficacy and student achievement in alternative education.

Research Setting

This research took place at an alternative school in the middle Georgia area of the United States. The population of this study consisted of a group of 28 parents of students enrolled in an alternative school as well as the students themselves. The alternative school had a very diverse

and fluid population with students enrolling and sometimes leaving the program throughout the academic school year. According to the United States Department of Education's National Center for Education Statistics (NCES) (2017), the alternative school had an enrolment of 183 students whose demographics were comprised of the following percentages: African-American: 68.9%; White: 20.2%; Hispanic: 8.2%; Two or More Races: 2.0%; Free/Discounted Lunch Recipients: 78.7%; Student/Teacher Ratio: 7.0%.

Research Participants

This research examined the effectiveness of implementing an innovative strategy at an alternative school in the southeastern United States. It focused on 28 parents and their children which were high school math students in the alternative school. This premise of this research was in alignment with the school's mission which is to successfully educate at-risk students both socially and academically. The sample population of parents was used to produce the control and experimental groups in which the same subjects served as both groups.

The participants of this study were chosen by necessity and convenience due to the small size of enrollment in alternative schools. The participants included a group of parents ($n=28$) whose children were all math students enrolled in the alternative school. The parents served as their own controls as they initially had no access to online remediation. During the treatment phase of the study, parents were provided access to an array of instructional videos via the Internet. The parents may have been of different creeds, ages, races and genders but all have the same characteristic of having children enrolled in a math class at an alternative school and as such, those students were deemed at-risk of school failure.

Access to Site

As a teacher employed at the alternative school where the research took place, the researcher had daily access to the site of research. The researcher had a key to his room but not to the building. Therefore, the researcher had access to the site during regular school hours, and during times which were permitted by the principal of the school. Most of the communication with parents was accomplished through web-based applications such as email or instant messaging but also through in-person meetings at the school and via telephone conversations.

Instrumentation

Likert type scale. The effects on parental self-efficacy was quantitatively analyzed using ordinal data collected from a survey by means of questionnaires which are, in general, expressed with reference to the Likert type scale anchored by response category labels ranging from strongly disagree to strongly agree. A Likert scale is the most commonly used scale in quantitative research which, according to Wadgave and Khairnar (2016), is a psychometric response scale primarily used in questionnaires to assess a subject's perception. The Likert type self-efficacy scale used in the present study had a 1-5 response number format. This helped to discern the effects of online remediation in math upon parental self-efficacy. In addition, pre- and post-tests were utilized to gain a better intuition for the effects of parental online-remediation and its efficacy for improving the teaching and learning in alternative education.

The pre-tests and post-tests differences of the Likert scale were calculated and tested for the control class compared to the treatment class. The Likert scales of this study will be kept confidential and managed as was suggested in Bandura (2006), "Self-efficacy judgments are recorded privately without personal identification to reduce social evaluative concerns. The self-efficacy scale is identified by code number rather than by name" (p. 314). The scale used in the

present study implemented 36 questions with the 5-point Likert-type scale anchored at 1 = Strongly Disagree, 3 = Slightly Agree, and 5 = Strongly Agree, and was based on the Likert scales discussed in the following two subsections.

Motivated strategies for learning questionnaire. The Likert scale used in this study, as seen in Appendix A, was roughly derived from the Motivated Strategies for Learning Questionnaire (MSLQ) which is used to measure self-efficacy for learning, performance and perceived goal structures (Pintrich, Smith, Garcia & McKeachie, 1991). The items from MSLQ assess two aspects of expectancy: expectancy for success and self-efficacy. Expectancy for success refers to performance expectations and relates specifically to task performance. Self-efficacy is a self-appraisal of one's ability to master a task. The MSLQ has two sections as described by Pintrich et al., in the following:

There are essentially two sections to the MSLQ, a motivation section, and a learning strategies section. The motivation section consists of 31 items that assess students' goals and value beliefs for a course, their beliefs about their skill to succeed in a course, and their anxiety about tests in a course. The learning strategy section includes 31 items regarding students' use of different cognitive and metacognitive strategies. In addition, the learning strategies section includes 19 items concerning student management of different resources. There are 81 items on the 1991 version of the MSLQ. (p. 3)

The researcher considered the types of statements in the MSLQ and developed a set of similar items (see Appendix A) related to parental demographics and motivations/beliefs regarding their mathematical self-efficacy. The researcher also chose to implement a 5-point scale rather than a 7-point scale to make it more reliable and less cumbersome for parents. As cited in Liu, Li, Cárdenas, and Yang (2018), “a five-point Likert scale was believed to generate

higher response rate and response quality, as well as lower respondents' frustration level (Babakus & Mangold, 1992; Buttle, 1996). In the present study context, the researchers decided to use a five-point Likert scale also to reduce respondents' cognitive load" (p. 304). In the present study, reliability of the Likert scale was also tested with Cronbach statistic presented later in Chapter 4. Overall, the MSLQ was deemed by the researcher to be a valid scale for the present investigation as it had been used in similar such studies and widely implemented in motivational and educational psychology research and peer reviewed many times as cited in Bonanomi, Olivari, Mascheroni, Gatti, and Confalonieri (2018),

According to a recent literature review based on the 81-item version of MLSQ (Credé & Phillips, 2011) tens of thousands of students from different countries have been evaluated using the MSLQ. Moreover, the MSLQ has been used to study different student populations such as university students (e.g., Balam & Platt, 2014; Valentín et al., 2013), secondary school students (e.g., Loy & Chai, 2014; Tsai, Lin, & Yuan, 2001), and primary students (e.g., Karadeniz, Buyukozturk, Akgun, Cakmak, & Demirel, 2008; Law, Chan, & Sachs, 2008; Ocak & Yamaç, 2013) aiming to measure common and stable dimensions of self-regulated learning among different cohorts. This instrument has also been used to evaluate students in different settings: online classes, distance learning course, telecourses (Puzziferro, 2008; Yukselturk & Bulut, 2007), and street learning stations (Dangwal & Gope, 2011), proving its flexibility. (p. 84)

Patterns of adaptive learning scales. The Patterns of Adaptive Learning Scales (PALS) was developed and refined by a group of achievement-goal researchers at the University of Michigan (Midgley, Maehr, Hruda, Anderman, Anderman, & Freeman, 2000). Corresponding to the present study, Buzza and Dol (2015) successfully used a modified PALS six-item Self-

Efficacy scale to assess self-efficacy for outcomes in mathematics. The modified version of the PALS Likert scale used in the present study was beneficial in that it helped investigate the relationship between teacher-made instructional videos provided in a web-based learning environment and parents' motivation, affect, and behavior. As previously mentioned, Cronbach's alpha (see Chapter 4) was also calculated by the researcher as a psychometric test to measure the reliability, or internal consistency, of the modified items that made up the survey used in the present study. This was useful to the present study because as cited in Vaske, Beaman, and Sponarski (2017), "Cronbach's alpha is perhaps the most common estimate of internal consistency of items in a scale (Cronbach, 1951; Cronbach & Shavelson, 2004). Alpha measures the extent to which item responses (answers to survey questions) correlate with each other" (pp.164–165).

PALS was instrumental in the development of the scale utilized in the present study as it evaluated parental outlook on their abilities to complete assignments in mathematics. PALS was considered by the researcher to be both a reliable and valid scale of similar studies. As cited in Urda and Midgley (2003), "These personal goals and self-efficacy scales are from PALS and have been used in a number of studies, demonstrating good reliability and validity (Midgley et al., 1998)" (p. 530). The researcher specifically considered the following items from the self-efficacy scale used by Urda and Midgley:

I'm certain I can master the skills taught in school (math) this year. I can do even the hardest work in my (math) classes if I try. If I have enough time, I can do a good job on all my (math) classwork. I can do almost all the work in school (math) if I don't give up. Even if the (math) work is hard, I can learn it. I'm certain I can figure out how to do even the most difficult school (math) work. (pp. 548-549)

As can be seen in Table 2, the researcher also chose to implement the same point scale as PALS and similar statements to measure the parents' self-efficacy.

Table 2

Survey Scale as Adapted from PALS (Midgley et al., 2000)

Strongly Disagree		Slightly Agree		Strongly Agree
1	2	3	4	5

A 5-point rather than 7-point scale was thought to likely reduce parental frustration. The researcher considered items in PALS regarding motivations and beliefs and then modified and developed the items used in items 8-25 (as seen in Appendix A) for the self-efficacy construct of the scale used in the present study. The modification was accomplished by the addition of items related to parental demographics and experience with technology. The scale was also modified by the researcher by altering the wording slightly and adapting items more specifically to mathematics. For example, two items from PALS that were slightly modified for the scale of the present study (see Appendix A) included the following:

- I am certain I can master the skills taught in class this year.
- I'm certain I can figure out how to do the most difficult class work.

SPSS. IBM SPSS Statistics for Windows, Version 25.0 (IBM Corp, 2017) was implemented as the primary analytical tool in the present study. SPSS is a widely-used computer software package designed for data analysis and addresses the entire analytical process. It has a wide range of use in data analysis from simple descriptive numbers to evaluations of more complex multivariate data. SPSS was helpful in testing the hypothesis and saved a considerable amount of time. It also reduced the likelihood of making errors in the analysis of data.

During the present study, several analytical tests (see Chapter 4) were ran using SPSS software. The Spearman's rank correlation and the Cronbach coefficient were used to gauge the correlation and reliability of the scores respectively. The Wilcoxon signed ranks test was implemented to determine the statistical significance of the difference in how parents scored on the self-efficacy scale before and after the online parental remediation. Additionally, a Dependent *t*-test was used to analyze the data from students' pre- and post-assessments. Altogether, the SPSS software was beneficial to the present study of the efficacy of online parental remediation with teacher-made instructional videos.

Teacher-made instructional videos. The researcher of the present study created 5 digital instructional videos (as seen in Appendix C) concerning different methods for solving quadratic equations. The template used in the production of the videos included a brief introduction by the researcher followed by the researcher thanking the parents for their participation. This was important so as to foster more positive teacher-parent communications and establish a welcoming environment for the parents. Sample problems were then presented as the researcher modeled the solutions to each and described the concepts and processes used to explain them. Lastly, the researcher concluded the videos by thanking the parents for watching and then invoking a call to action (CTA) asking parents to please join in the next video.

The teacher implemented several technological resources in creating the videos. This included a webcam and laptop computer, software provided by Screencast-O-Matic which allowed the researcher to record himself (audio and video) via the laptop webcam as well as the actions taken on the interactive SMART Board (an interactive whiteboard produced by SMART Technologies). The SMART Board provided the researcher the ability to model and expound on the various concepts and processes needed to solve the mathematical problems. The videos, as

seen in Appendix C, were then uploaded to a video hosting website (EDPuzzle) so that parents could have access to them.

The goal of the videos was to provide guidance to parents in understanding math problems that their children were learning to solve at school. The researcher attempted to explain the concepts and processes in layman's terms, or simple language, to make it easier for the parents to understand the material. This was important because as suggested by Molina (2012), "To understand mathematics at a deeper conceptual level, students need to develop a strong foundation by learning to define basic concepts, make connections, and unearth relationships; an understanding of the language, symbolism, and visual representation of mathematics is integral to this process" (p. 9).

The five teacher-made instructional videos had an average duration of approximately 10 minutes. The academic rigor of the videos was developed by the researcher to give parents a basic understanding of what was being taught in the classroom. The order in which the videos were presented was based on the school district's pacing guide. Additionally, the content of the videos was based on the following Georgia Standards (2018):

- MGSE9-12.A.SSE.3a: Factor any quadratic expression to reveal the zeros of the function defined by the expression.
- MGSE9-12.A.SSE.3b: Complete the square in a quadratic expression to reveal the maximum or minimum value of the function defined by the expression.
- MGSE9-12.A.REI.4b: Solve quadratic equations by inspection (e.g., for $x^2 = 49$), taking square roots, factoring, completing the square, and the quadratic formula, as appropriate to the initial form of the equation (limit to real number solutions).

- MGSE9-12.N.RN.2: Rewrite expressions involving radicals and rational exponents using the properties of exponents. (i.e., simplify and/or use the operations of addition, subtraction, and multiplication, with radicals within expressions limited to square roots).
- MGSE9-12. N.Q.2: Define appropriate quantities for the purpose of descriptive modeling. Given a situation, context, or problem, students will determine, identify, and use appropriate quantities for representing the situation.

The reliability and validity of the teacher-made instructional videos was also considered by the researcher. Reliability of an instrument signifies that it performs the same way every time. Reliability of the teacher-made instructional videos was ensured by allowing all parents to have the same access to all the same videos. Once a video was uploaded, every parent had the same opportunity to view it as often as they chose to. Validity of an instrument denotes that it measures what it is intended to measure. The validity of the videos was ensured by the researcher of the present study by having them peer reviewed by his colleagues to check for any errors or omissions. The colleagues were all veteran math teachers. Each teacher had at least 10 years of experience as a high school math instructor. After having the videos reviewed and cleared by his colleagues, the researcher then uploaded them to a video hosting website.

EDPuzzle website. A third-party website known as EDpuzzle was chosen to host the researcher's videos due to its economic advantage as it also offers free tools for data collection with the ability to gather a multitude of analytics. The website allowed the researcher to gain valuable data related to each individual participants' progress. According to Zellner (2016), EDpuzzle rates 4-stars on a 5-star scale, had a peer-reviewed rating of 5-stars and allowed data to

be saved and easily exported as a CSV file and incorporated into other grade- and course-management systems.

The website also allowed for the creation and management of individual password protected website assignments in which the researcher was able to upload the teacher-made digital instructional videos. The researcher was able to obtain data as to exactly when a participant watched a video, how many times a section was watched, and how long they spent on each video. Overall, by providing a method for hosting the instructional videos and for parents to gain access to them, as well as providing data for analysis, the incorporation of EDpuzzle into the design of this study proved to be a constructive asset in determining the effect of online remediation on self-efficacy and involvement of parents in alternative education. The hosting platform provided by the EDpuzzle website was beneficial to the present study in that it allowed parents to have access to the videos at any time as they were available 24 hours per day. As stated by Davey (2017):

Edpuzzle is a video platform that allows teachers to customize videos for their classes.

The platform has several features that promise to increase student engagement in video viewing. Teachers can pull existing videos or add their own, create questions for students to answer as they watch, and track how much of a video each student viewed.

Edpuzzle also allows teachers to edit videos by trimming video length or recording their own audio over videos. (p.1)

The establishment of an EDpuzzle account allowed the researcher to view a snapshot of statistics for any of the pages directly on the site's dashboard. These statistics could be expanded to view the number of page views and unique visitors to the remediation website. The data collected for analysis from these statistics included the number of unique site visits, page views,

average time on site, as well as the number of times a section of video was watched. This allowed the researcher to gather better data and kept track of how often parents participated in the online remediation of math. This was important to help gain a better understanding of the efficacy of using online learning for parental remediation in mathematics.

The timeline of the intervention began in February and concluded in April and covered the 4th unit of the district's Algebra curriculum. The parental online remediation was accomplished by giving parents an individual password to sign up for a class created on a video hosting website developed by the researcher. The video hosting website also provided detailed statistics which enabled the researcher to track the number of parental visits thereby enabling a better understanding of the degree of participation within the study.

Parent interviews. The researcher conducted semi-structured interviews with each parent ($n=28$) at the end of the study to clarify their beliefs and attitudes. The researcher digitally recorded the conversations and later transcribed the data. The interview times (approximately 5-10 minutes) were kept relatively short to accommodate parents and encourage their participation. The interview schedule, as seen in Appendix B, consisted of six open-ended questions. An interview schedule with open ended questions set an agenda and established the topic of discussion. It also allowed the opportunity for further discussion by both the researcher and parent. As stated by Galletta (2012), "The questions are open-ended in order to create space for participants to narrate their experiences; however, the focus of the questions is very deliberate and carefully tied to your research topic" (p. 47). Altogether, the data gathered by the interviews provided the researcher with deeper insights as to the parents' motivations and beliefs regarding the intervention under study. As cited in Potter (2018):

Bertrand and Hughes (2005) outline three reasons why interviews are a useful method of data gathering, which also suggest the particular data gathering ends to which interviews might usefully be put. First, they provide opportunities for interviewees to respond in their own terms, through their own linguistic structures; further, verbal answers can be longer and more complex, and so more rich and interesting, than written answers. And finally, simply observing may not provide the information sought or may provide only ambiguous data: asking the person helps to clarify what has been observed (Bertrand and Hughes 2005, 74). (pp. 163-164)

Data Collection and Analysis Procedures

The data for this study was collected in the form of a Likert type self-efficacy scale; statistics pertaining to the online videos such as whether parents watched the videos, number of views, and time spent watching; and pre- and post- student assessments. The Likert type scale survey instrument was developed to help gain a better understanding of parental self-efficacy regarding their perceptions of their ability to comprehend mathematical concepts and processes to solve math problems and participate and support their children with their studies in math. The Likert type scale survey was completed before and after the study by parents. Parents were chosen by necessity and convenience to participate in an interview where questions were asked to ascertain their attitudes and perceptions about the intervention of web-based instructional videos. Assessments were done both manually and electronically and stored in a locked file cabinet or password protected computer.

