Fall 11-18-2016

Efficacy of Math Video Tutorials on Student Perception and Achievement

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Abstract

The purpose of this mixed methods research study is to explore how teacher-made video tutorials in one middle school mathematics classroom are being used and what enables/impedes their effectiveness. A quantitative, quasi-experimental design investigates how video tutorial usage relates to students' self-efficacy and achievement in mathematics. The sample consisted of 55 students in the experimental group and 65 students in the control group. Results found parents wanted the tutorials even if they did not view them. Students did actually use the video tutorials for remediation and learning. Videos longer than ten minutes impeded the effectiveness of the videos. The mean average from the pre to the post self-efficacy survey did increase from 3.68 to 4.31. The students' mean change in achievement is not statistically significantly different. More research is needed as teachers experiment with making tutorials in their quest to meet the needs of today's digital learner.

ACKNOWLEDGEMENT

I would like to express my deepest appreciation, admiration, and respect to my committee chair, Dr. Jo Williamson, who has the attitude of an angel, the guidance of a true leader, and the precise knowledge of just how to write a dissertation. She calmly, continually and convincingly provided me with the spirit and belief that I needed in myself. Her positive enthusiasm was contagious and her advice was always priceless.

I would like to thank my committee member, Dr. Susan Stockdale, for being the amazing, dynamic genius that she is. She was the first person to welcome me to Kennesaw State University and stuck by my side throughout the years. I was truly blessed when she agreed to be on my committee.

I would like to thank my other committee member, Dr. Julie Moore. Her expert knowledge of technology allowed me to pursue a longtime dream of mine to produce my own video tutorials for my math students. She was instrumental in the production of the tutorials and providing the availability of these tutorials online to my students.

Without the guidance and persistent of my committee members, this dissertation would not have been possible. They were genuine, warm-hearted, and caring committee members that I am fortunate to now have as friends. I could not have had a better committee.

Lastly, I would like to thank my family for allowing me to have the endless hours required to conduct this research and for not complaining that they only saw me sitting in front of a computer for months, if not years. I especially want to thank my son, Nick, who inspired me and insisted I finish the final revisions while I sat with him even though he was in the ICU.

CHAPTER ONE

INTRODUCTION

"The United States' failure to educate its students leaves them unprepared to compete and threatens the country's ability to thrive in a global economy" was the dire warning recently issued by the Independent Task Force Council on Foreign Relations (2012). The Independent Task Force (2012), chaired by former New York City schools chancellor Joel I. Klein and former U.S. secretary of state Condoleezza Rice, stated that the United States "will not be able to keep pace—much less lead—globally unless it moves to fix the problems it has allowed to fester for too long." In 2010, only six percent of U.S. students were found to be performing at the advanced level in mathematics, which was lower than the percentage of students found to be performing at the advanced level in mathematics in 30 other countries (Hanushek, Peterson, & Woessmann, 2012).

The low performance in mathematics is not limited to just the top-performing students. The National Assessment of Educational Progress, NAEP, conducted a nineteen-year study from 1992 to 2011 on the annual rate of growth in student's mathematics achievement for the different states in the United States. By eighth grade, the mathematics performance percentages began to slip. Although 8 percent were performing at or above the advanced level, only 35 percent were scoring above the proficiency bar, while 73 percent were performing at or above the basic level (Hanushek, Peterson, & Woessmann, 2012). In 2011, only 32 percent of eighth graders in the United States were found to be proficient in mathematics, placing the United States 32nd when ranked among the participating international jurisdictions (Peterson, Woessmann, Hanushek, & Lastra-Anadón, 2011).

According to Hanushek, Peterson, and Woessmann (2012) the United States made substantial additional financial commitments to K–12 education and introduced a variety of school reforms. They found the variations in student growth across the states to be as large as the variation among the countries of the world. They also noted that the variation in state increases in per-pupil expenditure was not significantly correlated with the variation in the students' learning gains.

When analyzing the NAEP for Georgia, the state that this research was conducted, Georgia's poverty rate needs to be addressed. A strong negative correlation exists between test scores and poverty where the higher the poverty rate, the lower the test scores. The state of Georgia has one of the top ten highest K-12 poverty rates in the nation, so the analysis of the mathematics test scores should include analyzing the scores for the poor students in Georgia as compared with poor students in other states. In math, only ten states outperform Georgia's non-poor students, but twenty-three states outperform Georgia's low-income students, including North Carolina, Florida and Texas (McCutchen, 2015).