Empirical data was utilized to examine the effects of online remediation in mathematics on parental self-efficacy and involvement with their children's learning of mathematics in an alternative school, as well as the students' achievements. Because the participants in the pre-

tests were the same participants for the post-tests, the scores between pre- and post-assessments were meaningfully related; therefore, the dependent samples *t*-test, a statistical method of comparing two samples in terms of their means, was the parametric test implemented in this investigation for comparisons. This was supportive in determining whether there was a statistically significant difference between the means of the differences in the pre- and post-assessments.

The implementation of the Dependent *t*-Test allowed for the hypothesis testing procedure of the same groups of people serving as both the control and treatment group of the study. In addition, a dependent samples *t*-test helped ascertain if the difference between the means of the pre- and post-tests was statistically significant or larger than would be expected by chance. In completing the Dependent *t*-Test in SPSS, if the *p* value was less than our chosen significance level α , we could reject the null hypothesis. This meant that we could conclude that the mean performance level between the control and experimental groups was significantly different.

However, if the *p* value had been more than the chosen significance level, then we failed to reject the null hypothesis and determined that there was insufficient evidence or the difference in means was likely due to chance or sampling error. Table 3 below, as adapted from Edgeman (2018), presents the relationship and the tests completed in the present study regarding the first research question's set of sub-questions. It displays pertinent information concerning the corresponding independent and dependent variables, instruments or measurements used for each key variable as well as their scales, and the measurement types and statistical analysis ran for each question.

Table 3

Research Questions, Type of Measurement for Variables, and Corresponding Statistical Analysis

Research Question	Key Variables	Instrument(s) or Measurement of the Key Variables and Scale	Measurement Type	Statistical Analysis
(1a) Does participation in online parental remediation significantly improve parental self-efficacy in their ability to support their child in mathematics?	<p>Independent variables: Parental access to the online remediation in mathematics with teacher-made instructional videos.</p> <p>Dependent variable: Parental scores on mean variable self-efficacy pre-construct and the mean variable self-efficacy post-construct.</p>	<p>1. The parental responses on the survey questions comprising the mean variable self-efficacy construct before and after participating in the online remediation. Possible scores ranged from 1 to 5.</p> <p>2. Survey (parental beliefs of videos and the mean variable post-self-efficacy construct) and EDPuzzle analytics (parental usage of the online</p>	<p>1. Ordinal</p> <p>2. Ordinal and Ratio</p>	<p>1. Cronbach’s Alpha, Spearman rho and Wilcoxon Signed Ranks</p> <p>2. Pearson Correlation</p>

teacher-made instructional videos).

(1b) Is there a relationship between parental demographics (specifically amount of mathematics courses, age, and gender) and their use of online parental resources?

Independent Variable:
Parental demographics

Dependent Variable:
Online resources in the form of teacher-made instructional videos.

Parental survey and EDPuzzle analytics

Nominal and Ratio

Spearman rho

(1c) Does participation in online parental remediation significantly

Independent Variable:
Online remediation with teacher-made

Students' pre- and post-assessments

Ratio

Dependent *t*-test

improve students'

instructional videos.

mathematical

Dependent Variable:

achievement in

Student performance on

alternative education?

assessments

Validity of Interpretation

To establish the trustworthiness of this research, several quality criteria were considered, including such issues as the credibility, transferability, dependability and confirmability of its findings. These aspects of the study are important for the research to have any significant effect on the future of education. The design of this research attempted to construct validity and obtain reliable, meaningful data for a reasonable explanation of the relationship between online parental remediation in math and the self-efficacy and involvement of parents with their children's education as well as student success in alternative education.

Threats to validity include such things as history, maturation and testing. History and maturation were not an issue due to the control and treatment groups being comprised of the same subjects that went through the same development processes, as well as the research being non-longitudinal and taking place over a relatively brief period. However, testing could have potentially been a threat to validity due to the pretest itself affecting the outcomes of the post-test. Pre-test sensitization to the treatments could have potentially caused participants to be sensitive to the objectives of the study by providing them with an opportunity to practice which may have caused performances to be improved. As cited in Song and Ward (2017), "Assessment effects, first described by Solomon (1949) and further discussed by Campbell (1957), refer to a phenomenon in which the outcome of interest (e.g., a behavior, an attitude, or knowledge) is modified by merely assessing it" (p. 242). Unfortunately, testing effects are inherent to a pre- and post-test control group design as suggested by Song and Ward,

Repeated assessments over time are often a necessary component of efficacy trials, not as an intended intervention but rather to measure the intervention effect over time. In those

situations, repeated assessments threaten valid interpretations about the efficacy of the intervention being tested. (p. 242)

To try and counter this, parents were asked by the researcher to respond freely and honestly to the survey, and the pre-tests and post-tests were administered so that the same participants were exposed to the same assessments over the same content at the same time so that any difference between group phases was not due to testing, e.g., exposure to instruction before pre-test or given answers by peer who had already taken test. In addition, the pre- and post- test questions pertained to the exact same content and standards but were arranged slightly different to help ensure honest responses. This helped support the validity of the results of this study which may thus be supportive of other educators in their endeavors to improve the future of teaching and learning in alternative programs.

Limitations and Delimitations

One limitation to this study is that the scope of the research involved only a small number of parents of students enrolled in an alternative school in the southern United States over a relatively brief period. A longitudinal study might enlighten a better understanding of the impact of this research. A longer study over time would provide more data and give a clearer picture of the actual changes in their achievement.

A second limitation of this study was the potential for parents not to participate or follow through with the initiatives of the research. Parents may not have had access to the internet, fail to see the efficacy of their contribution, and/or lack confidence in their ability to successfully help their children with schoolwork. Working parents may have been too busy and not have had any spare time to devote towards the remediation. They could have also simply had no desire to participate and felt that it was a superfluous waste of time and unnecessary. Whatever the

reason, this could have caused insufficient data to be recorded, or possibly led to a misinterpretation of the statistics.

A delimitation of this study is that the research only focused on the math students in the alternative school and does not include students in other academic content areas. Therefore, the results may not establish a broad representation of student performance in all areas across the curriculum. Another delimitation of this study is that the investigation only considered the improvements achieved by those students whose parents received the online-remediation accomplished through web-based interventions, and again did not consider all of the students in the alternative school.

Ethical Considerations

Several ethical standards have been established to protect the rights of human research participants; i.e., The Belmont Report, the Declaration of Helsinki, and The Nuremberg Code. It is important to respect the participants' right to privacy; therefore, all information will be kept strictly confidential. Data will be kept in a locked file cabinet or password protected computer for a period of three years and then completely deleted from all records.

Normative ethical theories are mostly traditional moral theories which rest on principles that determine whether an action is right or wrong (Kagan, 2007). This was important to this research because another ethical consideration is whether all parents should always have access to the online remediation. Exclusion during the control group phase may imply an unethical treatment of students. A consequentialist ethical view negates this implication since the implementation of research without exclusion could not provide valid results; therefore, opportunities to improve alternative students' education would be lost with the consequences of not excluding parental remediation during the control phase. Consequentialism is the class of

normative ethical theories that suggest whether an act is morally right depends only on consequences as opposed to the circumstances or intrinsic nature of an act or anything that happens before the act (Sinnott-Armstrong, W., 2003). Nonetheless, in the sense of "fairness in distribution" and fulfill the Belmont principle of justice, each student always received a high standard of instruction.

According to the Code of Federal Regulations, "no investigator may involve a human being as a subject in research covered by this policy unless the investigator has obtained the legally effective informed consent of the subject or the subject's legally authorized representative" (Office of Human Research Protections, 2016). Therefore, all aspects of this study were reviewed and approved by a local Institutional Review Board (IRB) prior to conducting any of the proposed research. In addition, every subject in this research was fully informed and edified of the nature of the research and freely consented to participate.

This was important because as stated in the Nuremberg Code (1947), "The voluntary consent of the human subject is absolutely essential." This helped to ensure autonomy and provided sufficient information for them to make an informed decision as to whether they would participate. Subjects provided a signed consent form before participating in the study. Lastly, all laws, rights and obligations to participants were respected while maintaining excellent quality research during this study.

Chapter Four: Results

The purpose of this study was to examine the effect online parental remediation with the use of teacher-made instructional videos has on parental self-efficacy, attitudes, behaviors and motivations regarding their involvement with their children's mathematical education in alternative education. It further examined whether the intervention affects the mathematical achievements of alternative students. A quantitative methodology with a non-experimental correlational design was implemented in this study. The primary forms of data collected were in the form of surveys and analytics provided by the EDpuzzle website. Supplementary data was also collected in the form of interviews and student assessments to help gain better understandings of the impact of the intervention.

The results of the data analysis are subsequently presented in this chapter and then discussed further in Chapter 5. All data sources of this investigation provided useful information and helped discover the impact of the intervention being investigated by the researcher. As initially stated in Chapter 1, the research questions this study attempted to answer were as follows:

1. What effect does online parental remediation have on parental interaction and support for mathematics in an alternative school?
 - a. Does participation in online parental remediation significantly improve parental self-efficacy in their ability to support their child in mathematics?

H₀ There is no significant correlation between the participation of online parental remediation and parental self-efficacy in their ability to support their child in mathematics.

- H*₁ There is a significant correlation between the participation of online parental remediation and parental self-efficacy in their ability to support their child in mathematics.
- b. Is there a relationship between parental demographics (specifically amount of mathematics courses, age, and gender) and their use of online parental resources?
- H*₀ There is no significant correlation between parental demographics (specifically amount of mathematics courses, age, and gender) and their use of online parental resources.
- H*₁ There is a significant correlation between parental demographics (specifically amount of mathematics courses, age, and gender) and their use of online parental resources.
- c. Does participation in online parental remediation significantly improve students' mathematical achievement in alternative education?
- H*₀ There is no significant correlation between participation in online parental remediation and students' mathematical achievement in alternative education.
- H*₁ There is a significant correlation between participation in online parental remediation and students' mathematical achievement in alternative education.
2. How do parents of alternative students utilize online instructional videos in support of their children's learning of mathematics?
- a. How often do parents watch the instructional videos?
- b. Do parents watch videos alone, with the students or both?
3. What are the motivating factors that encourage or discourage parental utilization of online instructional videos for support of students in alternative education?

To discover the answer to these questions, a convenience sample was chosen from parents who agreed to participate in this study. The population of this study consisted of a sample of parents ($n=28$) along with their children ($n=26$) who were enrolled in an alternative school and served as both the control and experimental groups. The parents were given individual passwords that allowed them to have access to teacher-made instructional videos hosted on an EDpuzzle website. As previously stated in Chapter 2, this study on parental self-efficacy and how it is affected by mathematical remediation with the application of computer technology relates heavily to Vygotsky's theory of social development—one of the foundations of constructivism.

Data Descriptions

Survey data was collected from each parent at the beginning (pre-test) and end (post-test) of this study. The survey was comprised of 33 questions and was scored by means of a 5-point Likert-type scale ranging from 1 = Strongly Disagree, 3 = Slightly Agree, and 5 = Strongly Agree. The survey was created by the researcher and made accessible to parents on the Internet via the web-based technology provided by the Qualtrics website. Each parent was given an individual link and password to access the survey so that the researcher was able to gather relevant data from each parent.

The survey data was quantified and analyzed to measure the parents' attitudes and motivations regarding their self-efficacy and involvement with their children's learning of mathematics. This data corresponded primarily to the first question of this study which as previously stated was as follows:

- What effect does online parental remediation have on parental interaction and support for mathematics in an alternative school?

More specifically, does participation in online parental remediation significantly improve parental self-efficacy in their ability to support their child in mathematics? Furthermore, is there a relationship between parental demographics (specifically amount of mathematics courses, age, and gender) and their use of online parental resources?

The coded responses from the survey were analyzed using the embedded tool from the Qualtrics website as well as the SPSS software. Descriptive statistics of the survey were calculated for several variables including age, sex, and level of education. This data was used to find measures of central tendency and spread to identify trends or patterns. The Cronbach coefficient was implemented to gauge the reliability of the scores. The Spearman's rho was then used to measure the strength of association or correlation and The Wilcoxon signed ranks test was used to determine the statistical significance of the differences of the scores before and after the online parental remediation.

During this study, there were a total of five teacher-made instructional videos within the context of Unit 3: Modeling and Analyzing Quadratic Functions from the state of Georgia's Algebra 1 curriculum were created by the researcher. These videos were used to introduce the parents to new concepts and explain to them the different methods for solving quadratic equations. The researcher created the videos with the use of a laptop computer; Screencast-O-Matic computer application; as well as the Smart Board which is an electronic whiteboard software application from Smart Technologies. The videos were uploaded weekly as they were completed by the researcher to the EDpuzzle website where parents were able to access them. The topics of the five teacher-made instructional videos were as follows:

- Video 1: Solving Quadratic Equations ($a=1$) by Factoring
- Video 2: Solving Quadratics Equations ($a>1$) by Factoring

- Video 3: Modeling with Quadratics
- Video 4: Complete the Square
- Video 5: Quadratic Formula

The EDpuzzle website provided analytics regarding the videos such as the number of views, time spent, and percentage of parents that completed watching the videos. This data focused on the parent's use of the teacher-made instructional videos. This related mainly to the second research question which as formerly stated in this chapter was as follows: How do parents of alternative students utilize online instructional videos in support of their children's learning of mathematics? Also, how often do parents watch the instructional videos? Descriptive statistics were used to identify any trends and/or patterns. The Pearson's Correlation was implemented for the analysis of this data to determine the correlation between technology usage and self-efficacy.

The parents provided additional data by answering questions in a semi-structured interview. This data related mainly to the third research question of this study which, as stated earlier in this chapter, was as follows:

- What are the motivating factors that encourage or discourage parental utilization of online instructional videos for support of students in alternative education?

The interview consisted of six open-ended questions. The researcher chose to use open-ended questions, rather than closed-ended, to try and capture as much information as possible from the parents. The interview schedule consisted of the following six open-ended questions:

1. Why did you agree to participate in this study?
2. Did you find the videos helpful and if so, in what way?

3. What would you say was the most significant outcome of having access to the videos?
4. What was the most significant challenge in taking part of this study?
5. How often did you watch the videos?
6. Did you watch the videos alone, with your child or both, and if both, which would you say you did more of?

Each of these questions delineated the subject to be discussed but provided the opportunity for further discussion by both the researcher and parent. Descriptive statistics were used to identify any patterns across those responses. This helped the researcher gain a better understanding of the parents' true attitudes and beliefs regarding the online parental remediation with the use of teacher made instructional videos.

Students provided supplementary data on their achievements in the form of pre- and post-tests. A Dependent *t*-Test was used to analyze this data and compare the means of the students' performances. The analysis of this data was used to help determine whether there was a statistically significant difference between the means. This information provided insight as to how the intervention affected student achievement.

Credibility and validity are both important to the efficacy of the findings from any research study. The integration of multiple data sources, along with the appropriate analysis methods helped to maximize the credibility and validity of this study. Altogether, the analysis of this data helped discover a better understanding of the effect of the intervention under study. Table 4 below displays the research question number and the corresponding item of data involved in the present study.

Table 4

Research Question Number and Corresponding Data Type

	Survey	EDpuzzle	Interview	Student
	Items	Analytics	Items	Assessments
Q1	5-33	% Complete		Pre- & Post-
Q1A	5,6,8-23			
Q1B	1-4			
Q2	24-26	% Complete	1-6	
Q2A	23-33	# of Views	5	
Q2B			6	
Q3			1	

Notes: Q1= Question 1; Q1A = Question 1 Sub-Question A

The multiple forms of data and its analysis worked together and helped illuminate how online parental remediation with the use of teacher-made instructional videos affects the self-efficacy and involvement of parents with their children’s mathematical education at an alternative school. The triangulation of data supported the validity and credibility of this study. Multiple forms of data provided a better insight as to the intervention’s effect and strengthened the conclusions from the data analysis. The data and related statistics are subsequently presented in the following section.

Data Analysis

Survey statistics. The researcher began the analysis of the survey data by completing descriptive statistics for demographics of the participants of the study. This included the parents’ gender, age, and educational history. Table 5 below displays the disproportionate level of

participation between parental genders. It shows that most of the parents involved with this study were women, comprising 75% of the participants.

Table 5

Gender Percentages

Demographic	N	Percentage
Male	7	25%
Female	21	75%
Total	28	100%

The difference in the level of participation with this study between the two genders is in alignment with previous mentioned research regarding predictors of paternal involvement among nonresidential, black fathers from low-income neighborhoods (Coates & Phares, 2014). Like previous research, many of the students enrolled at the alternative school (site of research) are from single family homes. They also have no or minimal contact with their paternal parents.

Figure 5 below displays a comparison chart for the various age categories of the parents that were involved with the study. It clearly shows that most of the parents, nearly 54%, were between the ages of 30 and 40 years of age. Additionally, 32% were between 40 and 50; 10% between 50 and 60; and roughly 4% between the ages of 60 and 70 years of age. Also, none or 0% of the parents were between 20 and 30 years old.

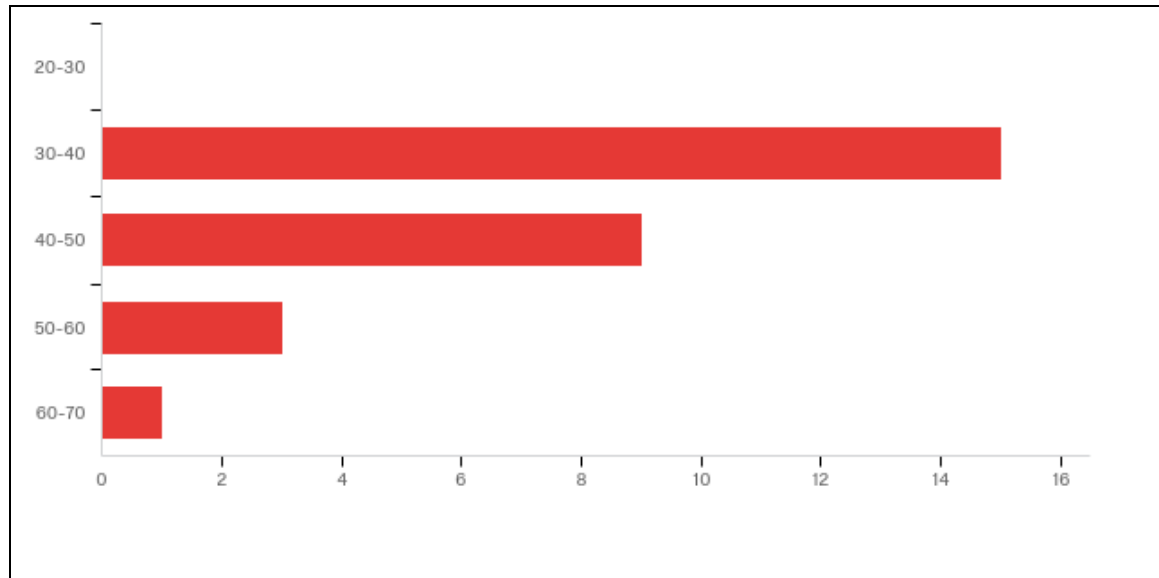


Figure 5: Parental age demographics

Figure 6 below displays a bar chart for the data on the educational experience of the parents who participated in this research. The chart highlights the fact that most of the parents, approximately 53%, indicated that they had graduated high school; whereas, approximately 4% indicated that they had not finished high school. Also, nearly 29% of the participants indicated that they had some college experience, approximately 10% of the parents had a 2-year degree, and around 4% indicated that they had completed a 4-year degree. Lastly, none or 0% of the parents indicated that they had a professional degree or doctorate. This information is corresponding with previous research on the effect of parents' level of education on the need for remediation in mathematics (Xu, 2016).

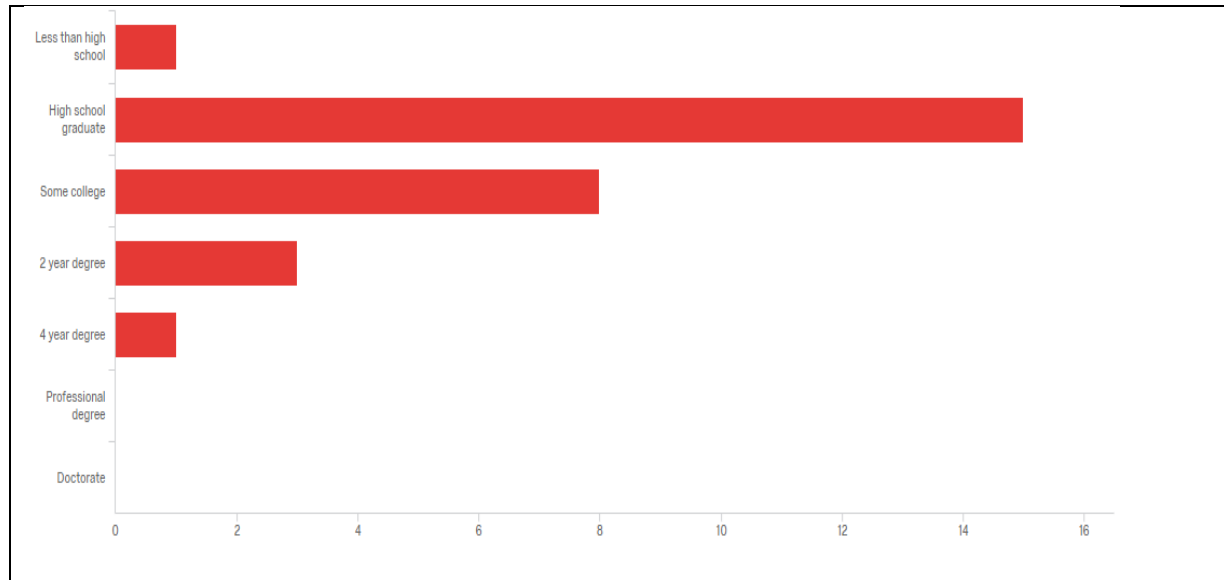


Figure 6: Parental education history

A summary description was also produced by univariate analysis of the parents’ responses to the question regarding their education experience. Table 6 below displays the measure of the central tendency and distribution of the data for those statistics. The small standard deviation demonstrates that the values in the statistical data set were close to the mean of the data set.

Table 6

Measures of Spread for Parental Education Experience

Field	Minimum	Maximum	Mean	Std. Dev	Var.	Count
Education History	1.00	5.00	2.57	0.86	0.74	28

Notes: Std. Dev = Standard Deviation; Var. = Variance

The Cronbach coefficient was implemented to gauge the reliability of the scores from the parental survey. The Cronbach's coefficient provides an estimate of the internal consistency with the responses aggregated from the Likert scale. This measurement of reliability is important because in the absence of reliability it's impossible to have any validity associated with the scales used in this research. The results of the Cronbach analysis show very high reliability and are

displayed below in the following two figures. A coefficient of .70 or higher indicates that the reliability is good. Cronbach's alphas for the items on parental self-efficacy and parental beliefs regarding the instructional videos were .96 and .89, respectively.

Figure 7 below displays the results from the Cronbach analysis for the scales that correspond to the parental self-efficacy construct.

Case Processing Summary				Reliability Statistics		
		N	%			
Cases	Valid	27	96.4	Cronbach's Alpha	Cronbach's Alpha Based on Standardized Items	N of Items
	Excluded ^a	1	3.6			
	Total	28	100.0			
a. Listwise deletion based on all variables in the procedure.				.956	.957	15

Figure 7: Cronbach statistics for parental survey: Self-efficacies construct

Figure 8 below presents the data from the Cronbach analysis for the scores that correspond to parental beliefs about the videos.

Case Processing Summary				Reliability Statistics		
		N	%			
Cases	Valid	28	100.0	Cronbach's Alpha	Cronbach's Alpha Based on Standardized Items	N of Items
	Excluded ^a	0	.0			
	Total	28	100.0			
a. Listwise deletion based on all variables in the procedure.				.891	.891	11

Figure 8: Cronbach statistics for parental survey: Video beliefs construct

Table 7 below displays the survey items used to compute the pre- and post- mean variable constructs on the parents' self-efficacy and beliefs regarding the teacher made instructional videos.

Table 7

Variables Used for Calculation of Mean-Variable-Constructs

Self-Efficacy Construct	Video Beliefs Construct
8-25	26-36

Notes: Numbers reflect item placement on parental survey

The Spearman's rho correlation was implemented to measure the strength of association or correlation between the pre- and post- mean variable constructs of the parents' beliefs and motivations regarding self-efficacy and the teacher made instructional videos. It is important to note that the survey question items 18-25 of the self-efficacy construct and 32-36 of the video beliefs construct were reverse coded due to the negatively worded questions. This helped to ensure validity of the parents' responses so that a high value indicated the same type of response on every item. It also supported the validity of the survey by helping to prevent any "straight line" answering (responses in one direction regardless of the item statement).

The correlation between the parental survey scores vis-à-vis the mean variable self-efficacy pre- construct and the mean variable self-efficacy post- construct of the parent sample is significantly correlated ($r=.752, p<.01$). Figure 9 below displays the results of the Spearman's rho correlation analysis in SPSS between the pre- and post- mean variable self-efficacy constructs.

Correlations				
			mean_variabl e_efficacy_co nstruct_pre	mean_variabl e_efficacy_co nstruct_post
Spearman's rho	mean_variable_efficacy_ construct_pre	Correlation Coefficient	1.000	.752**
		Sig. (2-tailed)	.	.000
		N	28	28
	mean_variable_efficacy_ construct_post	Correlation Coefficient	.752**	1.000
		Sig. (2-tailed)	.000	.
		N	28	28

** . Correlation is significant at the 0.01 level (2-tailed).

Figure 9: Spearman’s correlation mean-variable-efficacy-construct

Figure 10 below displays the results of the Spearman’s rho correlation analysis in SPSS between the pre- and post-mean variable videos construct which measured the strength of the relationship between the parents’ feelings and beliefs about the efficacy of the teacher made instructional videos. The correlation between parental scores of the pre- and post-mean variable videos construct is significantly correlated ($r=.459, p<.05$). The Spearman’s rho correlation coefficient of .459 shows a moderate strength correlation. Also, the p value of 0.014 is less than significance level (α) of 0.05; therefore, we reject the null hypothesis that there is no significant difference between the pre- and post-video constructs.

Correlations				
			mean_variabl e_videos_con struct_pre	mean_variabl e_videos_con struct_post
Spearman's rho	mean_variable_videos_c onstruct_pre	Correlation Coefficient	1.000	.459*
		Sig. (2-tailed)	.	.014
		N	28	28
	mean_variable_videos_c onstruct_post	Correlation Coefficient	.459*	1.000
		Sig. (2-tailed)	.014	.
		N	28	28

*. Correlation is significant at the 0.05 level (2-tailed).

Figure 10: Spearman’s correlation mean-variable-videos-construct

Figure 11 below displays the results of the Spearman’s rho correlation analysis in SPSS between the parents’ math experience and their use of the online teacher made instruction videos. The correlation between parental scores of the math experience and parental usage of the online videos is significantly correlated ($r=.472, p<.05$).

Correlations				
		Math_Experience		Parental_Usage_of_Online_Videos
Spearman's rho	Math_Experience	Correlation Coefficient	1.000	.472*
		Sig. (2-tailed)	.	.011
		N	28	28
	Parental_Usage_of_Online_Videos	Correlation Coefficient	.472*	1.000
		Sig. (2-tailed)	.011	.
		N	28	28

*. Correlation is significant at the 0.05 level (2-tailed).

Figure 11: Spearman’s correlation parental math experience and use of online videos

Figure 12 below displays the results of the Spearman’s correlation analysis between the parents’ age and their use of the online teacher made instruction videos. The correlation between parental age and their usage of the online videos is not significantly correlated ($r=.289, p>.05$).

Correlations				
		Parental_Age		Parental_Usage_of_Online_Videos
Spearman's rho	Parental_Age	Correlation Coefficient	1.000	.289
		Sig. (2-tailed)	.	.136
		N	28	28
	Parental_Usage_of_Online_Videos	Correlation Coefficient	.289	1.000
		Sig. (2-tailed)	.136	.
		N	28	28

Figure 12: Spearman’s correlation parental age and use of online videos

Figure 13 below displays the results of the Spearman’s correlation analysis between the parents’ gender and their use of the online teacher made instruction videos. The correlation between parental age and their use of the online videos is not significantly correlated ($r=.142$, $p>.05$).

Correlations			Parental_Gen der	Percent_Vide os_Viewed
Spearman's rho	Parental_Gender	Correlation Coefficient	1.000	.142
		Sig. (2-tailed)	.	.472
		N	28	28
	Percent_Videos_Viewed	Correlation Coefficient	.142	1.000
		Sig. (2-tailed)	.472	.
		N	28	28

Figure 13: Spearman’s correlation parental gender and use of online videos

A Wilcoxon signed ranks test was used to determine the statistical significance of the differences of the parent’s mathematical self-efficacy scores before and after the online parental remediation. It indicated that post-test ranks, $Mdn=3.10$, were significantly higher than pre-test ranks, $Mdn=3.96$, $z=406$, $p<.000$. The mean of the ranks of the pre-self-efficacy was 3.14, while the mean of the ranks of the post-self-efficacy was 4.0. Figure 14 below displays test summary statistics for the related samples of the Wilcoxon signed ranks analysis.

Null Hypothesis	Test	Sig.	Decision
1 The median of differences between mean_variable_efficacy_construct_pre and mean_variable_efficacy_construct_post equals 0.	Related-Samples Wilcoxon Signed Rank Test	.000	Reject the null hypothesis.

Total N	28
Test Statistic	406.000
Standard Error	43.912
Standardized Test Statistic	4.623
Asymptotic Sig. (2-sided test)	.000

Asymptotic significances are displayed. The significance level is .05.

Figure 14: Hypothesis test summary related-samples Wilcoxon signed-ranks test

EDpuzzle statistics. EDpuzzle provided detailed statistics. This included the completion rate, timeliness and summary statistics for each of the videos. Figures 15-19 present that data as follows:

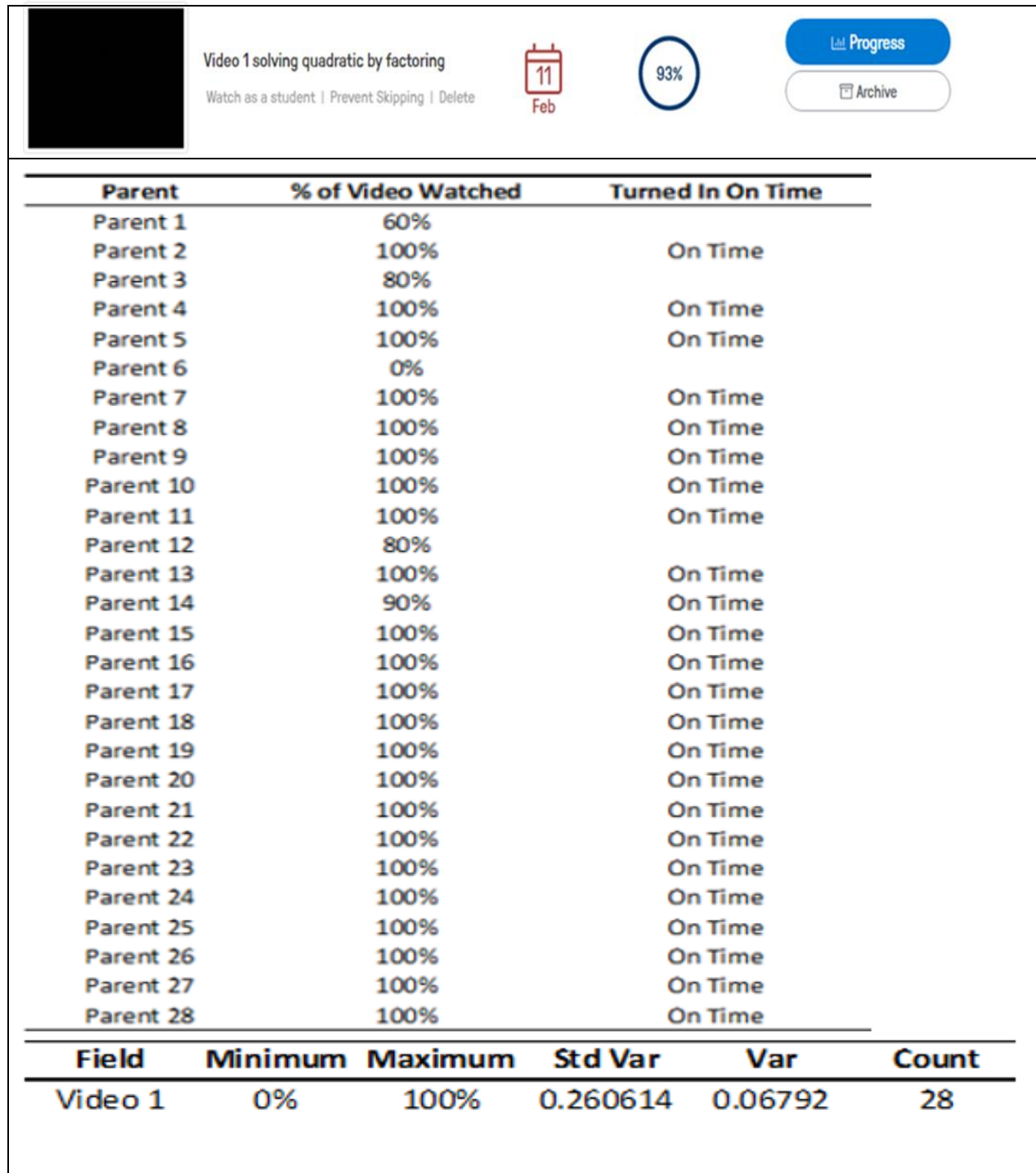


Figure 15: Summary statistics for video 1 (mean = 93%)