According to the Governor's Office of Student Achievement, while the overall mathematics performance of Georgia students on the Criterion-Referenced Competency Tests (CRCT) has improved modestly during 2009 to 2013, a comparison with national tests shows that Georgia sets a low bar for proficiency on the CRCT and still ranks in the bottom half of national comparisons on the NAEP (2013). NAEP assesses a representative sample of Georgia students that allows for comparisons between states and the nation, while the CRCT is designed to measure all Georgia students' mastery of grade-level performance standards.

Low achievement scores on the CRCT in the area of mathematics have been problematic for the State of Georgia. Students are tested on the mathematics part of the CRCT in four areas, algebra, data and probability, geometry, and numbers and operations. The Georgia Department of Education reported for the school year 2013-2014, the results of the CRCT in mathematics for the State of Georgia showed 16 percent of the students did not meet standards, scores of below 800. That same pattern of low scores in mathematics was found in the school district in which this research takes place. For that same time period, 18 percent of the students in the school district for this research, 21 percent of the students who attend middle school in this district, and 19 percent of the seventh grade students who attend middle school in this district did not meet standards in mathematics (2015).

Why is this low achievement in mathematics happening for so many of today's students? There are many different variables that play a role in this problem; five of these variables are present in this study. One of these variables is that some students lack self-efficacy. According to Bandura (1986), self-efficacy is people's judgments of their capabilities to organize and execute courses of action required to attain designated types of performances, in which the social cognitive theory suggests strongly influences the choices people make, the effort they expend, and how long they persevere in the face of challenge. Bandura went on to explain that how people behave can often be better predicted by their beliefs about their capabilities than by what they are actually capable of accomplishing, for these beliefs help determine what individuals do with the knowledge and skills they have (1986). Hackett and Betz (1989) define math self-efficacy as an assessment of students' self-confidence in their ability for successful task performing or math specific problem solving.

Another variable playing a role in the low mathematics achievement scores of today's students comes from the parents and their inability to help their child with the new math standards. Parents play a substantial role in their child's attitude toward mathematics. Many parents pass their negative attitude of math down to their children. Common statements from parents are “I can’t do this new math” and “ I can’t help my child with their homework because I don’t know how to do it.” Current literature suggests that parents need to be taught how to support their children at home (Mistretta, 2013). Mathematics teachers need to initiate a proactive interaction between parents and themselves to improve student attitudes and self-efficacy in mathematics that will hopefully improve the student’s mathematics performance. As Willis (2010) stated, the first step to success in math is a positive attitude.

In the light of the new Georgia Common Core Performance Standards and Milestone Assessment system, more educators are fielding comments from students concerning their dislike of mathematics, perhaps due to its complexity and rigor. “Math is too hard”, “I can’t do this”, and “I hate math” are prevalent attitudes among struggling mathematics students throughout our nation, state, and district. Instructional videos that leave the middle grades viewer with “I think I can, I think I can” efficacy for mathematics may overcome the perception that today’s mathematics is too difficult to master.

Attitudes are difficult to change; and making mathematics look easy requires precision targeting of students’ needs. Students achieve mathematics skills at different speeds, therefore, requiring individual attention and modeling of instruction geared to their needs. Since readiness to successfully being able to acquire the new mathematics skills required in the Common Core Performance Standards occur in students are different times, other variables that should be addressed are the needs for differentiation and modeling.

According to Bender, students demonstrate varying learning abilities, academic levels, learning styles, and learning preferences and need tailored instruction to meet their unique needs. Teachers need to consider students’ unique learning styles and differentiate educational activities to provide for their divergent learning styles by differentiating instruction in three areas: content, process, and product (2012). Differentiating instruction in mathematics can include strategies such as the teacher modifying the curriculum, teaching methods, forms of instruction delivery, resources, learning activities, and/or student work products. Differentiation addresses the needs of individual students and small groups of students to maximize the learning opportunity for each student in the classroom (Hillier, 2011).

Students need to see teachers model how to solve math problems. This modeling provides students with the knowhow they need that in turn builds their confidence in their ability to replicate the process to solve other similar mathematics problems. Teachers routinely model how to work math problems in the classroom, yet this may not be the best place for the modeling to occur, at least, it should not be the only place that modeling occurs. In the classroom, teachers may model how to solve a particular type mathematics problem only once and that is about it due to the time constraints put on teachers to be sure that they teach all the standards that the state requires. Dan Meyer from the National Council of Teachers of Mathematics, NCTM, stated that The Common Core State Standards for Mathematics (CCSSM) have exerted enormous pressure on every participant in a child's education. Students are struggling to meet new standards for mathematics learning, and parents are struggling to understand how to help them (2015). While teachers and textbooks offer some modeling, more opportunities of modeling need to be made available for students and parents to experience the optimal benefits of modeling. The basis of this research is in respond to students and parents needing modeling of mathematical knowhow available to them continuously anytime of the day to build their confidence in their ability to solve math problems requiring similar skills.