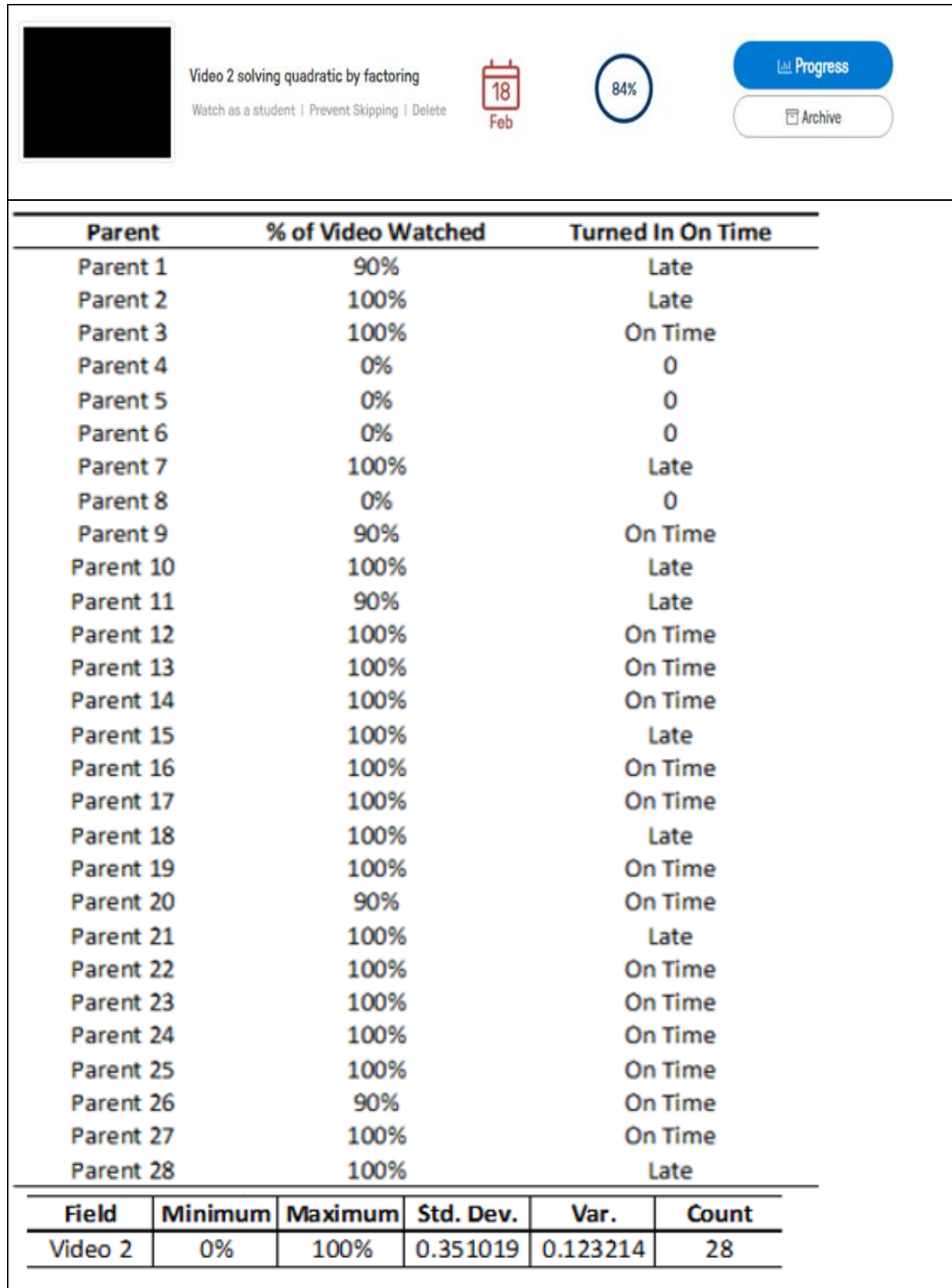


Figure 16: Summary statistics for video 2 (mean = 84%)

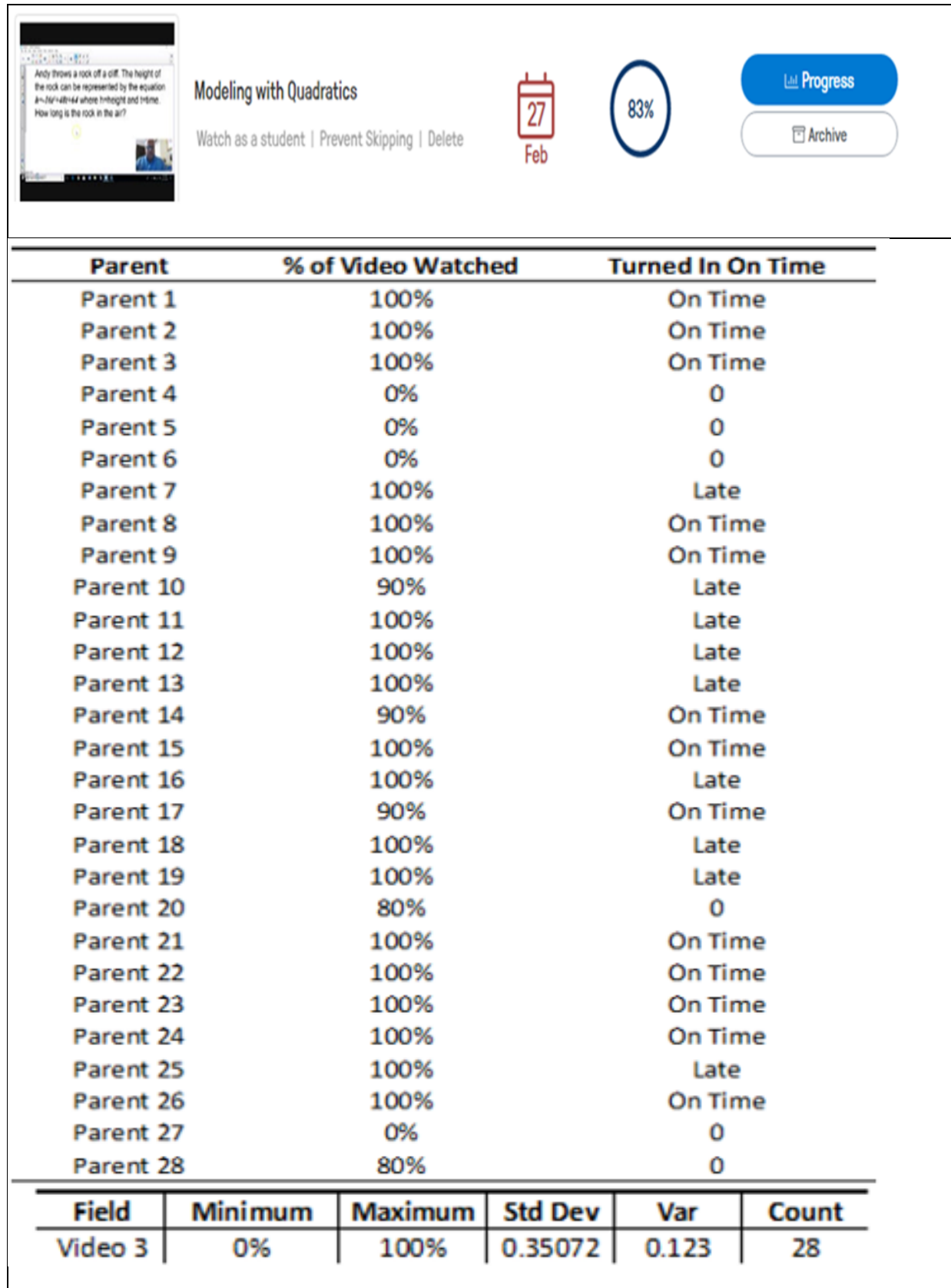


Figure 17: Summary statistics for video 3 (mean = 83%)

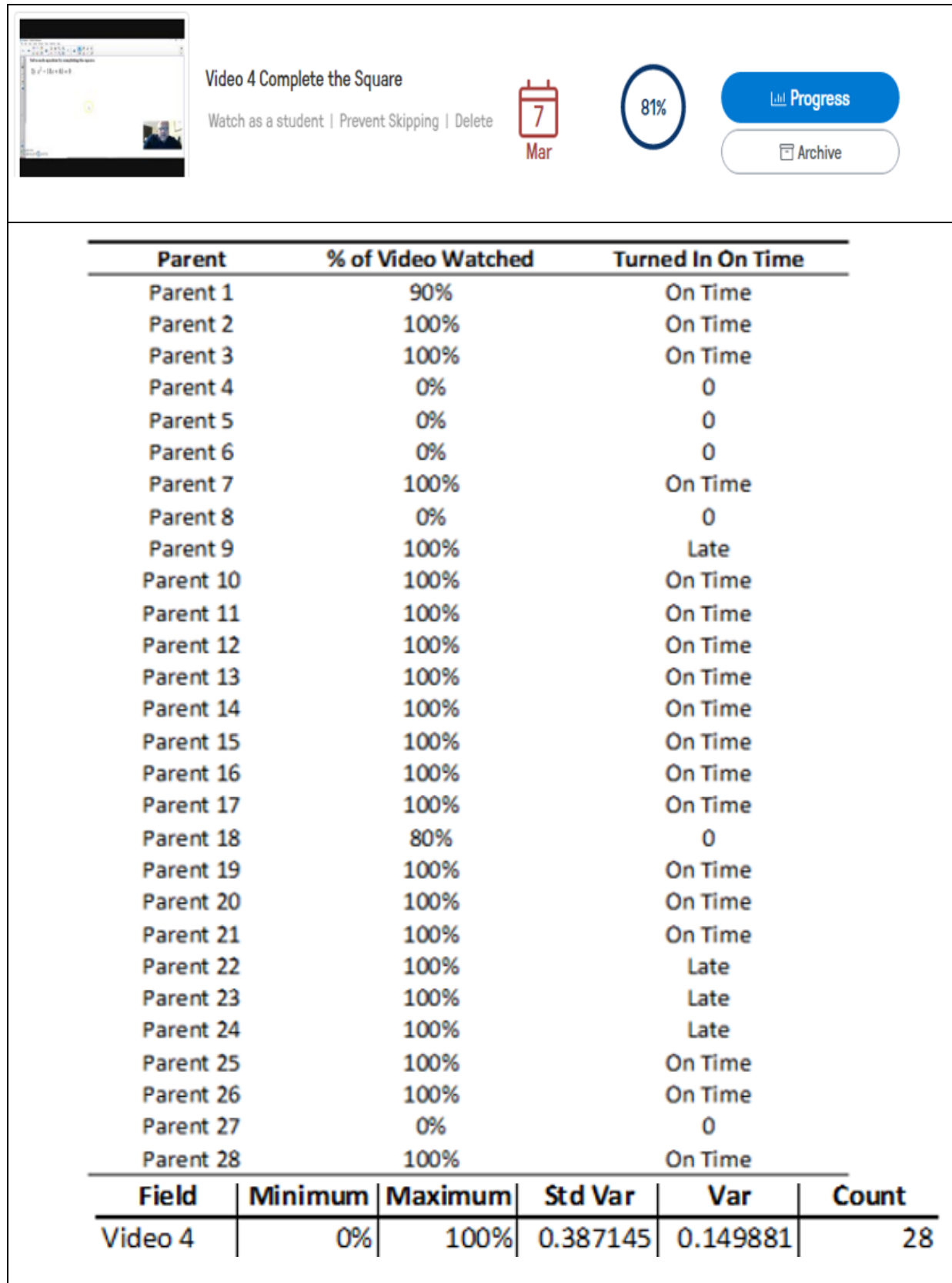


Figure 18: Summary statistics for video 4 (mean = 81%)

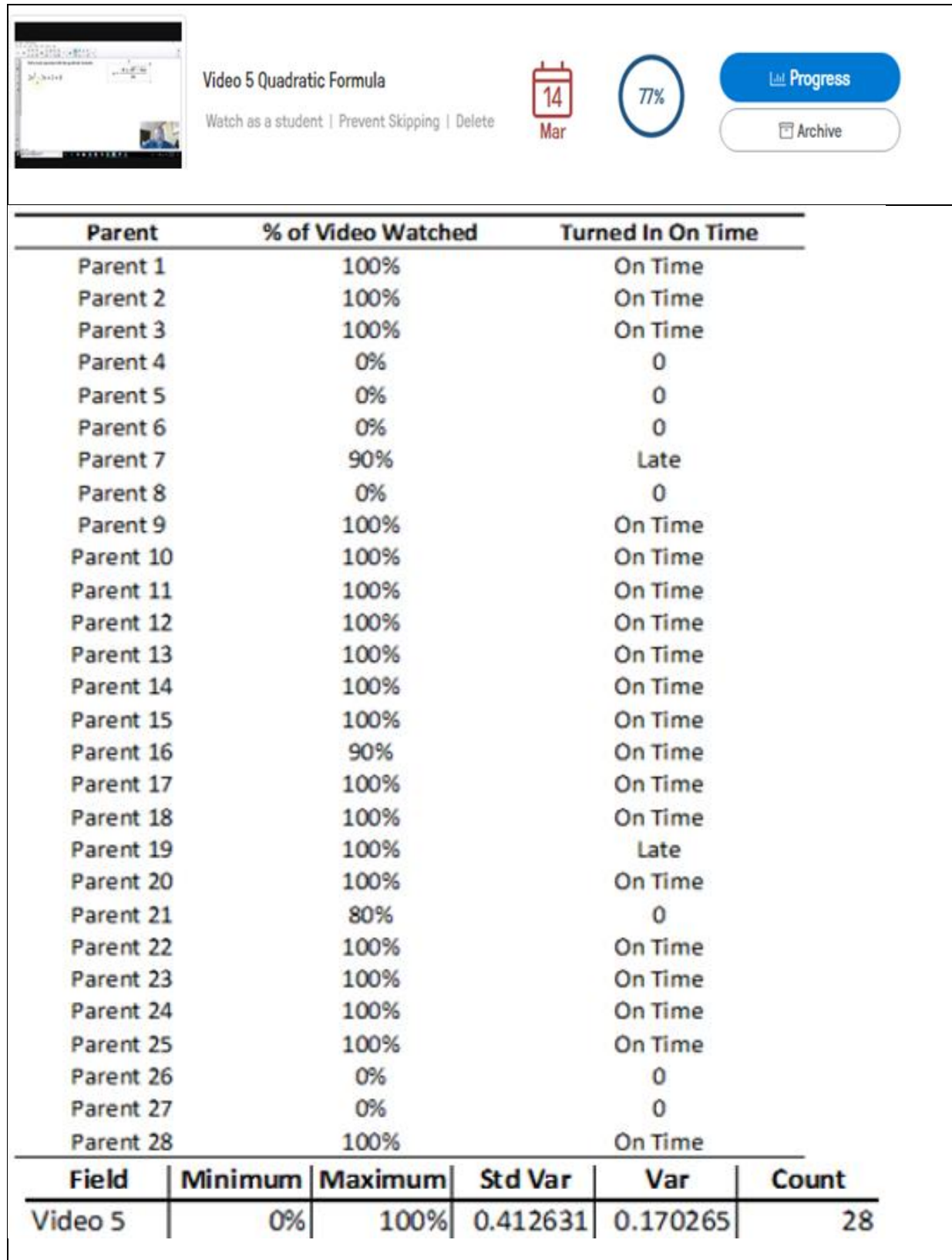


Figure 19: Summary statistics for video 5 (mean = 77%)

Table 8 below displays data provided by the EDpuzzle analytics. The table shows the average percentages each parent viewed each instructional video. It also presents the mean percent completion rate for each parent.

Table 8

Percentage of Videos Viewed by Parents

Subject	% Video 1	% Video 2	% Video 3	% Video 4	% Video 5	Mean % All Videos
Parent 1	60%	90%	100%	90%	100%	88%
Parent 2	100%	100%	100%	100%	100%	100%
Parent 3	80%	100%	100%	100%	100%	96%
Parent 4	100%	0%	0%	0%	0%	20%
Parent 5	100%	0%	0%	0%	0%	20%
Parent 6	0%	0%	0%	0%	0%	0%
Parent 7	100%	100%	100%	100%	90%	98%
Parent 8	100%	0%	100%	0%	0%	40%
Parent 9	100%	90%	100%	100%	100%	98%
Parent 10	100%	100%	90%	100%	100%	98%
Parent 11	100%	90%	100%	100%	100%	98%
Parent 12	80%	100%	100%	100%	100%	96%
Parent 13	100%	100%	100%	100%	100%	100%
Parent 14	90%	100%	90%	100%	100%	96%
Parent 15	100%	100%	100%	100%	100%	100%
Parent 16	100%	100%	100%	100%	90%	98%
Parent 17	100%	100%	90%	100%	100%	98%
Parent 18	100%	100%	100%	80%	100%	96%
Parent 19	100%	100%	100%	100%	100%	100%
Parent 20	100%	90%	80%	100%	100%	94%
Parent 21	100%	100%	100%	100%	80%	96%
Parent 22	100%	100%	100%	100%	100%	100%
Parent 23	100%	100%	100%	100%	100%	100%
Parent 24	100%	100%	100%	100%	100%	100%
Parent 25	100%	100%	100%	100%	100%	100%
Parent 26	100%	90%	100%	100%	0%	78%
Parent 27	100%	100%	0%	0%	0%	40%
Parent 28	100%	100%	80%	100%	100%	96%

EDpuzzle analytics provided more detailed information as to how many times the parents viewed a section of video. This gave insight as to the part of a video parents may have found more significant. Figure 20 below displays the sectional and total data for video 1.

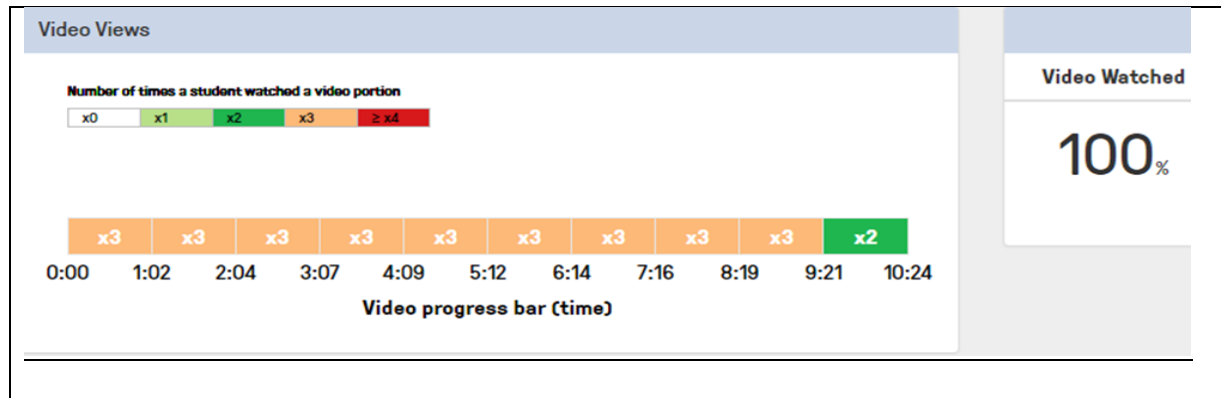


Figure 20: Sectional & total data video 1

The Pearson Correlation Coefficient was used to analyze the strength of the relationship between the self-efficacy of the parents and the percentage of videos viewed. The correlation between parental usage of the online videos and the mean variable post-self-efficacy construct is not significantly correlated ($r=.174, p>.05$). Figure 21 below displays the results from the Pearson Correlation analysis.

		Parental_Usage_of_Online_Videos	mean_variable_efficacy_construct_post
Parental_Usage_of_Online_Videos	Pearson Correlation	1	.174
	Sig. (2-tailed)		.375
	N	28	28
mean_variable_efficacy_construct_post	Pearson Correlation	.174	1
	Sig. (2-tailed)	.375	
	N	28	28

Figure 21: Pearson correlation analysis

Interview data. After transcribing the interviews with parents, the researcher carefully read through each set of questions and then carried out a content analysis to identify any main ideas or concepts the parents provided. The researcher then quantitatively coded any commonalities among the parents' answers by assigning those responses with a numerical value. The individual parental replies that most closely matched those common concepts or themes identified were then assigned the corresponding set value.

Descriptive statistics were utilized to highlight any trends or patterns from those responses. The analysis of this data helped the researcher gain a better understanding of the parents' true attitudes and beliefs regarding the online parental remediation with the use of teacher made instructional videos. It also supported the researcher in identifying the largest commonality among the parental opinions of the online parental remediation with teacher-made instructional videos.

Helping their children with homework was the most frequent theme that emerged from the interview data. Another closely related common theme to emerge was parents wanted to help their children get better grades in school. Other frequent responses that were identified included various self-enrichment reasons and to also learn more about the material their children were learning in the classroom. Figure 22 below displays the descriptive statistics for Question 1 of the parent interview.

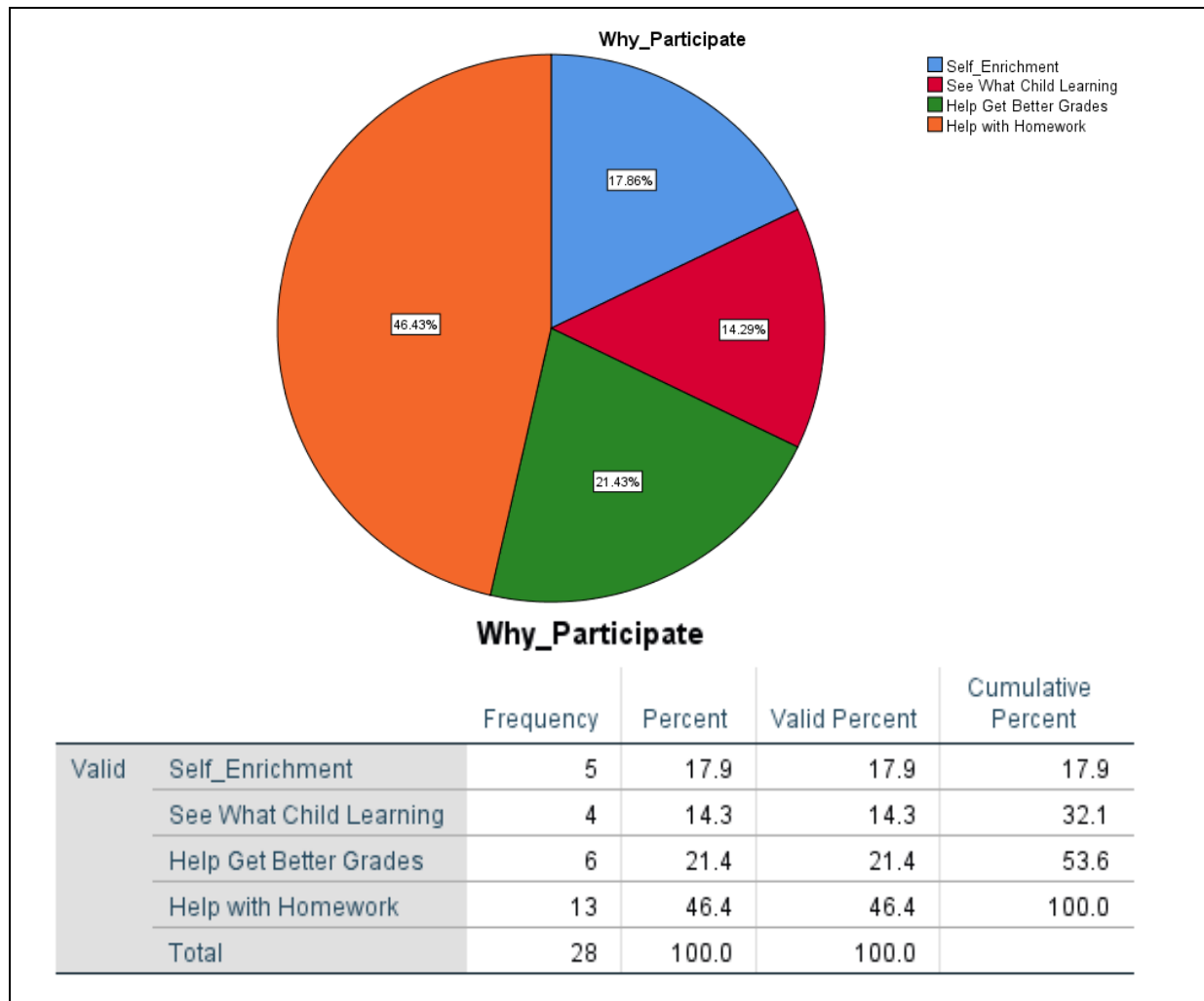


Figure 22: Frequency analysis of interview question 1

The second question of the interview pertained to parental feelings regarding the efficacy of the videos. All the parents (100%) agreed that the videos were helpful. A common theme to emerge from Question 2 was that having the ability to rewind and repeatedly watch the videos was beneficial to their understanding of the material. Some of the parents’ responses to Question 2 of the interview included the following:

“Yes, absolutely because the videos showed me how to do it. And even when I didn’t get it, all I had to do was rewind it and watch it again.”

“Yeah, I did. The videos were great. I enjoyed having the material to look over. It helped me understand it better.”

“They were pretty good. Having the videos...I mean...I watched some parts over again that I didn’t understand.”

“I think they were helpful to me and my child because we did understand it better.”

Corresponding to the responses for Question 1, the most frequent response from parents to Question 3 indicated that the most significant outcome to participating in this study was that they were able to help their child more with their homework. Figure 23 below displays statistics of the parental responses to Question 3 from the parent interview.

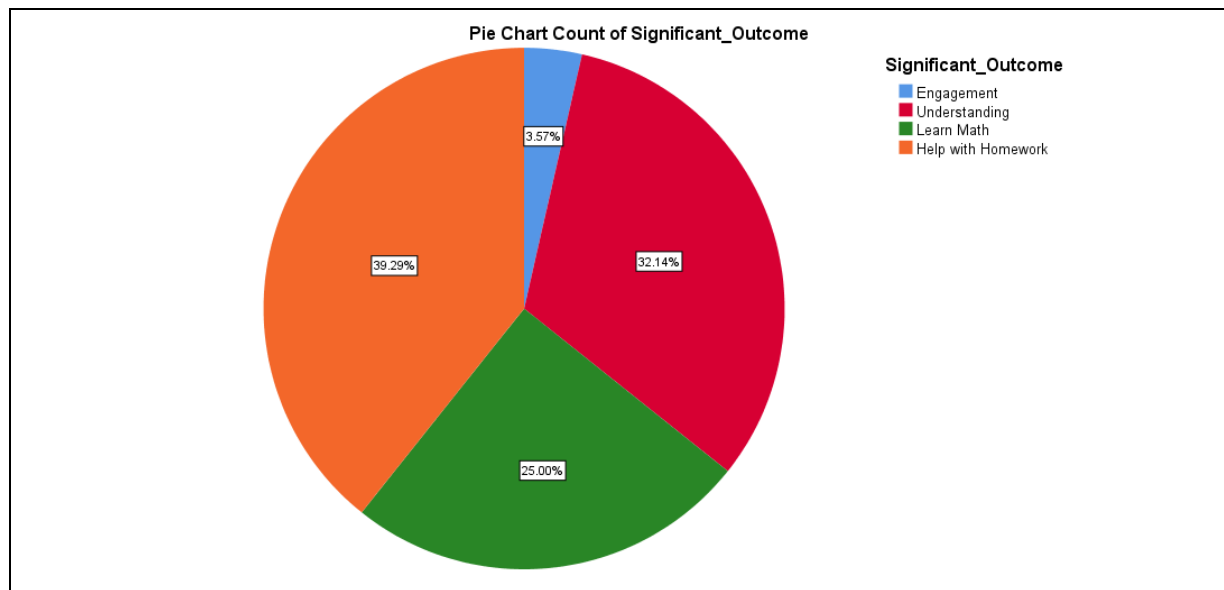


Figure 23: Frequency analysis of interview question 3

In Question 4, parents were asked what they thought was the most significant challenge in taking part this study. The theme of time constraints was the most frequent commonality to emerge in the content analysis of the interview data. Technology problems were the second most frequent response to Question 4 followed by math difficulties and motivation. One parent

indicated that there was no significant challenge in participating. Figure 24 graphically displays the parents' responses to Question 4.

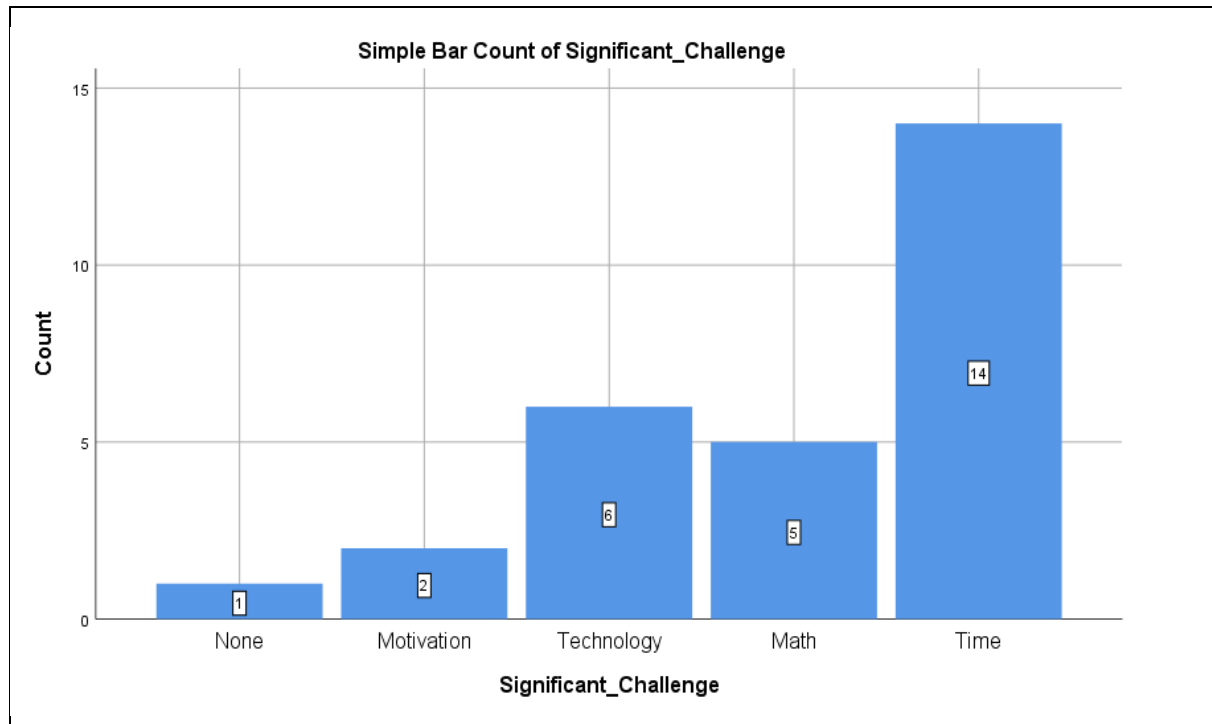


Figure 24: Frequency analysis of interview question 4

Questions 5 and 6 of the interview pertained to how often parents watched the videos and whether they watched alone, with their children or both. The parents' responses to these questions were complimentary to the EDpuzzle analytics such as previously discussed. The frequency analysis seen in Figure 25 below shows that most parents indicated that they viewed each video only once. However, the analytics from EDpuzzle show that some parents watched some segments several times as they would rewind and replay the videos.

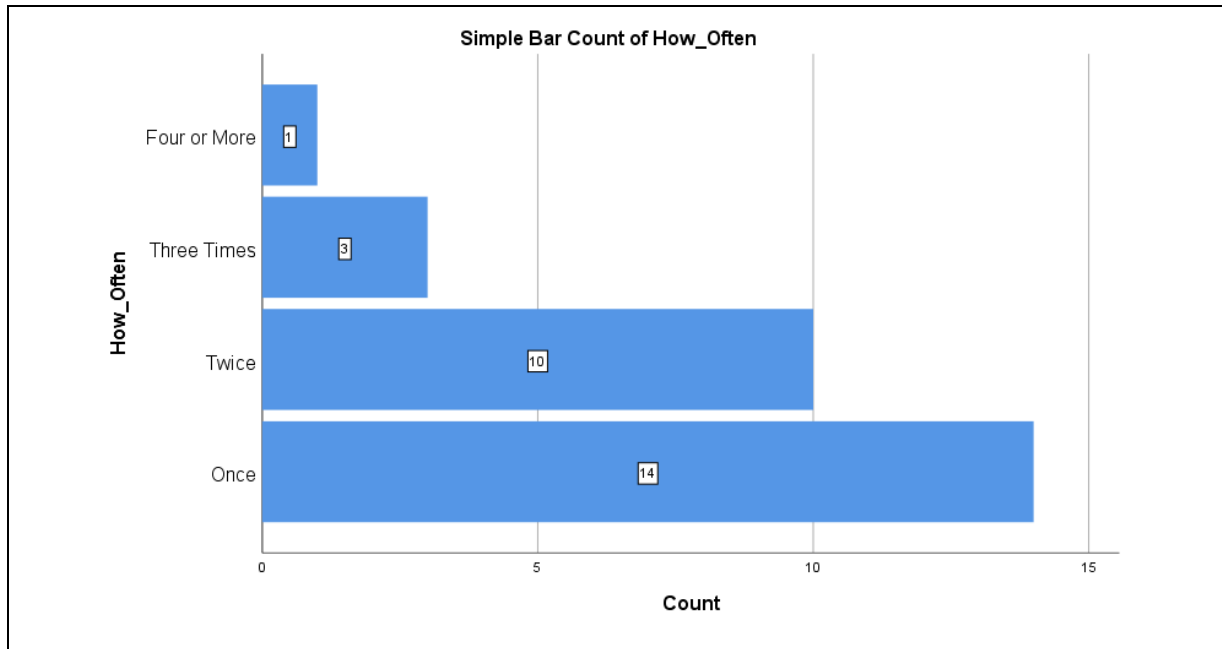


Figure 25: Frequency analysis of interview question 5

Figure 26 below displays the frequency analysis for Question 6 of the parent interview.

Most parents indicated that they watched the videos alone.

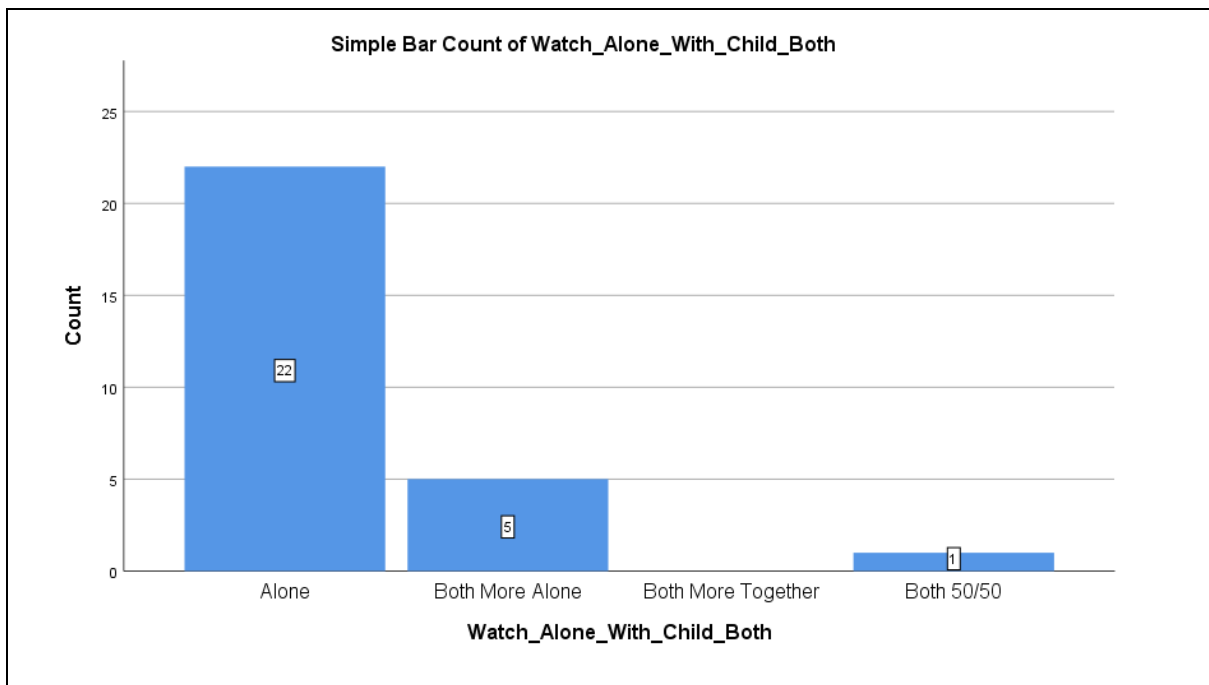


Figure 26: Frequency analysis of interview question 5

Student assessment data. Students ($n=23$) were given pre- and post- assessments in Unit 3 of the Algebra 1 curriculum. This data helped garner a better understanding of the benefits of the online parental remediation in mathematics. Figure 27 below displays the descriptive statistics.

	N	Minimum	Maximum	Mean	Std. Deviation
Quad_Pre	23	.00	35.00	11.7826	13.13551
Quad_Post	16	65.00	94.00	82.1250	7.54431
Valid N (listwise)	16				

Figure 27: Descriptive statistics

Seven students withdrew from the alternative program before completion of the study and did not take a post-test. A Dependent t -Test was used to compare the means of the paired samples. There was a significant difference in the scores for the pre-test ($M=16.94$ $SD=12.65$) and post-test ($M=82.13$, $SD=7.54$) conditions; ($t_{15} = 33.8$, $p = .000$). Figure 28 below displays the paired samples statistics of the Dependent t -Test.

		Mean	N	Std. Deviation	Std. Error Mean
Pair 1	Quad_Pre	16.9375	16	12.64631	3.16158
	Quad_Post	82.1250	16	7.54431	1.88608

Figure 28: Mean comparison Unit 3 assessments

Figure 29 below displays the paired samples correlations and paired differences test statistics. It shows that students' pre- and post-test scores were strongly and positively correlated ($r = 0.825$, $p = .000$). There was a significant average difference between the pre- and post-scores ($t_{15} = 33.8$, $p = .000$). On average, post-test scores were 65 points higher than pre-test scores (95% CI [61.08, 69.30])

		Paired Differences							
		Mean	Std. Deviation	Std. Error Mean	95% Confidence Interval of the Difference		t	df	Sig. (2-tailed)
					Lower	Upper			
Pair 1	Quad_Pre - Quad_Post	-65.18750	7.71335	1.92834	-69.29766	-61.07734	-33.805	15	.000
		N		Correlation	Sig.				
Pair 1	Quad_Pre & Quad_Post	16		.825	.000				

Figure 29: Unit 3 paired samples correlation and test

To add reliability to this study, a second pre- and post-assessment was given to students ($n=16$) for Unit 6 of the Algebra 1 curriculum. A Dependent t -Test was used again to compare the means of these test so that they could be compared with those from Unit 3: Modeling and Analyzing Quadratic Functions. There was a significant difference in the scores for the pre-test ($M=17.44$ $SD=11.13$) and post-test ($M=80.31$, $SD=7.18$) conditions; ($t_{15} = 26.36$, $p = .000$).

Figure 30 below displays the paired samples statistics for the Unit 6 pre- and post-assessments.

Paired Samples Statistics					
		Mean	N	Std. Deviation	Std. Error Mean
Pair 1	Stat_Pre	17.4375	16	11.12935	2.78234
	Stat_Post	80.3125	16	7.18070	1.79518

Figure 30: Mean comparison Unit 6 assessments

The students' pre- and post-test scores for Unit 6 were strongly and positively correlated ($r = 0.528$, $p = .000$). There was a significant average difference between the pre- and post-scores ($t_{15} = 26.36$, $p = .000$). On average, post-test scores were 62 points higher than pre-test scores ($95\% CI [57.79, 67.96]$). Figure 31 below displays the information regarding the paired samples correlation and paired differences test statistics.

		Paired Differences					t	df	Sig. (2-tailed)
		Mean	Std. Deviation	Std. Error Mean	95% Confidence Interval of the Difference				
					Lower	Upper			
Pair 1	Stat_Pre - Stat_Post	-62.87500	9.54201	2.38550	-67.95958	-57.79042	-26.357	15	.000
		N		Correlation	Sig.				
Pair 1	Stat_Pre & Stat_Post	16		.528	.036				

Figure 31: Unit 6 paired samples correlation and test

This data was not much different from the data in the Unit 3 assessments. Figure 32 below graphically displays the data from the post-assessments on Unit 3 and Unit 6 of the Algebra 1 curriculum. It shows that the students scored better on the Unit 3 assessments but not by very much considering parents did not receive any instructional videos for online remediation on the material from Unit 6.

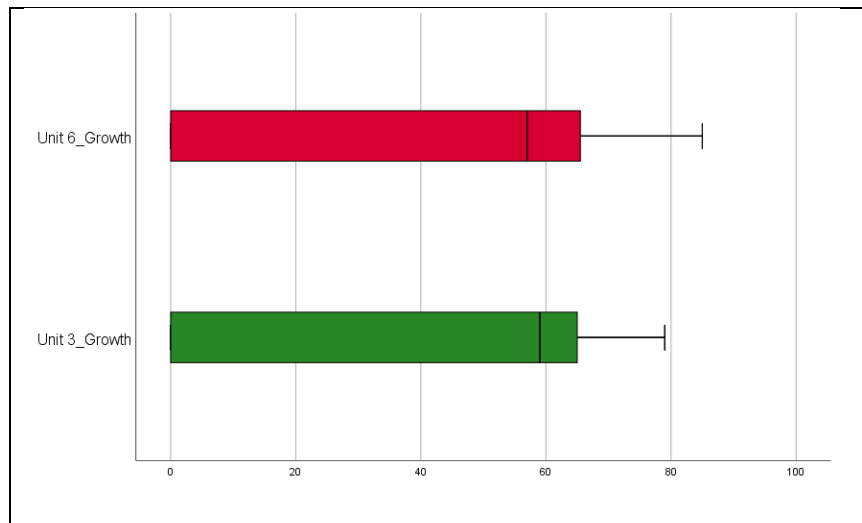


Figure 32: Boxplot comparison of post-assessments

The mean differences between the pre- and post-assessment scores on Unit 3 and Unit 6 also appear to be very similar. Although the scores were similar in both units, they were slightly higher in Unit 3 which is the unit parents received the online remediation with the teacher-made

instructional videos. Figure 33 below displays a line graph of the mean differences in the students' scores on the pre- and post-tests of both units.

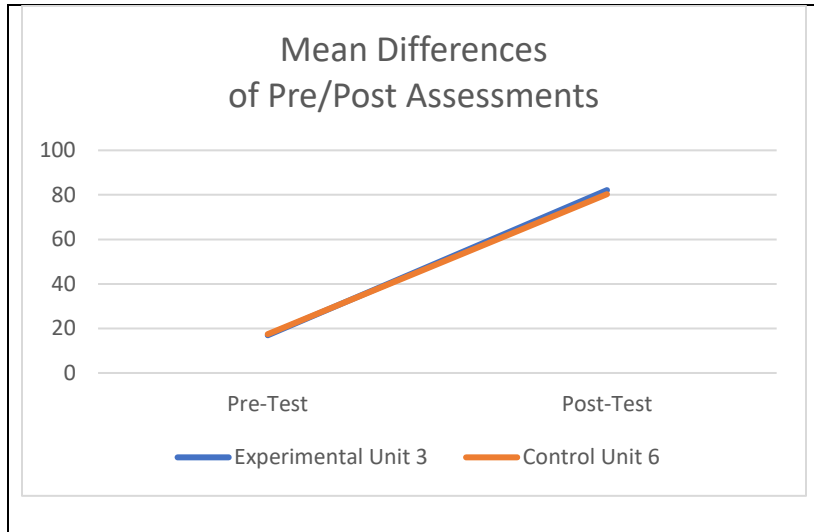


Figure 33: Mean differences pre/post assessments

Student growth between the pre- and post-assessments was also very similar for both Unit 3 and Unit 6. The mean growth was slightly higher on the Unit 3 assessments. Figure 34 below displays a boxplot of the mean growth for both units.

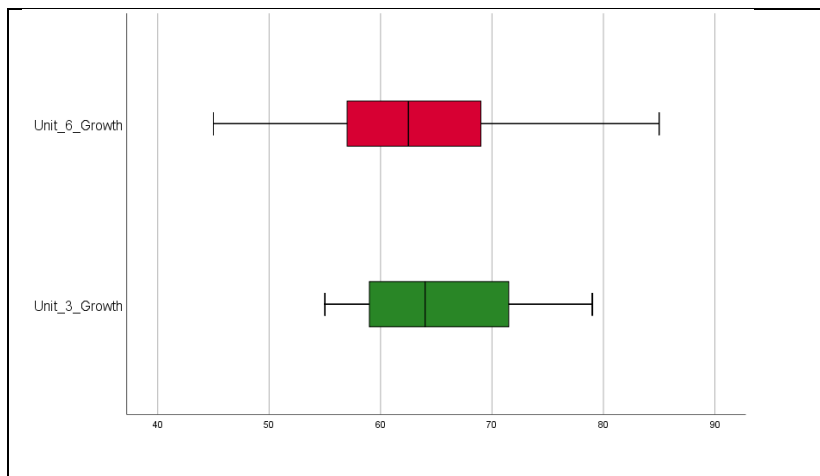


Figure 34: Mean growth Unit 3 and Unit 6

To compare the mean growth between Unit 3 and Unit 6, a Dependent *t*-Test was used to compare the means of the paired samples. There was not a significant difference in the scores

for the growth in Unit 3 ($M=65.19$ $SD=7.71$) and growth in Unit 6 ($M=62.88$, $SD=7.54$) conditions; ($t_{15} = 0.954$, $p = .355$). Figure 35 below displays a comparison of the mean growths in Unit 3 and Unit 6.

		Mean	N	Std. Deviation	Std. Error Mean
Pair 1	Unit_3_Growth	65.1875	16	7.71335	1.92834
	Unit_6_Growth	62.8750	16	9.54201	2.38550

Figure 35: Mean growth comparison

The mean growth scores were moderately correlated ($r = 0.383$, $p = .355$). There was not a significant average difference between the mean growth scores ($t_{15} = 0.954$, $p = .355$). On average, the mean growth of the Unit 3 scores was 2 points higher than the mean growth scores in Unit 6 (95% CI [-2.86, 7.48]). Figure 36 below displays the paired samples correlation and test of the mean growth scores.

		Paired Differences					t	df	Sig. (2-tailed)
		Mean	Std. Deviation	Std. Error Mean	95% Confidence Interval of the Difference				
					Lower	Upper			
Pair 1	Unit_3_Growth - Unit_6_Growth	2.31250	9.70030	2.42508	-2.85643	7.48143	.954	15	.355
		N		Correlation	Sig.				
Pair 1	Unit_3_Growth & Unit_6_Growth	16		.383	.143				

Figure 36: Mean growth paired samples correlation and test

The mean growth scores were not significantly different; therefore, the students' performance levels do not support the rejection of the null hypothesis that the difference between the two means is zero. The students' achievement levels in Unit 6 were very similar to their achievement levels in Unit 3. The intervention of online parental remediation did not seem to have a statistically significant effect on student achievement based on this data.

Chapter Five: Discussion, Conclusions, and Implications

This study implemented a quantitative methodology with a non-experimental design and used computer technology as tools for parents to view teacher-made instructional videos. The aim of the study was to examine the effect teacher-made instructional videos for online parental remediation in mathematics has on the parents of students enrolled in an alternative school algebra class. One of the goals of this research was to increase parents' involvement levels with their children's education by supporting their knowledge of mathematics, and thereby support student achievement in alternative education.

The participants of this research included 28 parents of students enrolled in an alternative school in the Middle Georgia area. The focus on parents with the inclusion of computer technology in this study reflected Vygotsky's Social Development Theory—one of the foundations of constructivism. Constructivist learning strategies were implemented as parents had the ability to pause, rewind, replay, and fast-forward the teacher-made instructional videos which helped to increase their tactile, visual and auditory interactions which cannot be accomplished in the real world, and thereby produce knowledge and form meaning based upon their own experiences.

Multiple forms of data were collected and analyzed in the form of parental pre- and post-survey assessments, analytics from the EDpuzzle website, interviews, and pre- and post- student assessments. This chapter presents a discussion of the findings as well as conclusions and implications for future research. The findings of this research will be discussed for each of the questions that follow:

1. What effect does online parental remediation have on parental interaction and support for mathematics in an alternative school?

- a. Does participation in online parental remediation significantly improve parental self-efficacy in their ability to support their child in mathematics?

H_0 There is no significant correlation between the participation of online parental remediation and parental self-efficacy in their ability to support their child in mathematics.

H_1 There is a significant correlation between the participation of online parental remediation and parental self-efficacy in their ability to support their child in mathematics.

- b. Is there a relationship between parental demographics (specifically amount of mathematics courses, age, and gender) and their use of online parental resources?

H_0 There is no significant correlation between parental demographics (specifically amount of mathematics courses, age, and gender) and their use of online parental resources.

H_1 There is a significant correlation between parental demographics (specifically amount of mathematics courses, age, and gender) and their use of online parental resources.

- c. Does participation in online parental remediation significantly improve students' mathematical achievement in alternative education?

H_0 There is no significant correlation between participation in online parental remediation and students' mathematical achievement in alternative education.

H_1 There is a significant correlation between participation in online parental remediation and students' mathematical achievement in alternative education?

2. How do parents of alternative students utilize online instructional videos in support of their children's learning of mathematics?
 - a. How often do parents watch the instructional videos?
 - b. Do parents watch videos alone, with the students or both?
3. What are the motivating factors that encourage or discourage parental utilization of online instructional videos for support of students in alternative education?

Parental Self-Efficacy, Demographics and Student Achievement

Discussion of findings. The quantitative analysis of the survey data found that the videos significantly helped with improving the parents' learning and self-efficacy as well. The parents were able to watch the videos and gain a better understanding of the math content and therefore were more confident in their abilities to help their children with their studies. Parental self-efficacy, as previously mentioned in Chapter 2, refers to the parent's belief about his/her ability to parent successfully (Jones, 2005). The results of the study indicated that the online remediation did help to build the parents' confidence and supported their belief that they could successfully help their children with their mathematical homework.

In quantitatively analyzing the survey data, the results indicated a moderately significant correlation of the parents' belief about the efficacy of the teacher-made videos before and after the online parental remediation. Most of the parents believe the videos were beneficial and helped them support their children more with their homework. Many parents indicated that they enjoyed learning what their children were learning about in the classroom. A majority also indicated that they would like to have more videos in the future to help with their children's studies. This is consistent with previously mentioned research that suggests when parents feel

greater self-efficacy they also tend to exhibit more involvement with their children's learning at home (Pressman et al., 2015).

The quantitative analysis of the survey data was also used to try and determine whether there exists a relationship between parental demographics and their use of online parental resources. Of the three demographics tested (math experience, age and gender), parents' experience with math was the only one to exhibit a significant correlation with parents' use of online parental resources. This is indicative of the fact that the more experienced parents are in math the more apt they are to participate in their children's learning of it. It logically follows then that the less experienced parents are in math and the more rigorous the work, the less likely they will participate in their children's learning. This is in alignment with previously mentioned research that suggests parental involvement with homework decreases as the student grows older and schoolwork becomes more difficult (Sad & Gurbuzturk, 2013).

In addition, pre- and post- student assessments were given to gauge the effectiveness of the teacher-made instructional videos in helping parents support and improve their children's learning. Students were assessed over two different units of the Georgia high school Algebra 1 curriculum. Unit 3 served as the experimental group as parents participated in the online remediation. Unit 6 was used as the control where parents did not receive any teacher-made instructional videos. The results of the quantitative analysis of this data were surprisingly similar for student performances in both groups. And although there was a significant difference in the scores for the pre- and post- assessments in each individual group, and the experimental group did have a slightly higher mean growth; there was not a significant difference in the scores for the mean growth of the students' achievements between the control and experimental phases.

Conclusions. The results from the quantitative analysis of this study helped the researcher garner a better understanding of how the parental online-remediation related to the parents' self-efficacy. The data showed that most of the parents agreed the videos helped them to understand the math better. This in alignment with the previously mentioned research by Muir (2015), regarding the flipped classroom which found that an overwhelming majority of subjects (96%) agreed that online tutorials helped with their learning and helped them to learn a concept.

In quantitatively analyzing the survey data regarding self-efficacy, it was discovered that the parents exhibited a highly significant difference between their self-efficacy before participating in the online-remediation and their self-efficacy after participating in the web-based intervention. The very high correlation illustrates the significance that the online remediation with teacher-made instructional videos has in supporting the self-efficacy of parents of alternative students and combatting the deleterious effect that living in low-income communities has on parental involvement with their children's education as previously mentioned in other research (Gonida, & Cortina, 2014).

The analysis of data shows mixed results in answering research question number one. The results do show that the online remediation with teacher-made instructional videos was supportive of parental self-efficacy; however, the intervention was not as successful in helping parents support student achievement. This does not correspond with previously mentioned research which purported parental involvement to be supportive of student performances (Jeynes, 2016).

One possible reason for this inconsistency could be that the instructional capacity of the teacher may have been stronger for the control group (Unit 6: Describing Data) than in the experimental (Unit 3: Modeling and Analyzing Quadratic Functions). In addition, students are

exposed to data and statistical content in earlier grade level math courses; whereas, this was the first time they were introduced to material related to quadratic functions. Consequently, the students may have already been more familiar with the statistical content which is covered in Unit 6 than the material covered in Unit 3. Nonetheless, based on the student assessment data, we cannot reject the null hypothesis that the differences between the achievements of both groups of students (control and experimental) are the same.

The quantitative analyses of the survey data indicated that the parental online remediation with teacher-made instructional videos is beneficial to parental self-efficacy. The findings also indicated that the mathematical experience of parents is related to their use of the web-based resources. However, parental age and gender are not significantly correlated with their utilization of online technology. This is in alignment with the previously mentioned literature on the composite construct of intrinsic motivation which suggests that the constructs of perceived usefulness and joy are contributing factors to the acceptance of technology (Stanciu, 2017).

These findings seem reasonable to the researcher since most loving parents do want their children to have a successful education and life. The results also seem logical due to the rapid rate at which technology is advancing and the fact that computers are now a part of everyday life for most people in the United States regardless of age or gender. This also corresponds with the previously mentioned literature that postulated over 80% of American households own a personal computer (File & Ryan, 2014).

The quantitative analyses of student assessments do not support the proposal that online remediation in math with teacher-made instructional videos is beneficial to parental support of student achievement in alternative education. This information corresponds with the previously mentioned research that postulated an inconsistent relationship between parental involvement

and the students' academic achievement (McNeal, 2014). However, it is not in alignment with other previously mentioned research which claimed that parental involvement in online classes improved student achievement (Stevens & Borup, 2015).

One aim of the researcher for future research is to study and focus more on the relationship between parental involvement and student achievement in alternative education. Perhaps designing a study in which parents are invited to participate more and volunteer in the school building such as quasi-para-pros and sit in on their children's classes. This would include all classes and not just algebra classes. It may prove to be prudent and beneficial for parents as they may enjoy the opportunity to be directly involved with their children's learning experiences and take more of an active role therein. Student assessments could then be used to measure the effect of the parental involvement on their achievement levels. This design may help to shed more light on the relationship between parental involvement and the performance levels of student in alternative education.

Implications. The mixed results of this study are indicative of the need for further research on parental involvement and its relationship to the achievement levels of students enrolled in alternative education program. As previously mentioned in Chapter 3, a major limitation of this study was that the scope of the research was over a relatively brief time-period and involved only a small number of parents. Further research over a longer period and a larger population would provide more reliable results on the study of the effect that parental involvement has on student achievement in alternative education.

This study was conducted in a small town in the southeastern United States. A study that includes parents of students from different alternative schools in different states throughout the United States would increase the reliability of the results. Perhaps including other subject areas

rather than mathematics would broaden the validity and provide a better insight as to the true effects of parental involvement on the performances of alternative students. Also, a delimitation of this study is that the focus is strictly on alternative education and therefore the participants of the study are not a true representation of the general population. A study that includes all types of schools across the country might provide a better insight into the true effects of the intervention being studied.

Parental Utilization of the Videos

Discussion of findings. EDpuzzle provided an array of data which allowed the researcher to calculate various statistics for each of the video assignments. One interesting statistic discovered by the EDpuzzle analytics was the 14% of the parents did not watch a significant total amount of the teacher-made instructional videos. Other statistics gained from the analytics include data for each individual video. For example, the first video assignment had a mean completion rate by the parents of 93%. Other data that can be extrapolated from the data includes the fact that 14% of the parents only looked at part of the video; whereas, 3.57% of the parents failed to look at any of the video. Having such a high initial parental interest in the teacher-made instructional videos is in alignment with the previous mentioned literature regarding the novelty factor (Witt, 2016).

The numbers diminished with the second video as it had a mean completion rate of approximately 84%. This video had fewer parental views with approximately 14% of the parents failing to watch any part of it. Additionally, approximately 18% of the parents did view most (90%) of the second video. It is also notable that over 32% of the parents were late in completing their assignment of viewing video 2; whereas, all parents that watched video 1 completed its viewing on time.

The number of parental views weakened again slightly for the third instructional video. The analytics showed that Video 3 had a mean completion rate of approximately 83%. Also, more parents failed to watch Video 3 with around 21% of the parents having a 0% view of it. In addition, roughly 18% of the parents viewed between 80% and 90% of Video 3. Regarding the timeliness, approximately 32% were late in viewing the video.

The declining trend continued for the completion rate of videos 4. Video 4 merely had a mean completion rate of 81%. Video 4 had a lower percentage of “no views” as Video 3 with approximately 18% of parents not watching the video at all. Also, 7% of parents watched between 80% and 90% of the video. Approximately 14% of the parents were late viewing this video.

The diminishing trend in the number of parental views of the instructional videos continued with the fifth video as well. Video 5 had the lowest completion rate than any of the other teacher-made instructional videos. The fifth video only had a 77% completion rate by the parents. It had 25% of the parents not watch at all. Also, approximately 11% of the parents watched between 80% and 90% of video 5. Lastly concerning this video, 7% of the parents were late in viewing it. This trend of declining parental interest in the video clips is again in alignment with the previously mentioned literature concerning the novelty factor (Witt, 2016).

Conclusions. Altogether, the information gained from the EDpuzzle analytics and parent interviews was very helpful in assessing the parents’ usage of the videos. The analytics provided by the EDpuzzle website showed that most of the parents did watch every one of the videos; however, it also indicated a declining trend in the number of parental views for each subsequent one. Although most of the parents did watch each of the videos only once, the analytics showed that many parents did rewind and watch different segments of the instructional videos multiple

times. During the interviews with parents, it was discovered that the ability to rewind and replay videos was something many of them appreciated because it allowed them to repeat certain segments which they may have had difficulty comprehending.

The teacher-made instructional videos were found to be convenient, flexible and supportive of parental understanding. Parents were able to watch the videos at their leisure as many times as needed until they had a sufficient understanding of the material. The ability to manipulate and control the videos helped parents to understand the material. This is consistent with the previously mentioned literature regarding the constructivist learning theory concerning computers and their ability to present abstract ideas in concrete and malleable ways (Swan, 2005).

There are several limitations inherent to the use of teacher-made instructional videos for parental online remediation. First, online learning might be convenient, flexible and supportive, but it also impersonal as it lacks the personal communication, immediate feedback, and less attention from the teacher as is found in a brick-and-mortar class. Although teacher-made instructional videos provided through a virtual environment can give instruction and explain a concept, nothing can replace the benefits of personal communication through the one-on-one aspect of human interaction.

Another limitation to use of teacher-made instructional videos for parental online remediation is the time commitment that it requires for parents to continue watching the videos. A rigorous schedule of weekly postings of the videos could conceivably cause busy parents to fall behind and consequently lose interest or stop watching the videos. Parents that have the luxury of free time may stay up to date in viewing the videos are more likely to keep watching.

The parents' availability of time is significant to the implementation of this strategy because the lack thereof could diminish the efficacy of the teacher-made instructional videos.

Overall, the EDpuzzle analytics showed that most of the parents were diligent and punctual in viewing the videos. This information supported the efficacy of using online parental remediation with teacher-made instructional videos to improve parental self-efficacy and involvement in their children's education. However, the declining number of views for each subsequent video seems to be indicative of the parents losing interest in the videos over time which could diminish their usefulness.

Implications. The findings from EDpuzzle analytics are indicative that further research may be needed over a longer time-period to better understand the efficacy of teacher-made instructional videos for improving the mathematical self-efficacy of parents and their involvement in not only alternative education but traditional schools as well. The results however do have promising implications for the use of technology and online resources for improving parental involvement as most parents did take the time to watch the online videos and displayed improvements to their mathematical self-efficacy. Technology is advancing rapidly and so is the development and expansion of e-learning as many institutions are now embracing online education with such programs as Odysseyware, Edgenuity among other web-based platforms.

The researcher feels that more studies should be done to better understand the full and true effects of teacher-made instructional videos on parental involvement and student achievement in alternative education. Considering the expansion of online learning coupled with the previously mentioned fact that most Americans now own some type of computer (File & Ryan, 2014), future research should be expanded to include all types of schools (alternative and

traditional) to support the understanding of an effective relationship between parental involvement and student achievement. The researcher believes that future research is needed so that teachers and leaders will be better prepared to develop and support strategic plans for promoting the academic success of all students—not just those in alternative education.

One conceivable long-term goal of the researcher regarding future research is to incorporate videos from other teachers. A study that includes parents of students enrolled in classes of other content areas and provides them access to teacher-made instructional videos produced by the teachers of those classes may deliver better and more reliable data on the efficacy of parental involvement in the improvement of student achievement in alternative education. Also, a study that is not limited to alternative education but also includes parents of students in a traditional educational setting may be supportive and strengthen the reliability of the results.

Motivating Factors for Utilization of Online Resources

Discussion of findings. The interviews with the parents were beneficial in gaining a better understanding of the parents' feelings concerning the efficacy of this study. The data provided detailed information regarding the motivating factors that encouraged or discouraged the parents' utilization of the teacher-made online instructional videos for support of their children's learning. In quantitatively analyzing the data gathered through the interviews, there were numerous common concepts identified regarding the parental beliefs and motivations concerning their participation with this research.

An interesting discovery was that all (100%) of the parents found the videos beneficial and believe that they helped them understand the material better. Another finding which is noteworthy is the fact that most of the parents watched the videos alone. A few major common

themes to emerge from the analysis of the interview data concerned the time required to watch the videos; technological and math problems; the ability to control the video; i.e., rewind and replay parts of the videos; and helping children with their homework.

Although all parents found the videos supportive of their mathematical understanding, many (50%) indicated that a major drawback to participation was the time it required to watch the videos. The findings showed that most of the parents are single and work to provide a living for themselves and their children. After coming home from work, cooking dinner and completing all the other household duties, they are usually very busy and therefore do not have a lot of spare time to contribute to other things. This information may help explain the reason why most parents viewed the videos alone. It also corresponds with the previously mentioned literature regarding the low degree of parental involvement in the education of at-risk students (Coates, 2014).

After the time requirements, problems encountered with technology and/or math were identified as causing the parents difficulty in their participation. This relates to the findings from the survey data regarding the significant correlation between the parents' mathematical experience and their usage of the online resources. This makes sense because people with more educational experience are more likely to have more experience dealing with technology and math.

Another significant commonality among the parents was that many of them indicated that they felt rewinding and replaying different parts of the videos was beneficial to their understanding which is in alignment with Vygotsky's previously mentioned Social Development Theory which postulated that knowledge is constructed through experiences, social relationships, and interactions. This also corresponds with previously mentioned research regarding a semiotic

view of learning involving the action of communication through some form of signs or tools as an intervention in a sociocultural context (Kim, 2014).

Another major commonality among the parental responses was in their answers to the first question. It asked parents about their motivations for agreeing to participate in this study which helped to discover the answer to the third research question of this study. The major theme to emerge was that most parents agreed to participate in this study so that they would be able to understand the material being taught in class and be better prepared to help their children with their homework. Approximately 46% of the parents' responses related to helping their children with home-based studies.

Conclusions. The interview questions were a significant resource for gathering data in this study. The parental responses to the first interview question provided detailed information as to exactly why the parents agreed to participate in this study. There were three major findings to emerge from the interview data. One is that time is an issue that must be considered. Another is that having control (rewind, replay) of the video is supportive to parental understanding of the mathematical content. Lastly and most importantly as it provided the answer to the third research question of this study, parents want to have more involvement with their children's learning and provide more help with their homework.

This information corresponds...and helps provide insight to...the question posed by President Obama in his previously mentioned State of Union Address in which he stated, "And so the question is whether all of us — as citizens, and as parents — are willing to do what's necessary to give every child a chance to succeed" (White House, 2011). Based on the parents' responses to the interview questions regarding their motivations for participation, the researcher

believes that most parents are willing to do what is necessary to help their children be successful—such as in helping with homework.

Implications. The results obtained from the interview have several implications for future research. One implication comes from the fact that a few parents indicated they experienced some difficulty with the technology. Therefore, perhaps further research should be done to explore the vast array of technological web-based resources available when deciding the best option for online parental remediation. Future research should be done to compare the use of teacher-made instructional videos with other technological instructional resources, such as Khanacademy.com, in teaching mathematics to parents.

The results from the analysis of the interview data show that parents do want to participate in their children's home-based learning. However, the findings also show that most parents watched the videos alone. This may account for why there was not a significant correlation between the two groups of student assessments. A caveat should be noted as the researcher did not originally believe the parental remediation with online videos would significantly improve the alternative students' performance levels but since the opportunity was conjunctive with other research questions it was considered practical to test for any correlations. Nonetheless, a longer period of investigation may reveal better and/or different results. For this reason, perhaps more research should be done that requires the parents and the students to watch the instructional videos together.

Another interesting discovery was that although most parents participated and watched the videos, most of them admitted to watching them alone and only once. Considering this, and the fact that there was no significant difference in the student achievements, the researcher feels that it may be prudent for any future research to include assessments of the learning and

knowledge of the parents themselves. A future study might include giving the parents homework assignments and/or assessments to help gauge their understanding of the mathematical material.

To help ensure parental participation, the design of future research must consider time requirements to be involved as the findings of this research show that it is a significant factor for the parents of at-risk students such as those in alternative education. Many at-risk students are from working-class, single-parent homes, and many of those parents have non-traditional schedules. For those parents, assisting their children with homework can be extremely difficult to manage.

There is one inconsistency the researcher noticed in the analysis of data that should be noted. The data supplied from the EDpuzzle analytics show that four of the parents did not watch a significant amount of the teacher-made instructional videos. Their mean percent completion rates were as follows: 0%; 20%; 20%; 40%. Yet, each of these parents indicated a positive response during the interviews as to how the videos affected their self-efficacy.

It is possible that these responses represent honest mistakes, perhaps the parents wanted to please the teacher with these answers, or maybe they reflect their true feelings. Whatever the case, the researcher feels that this information, combined with the mixed results from the first research question concerning the intervention's effect on parental self-efficacy and student achievement, may represent the need for further research on the effects of online parental remediation and its effect on student achievements.

In closing, the researcher feels the results of this study indicate the potential for post-doctoral work and the need to do more study on the true relationship between parental

involvement and student achievement in alternative education. More studies are called for to discover more and better methods for teachers to include parents and improve student achievements in alternative education. Finally, future studies should be done to help improve parents' abilities to help with their children's homework because as posited by President Obama (2009), during his address to the joint session of Congress, as reported by the Washington Post:

In the end, there is no program or policy that can substitute for a mother or father who will attend those parent/teacher conferences, or help with homework after dinner, or turn off the TV, put away the video games, and read to their child. I speak to you not just as a President, but as a father when I say that responsibility for our children's education must begin at home. (para. 68)

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Appendix A: Teacher-made Video Remediation Survey

Academic-Related Perceptions, Beliefs, and Strategies of Academic Efficacy Survey

This survey asks questions about your perception of competence to do class work as well as the teacher-made website and videos for remediation. Please answer the questions as honestly as possible. Participation is voluntary, and all responses will be kept confidential. Remember to place a check in only one box for each question. Thank you for your time!

The number 1 being strongly disagree and 3 representing slightly agree and 5 being strongly agree. Please indicate your level of agreement with the following statements:

	Strongly Disagree 1	2	Slightly Agree 3	4	Strongly Agree 5
Demographics					
1. Gender Male (1) Female (2)					
2. Age Range 20-30 (1) 30-40 (2) 40-50 (3) 50-60 (4) 60-70 (5)					

<p>3. Education History</p> <p><input type="radio"/> Less than high school (1)</p> <p><input type="radio"/> High school graduate (2)</p> <p><input type="radio"/> Some college (3)</p> <p><input type="radio"/> 2 year degree (4)</p> <p><input type="radio"/> 4 year degree (5)</p> <p><input type="radio"/> Professional degree (6)</p> <p><input type="radio"/> Doctorate (7)</p>					
<p>4. Previous math experience</p> <p>None (1)</p> <p>High School (2)</p> <p>College (3)</p> <p>After College (4)</p>					
<p>5. How would you rate you experience with math?</p> <p>Poor (1)</p> <p>Fair (2)</p> <p>Good (3)</p> <p>Excellent (4)</p>					
<p>6. How would you rate your comfort with using technology?</p> <p><input type="radio"/> Poor (1)</p> <p><input type="radio"/> Fair (2)</p> <p><input type="radio"/> Good (3)</p>					

o Excellent (4)					
7. What would say you used most to access the internet? o Desktop (1) o Laptop (2) o iPad or tablet (3) o SmartPhone (4)					
<p style="text-align: center;">Self-Efficacy Construct</p>					
8. I'm certain I can master the skills taught in class.					
9. I'm certain I can solve the most difficult class work.					
10. I can do almost all the work in class if I don't quit.					
11. Even if the work is hard, I can learn it.					
12. I believe I will be able to do well in future math courses.					
13. I think I can understand the concepts in other math courses.					
14. I believe I will be able to use math in future jobs if needed.					

15. I believe I will be able to do well in future math courses.					
16. I think I can understand the concepts in other math courses.					
17. I believe I will be able to use math in future jobs if needed.					
18. I get nervous whenever I take a math test.					
19. Solving math problems is difficult for me.					
20. I worry I will not be able to solve math problems.					
21. I worry I will not be able to complete math assignments.					
22. I don't think I can get a good grade in math.					
23. I get tense whenever I take a math test.					
24. I do not think I can solve math problems.					
25. I get anxious whenever face with a math problem.					

Video Beliefs Construct					
26. I enjoyed having the videos to help me learn.					
27. The videos were very effective in teaching me the material.					
28. The videos helped me work at my own pace in learning the material.					
29. I enjoyed the ability to fast forward and rewind the video					
30. The videos helped me be more active in my child's education.					
31. I would like to have access to more videos for remediation in all areas of my child's learning.					
32. I did not like the online videos.					
33. I found it hard to understand the online videos.					
34. I had a lot of difficulty in viewing the videos.					
35. I did not understand how to use the videos.					
36. The videos did not improve my ability in math.					

Appendix B: Interview Questions

I asked a few interview questions after the study to ascertain a better understanding of the parents' attitudes and opinions regarding the intervention of using digital videos for online remediation in mathematics. The questions asked the parents were regarding their use of the videos and their effectiveness in helping them learn. The interview questions were as follows:

1. Why did you agree to participate in this study?
2. Did you find the videos helpful and if so, in what way?
3. What would you say was the most significant outcome of having access to the videos?
4. What was the most significant challenge in taking part of this study?
5. How often did you watch the videos?
6. Did you watch the videos alone, with your child or both, and if both, which would you say you did more of?

Appendix C: EDPuzzle Video Clips

1. Solving Quadratics by Factoring:

<https://edpuzzle.com/assignments/5a78aeef17f579410f7e2045/watch>

2. Solving Quadratics by Factoring:

<https://edpuzzle.com/assignments/5a80a2bf12a69240f14fb711/watch>

3. Modeling Quadratics:

<https://edpuzzle.com/assignments/5a8dfaafec327b4164bc28a4/watch>

4. Solving Quadratics by Completing the Square:

<https://edpuzzle.com/assignments/5a97751a8f8ca5412677acf7/watch>

5. Solving Quadratics with the Quadratic Formula:

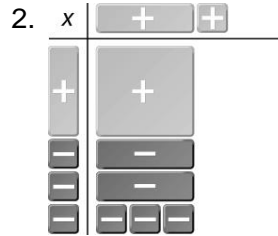
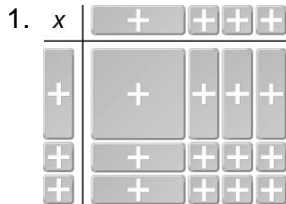
<https://edpuzzle.com/assignments/5aa0bd4f5d155740e081abe5/watch>

Appendix D: Quadratic Unit Pre-Test

Solving Quadratic Equations

Pre-Test

What factors are shown by the algebra tiles?



Factor.

3. $x^2 - 3x - 4$

4. $x^2 + 4x + 3$

5. $x^2 - 14x + 45$

6. $x^2 + 11x + 24$

7. $x^2 - 12x + 32$

8. $x^2 - 15x + 36$

9. $x^2 - 11x - 42$

10. $x^2 - 18x + 81$

11. $x^2 - 7x - 44$

Solve each equation by completing the square. Express square roots in simplest form.

12. $x^2 - 2x = 1$

13. $x^2 - 6x = -6$

14. $x^2 - 4x = -1$

15. $2x^2 - 4x = 8$

16. $x^2 + 4x = -1$

17. $3x^2 - 12x = 3$

18. $3x^2 - 6x = 21$

19. $3x^2 - 12x = 69$

20. $5x^2 - 50x = -85$

Solve using the quadratic formula

21. $x^2 + x = 12$

22. $4x^2 - 17x - 15 = 0$

23. $2x^2 - 5x = 3$

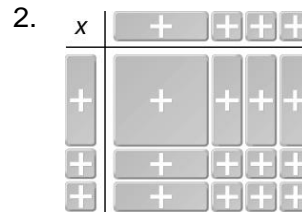
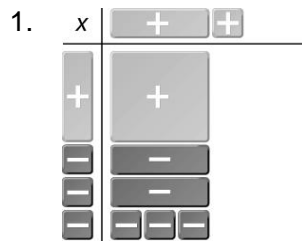
24. $3x^2 + 11x + 5 = 0$

Appendix E: Quadratic Post-Test

Solving Quadratic Equations

Post -Test

What factors are shown by the algebra tiles?



Factor.

3. $x^2 - 6x - 16$

4. $x^2 + 8x + 16$

5. $x^2 - 8x + 12$

6. $x^2 + 10x + 16$

7. $x^2 - 14x + 49$

8. $x^2 - 12x + 36$

9. $x^2 - 14x - 32$

10. $x^2 - 4x + 3$

11. $x^2 - 18x - 40$

Solve each equation by completing the square. Express square roots in simplest form.

12. $x^2 - 2x - 1 = 0$

13. $x^2 - 6x + 6 = 0$

14. $x^2 - 4x + 1 = 0$

15. $2x^2 - 4x - 8 = 0$

16. $x^2 + 4x + 1 = 0$

17. $3x^2 - 12x - 3 = 0$

18. $3x^2 - 6x - 21 = 0$

19. $3x^2 - 12x - 69 = 0$

20. $5x^2 - 50x + 85 = 0$

Solve using the quadratic formula

21. $x^2 + x - 12 = 0$

22. $4x^2 - 17x = 15$

23. $2x^2 - 5x - 3 = 0$

24. $3x^2 + 11x = -5$

Appendix F: Data & Statistics Pre-Test

Statistical Models

Pre-Test

1.

	Do you Read More than 30 Minutes Per Day?	
Gender	Yes	No
Male	107	21
Female	86	9

How many people surveyed read less than 30 minutes per day?

2.

	What Types of Music do you Like?		
	Classical		
Pop	Yes	No	Total
Yes	82	42	124
No	15	61	76
Total	97	103	200

What is the joint relative frequency that a person surveyed likes classical music and pop music?

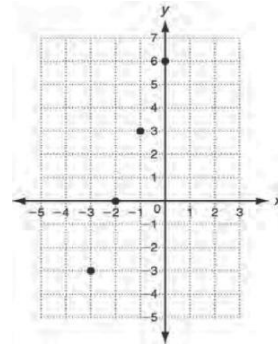
- A 0.41 C 0.76
 B 0.82 D 0.97

3. One hundred eighty people filled out a survey about their favorite color. Of those people 95 of the respondents were female; 21 males responded that their favorite color is red. What is the approximate conditional frequency that a person surveyed was a male whose favorite color is red?

- A 0.12 C 0.25
 B 0.22 D 0.33

4. What is the mean of the data set $\{-5, -5, 2, 6, 8, 9, 12, 13\}$?

5. Which correlation coefficient best matches the data shown on the graph below?



- A -1 C 1
 B 0.8 D 3

6. Ana's data set has a normal distribution. What percent of the data points are within 1 standard deviation of the mean?

7. Data set **A** has a correlation coefficient of -0.93 , and data set **B** has a correlation coefficient of 0.09 . Choose True or False for each statement.

- A The variables from set **A** have a low negative correlation.
 True False
- B The variables from set **A** have a strong negative correlation.
 True False
- C The variables from set **B** have a strong positive correlation.
 True False

Statistical Models

Pre-Test

8. The frequency table below shows the age and gender of the students at Hilton High School.

a. Complete the frequency table.

Age	Gender		
	Male	Female	
13–14	61	60	
15–16	62	52	114
17–18	45		
19–20	15	13	
Total		175	

b. How many 15–16 year old female students attend Hilton High?

c. In all, how many students are male?

d. Are there more 13–14 year old students or 15–16 year old students? How many more?

9. The table below shows the results of a survey of the primary mode of transportation of residents of Sarasota, Florida.

Bus	Bike	Car	Walking
31	35	119	25

a. What is the relative frequency that a resident who was surveyed primarily takes the bus? Round to the nearest hundredth.

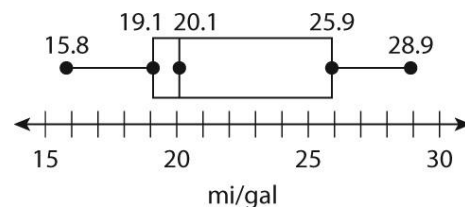
10. a. Complete the tables.

$s = 2r - 6$			
r	s (actual)	p (predicted)	residuals
-1	-7	-8	
0	-7		
1	-3		
2	0		
$s = 2r - 5$			
r	s (actual)	p (predicted)	residuals
-1	-7	-7	
0	-7		
1	-3		
2	0		

b. Find the sum of the squared residuals for both lines of fit.

c. Which line is a better fit to the data? Explain why.

11. Based on the box-and-whisker plot below, what is the range of the data?



Appendix G: Data & Statistics Post-Test

Statistical Models

Post-Test

1.

Eye Color	Gender		Total
	Male	Female	
Brown	12	32	44
Blue	25	16	41
Green	13	4	17
Total	50	52	102

How many females surveyed did not have brown eyes?

2.

Rock	What Type of Music do you Listen To?		Total
	Country		
	Yes	No	
Yes	55	25	80
No	32	38	70
Total	87	63	150

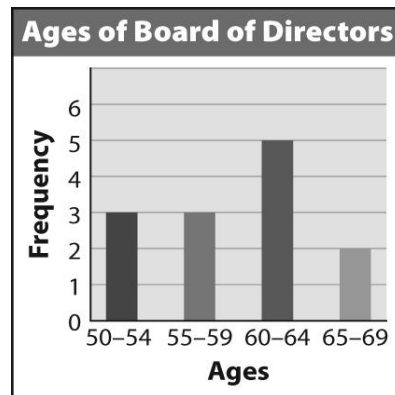
Approximately what is the relative frequency that a person surveyed listens to rock music or country music or both?

3. Marion surveyed 55 girls and 25 boys and asked about their preferred sport. In all, 22 girls preferred soccer, and 7 boys preferred soccer. What is the conditional relative frequency that a student's favorite sport is not soccer given that the student is a boy?

4. The variables in data sets **A** and **B** have strong negative correlations. The variables in set **A** have a stronger correlation than the variables in data set **B**. Could each of the following correlation coefficients match the sets?

- A **A**: -3.1; **B**: -2.2 Yes No
- B **A**: -0.93; **B**: -0.91 Yes No
- C **A**: -0.88; **B**: -0.95 Yes No
- D **A**: -0.90; **B**: -0.89 Yes No

For 5–6, refer to the histogram below.



5. Could each of these be a possible median of the data?

- A 57 Yes No
- B 60 Yes No
- C 62 Yes No

6. What is the relative frequency that a member of the board of directors is less than 60 years old?

Statistical Models

Post-Test

7. The frequency table below shows the ages of the employees at Marianna's Auto Shop. Marianna has 56 male employees and 34 female employees.
- Fill in the frequency table.

Age	Gender		
	Male	Female	
18–27		5	15
28–37			
38–47	18		28
48–57	12	17	
Total			

- How many 38–47 year olds work at the auto shop?

- Does Marianna employ more 18–27 year olds or 48–57 year olds? How many more?

8. The table displays the results of a survey of the primary mode of transportation of the teachers at a community college.
- Fill in the joint relative frequencies.

	Bus	Bike	Car
Female	20 = 0.16	15 =	30 =
Male	12 =	12 =	36 =

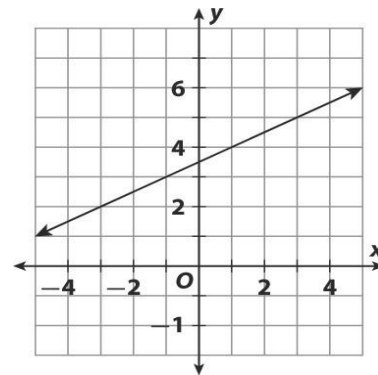
- Find the marginal relative frequency that a teacher bikes to work.

- What is the frequency that a teacher drives a car, given that the teacher is a male?

9.

x	-5	-2	0	2	5
y	1	2	2	3.5	4

A line of fit for the data on the table is graphed below.



- Write the equation and squared residual for the line of fit.

- Write an equation for a line of fit that better fits the data. Explain why the line is a better fit for the data.

10. The scores on quizzes for ten students in Mrs. Franc's morning and afternoon math class are given below.

M: {32, 48, 50, 46, 35, 49, 35, 45, 33, 50}

A: {35, 44, 30, 48, 34, 44, 43, 36, 31, 33}

- Make a box-and-whisker plot to represent the data.



- Compare the medians and interquartile ranges of the quiz scores from the morning class and the quiz scores from the afternoon class.