When addressing reasons for low achievement scores in mathematics, one additional variable must be considered, absenteeism. According to “A Report on Absenteeism in the Nation’s Public Schools”, achievement, especially in math, is very sensitive to attendance, and absence of even two weeks during one school year matters (Balfanz & Byrnes, 2012). Students of poverty are more likely to have chronic absenteeism, although ironically, it is these students who would benefit the most from regular school attendance. In this same report, the poverty state of Georgia reported only 53 percent of their students miss five or fewer days of school. One clear relationship that emerged from this report is a strong correlation between poverty and chronic absenteeism, stating that chronic absentee rates were three times higher among economically disadvantaged students in middle school. In Georgia, 70 percent of chronically absent students are economically disadvantaged (Balfanz & Byrnes, 2012). A study that followed four cohorts of students through high-poverty middle schools in Philadelphia found that controlling for teacher quality, prior achievement, behavior, effort, and demographics, students who were chronically absent had significantly lower odds of closing their mathematics achievement gap, than students who were equal in all other respects but attended school regularly (Balfanz & Byrnes 2006). Since there is a strong connection among absenteeism, academic mathematics achievement, and poverty, an effective strategy is needed to help close the achievement gap and ensure all students, especially the poverty students who do not attend school regularly, have access to the mathematics instructional material that they miss from class on the days that they are absent.

As professional educators respond to all these different variables that play a role in why achievement scores in mathematics are low, technology has provided them with new emerging practices to address these variables. One of these emerging practices is the “flipped” classroom, a novel blend of teachers, peers, and technology, where technology is used outside of class to provide students with the information that might normally occur during direct instruction in the classroom, such as offering video-based tutorials to be viewed at home before class, while mathematics class time is used for discussion, collaborative and problem solving (Darling-Hammond, Zielezinski, & Goldman, 2014). While the “flipped” classroom is a being tried in many settings, little research is available on its effectiveness for different demographics and populations. Another emerging practice is the blended classroom, where there is a blend of technology and traditional face-to-face instruction. Online video tutorials offered outside the blended classroom allow students to control the time, pace, frequency and place of their learning. One study found significant gains in mathematics achievement for students using video- based instruction modules with annotations to help them identify important elements in a problem and interact with 3-D digital models before applying their understanding by building a product in the digital environment (Bottge, Rueda, & Skivington, 2006).

When mathematics teachers use technology strategically, more students, especially those students who struggle, are given the opportunity to learn math skills effectively, close their achievement gaps, and have a better chance for a productive future. Using technology, such as the video tutorials, can improve student achievement in mathematics by providing multiple means and methods for learners to grasp traditionally difficult concepts (Darling-Hammond, Zielezinski, & Goldman, 2014). By embracing this strategic use of technology to assist in my teaching of mathematics, I produced my own teacher made video tutorials for my math students and researched the effect these video tutorials had on students’ perception and achievement in mathematics. By offering my students and their parents my own teacher made math video tutorials, all the variables discussed above as possible reasons for low achievement scores in mathematics were being addressed.

In an effort to improve my students low mathematics achievement scores, the video tutorials tackled the goals of improving the students' self-efficacy, giving the parents resources to help their child with their math skills, differentiation of instruction delivery, access to continuous modeling by the teacher, and resources of the material missed when students were absent. Hackett and Betz (1989) defined math self-efficacy as an assessment of students' self-confidence in their ability for successfully solving math problems. The video tutorials provide the students with resources that can build this self-confidence. The student is no longer alone trying to solve problems; they have these instructional tutorial guides to refer to and boost their belief in their capabilities. The use of teacher made video tutorials for math also addresses Mistretta's (2013) finding where current literature suggests that parents need to be taught how to support their children at home. The videos provide the parents with just how their own child's teacher teaches the math concepts in the classroom, enabling them with the tools needed to assist and support their child at home. The video tutorials address the variable of differentiation by differentiating instruction in mathematics by giving the students another form of instruction delivery, not just classroom lecture. The video tutorials also give the students and parents different resources available to them at all times online. The videos give the students the opportunity to view them as many times as that particular student needs to review the videos. In the videos the teacher's modeling provides students the knowhow they need, that in turn builds their confidence in their ability to replicate the process to solve other similar mathematics problems. Lastly, the video tutorials address the problem of absenteeism by being available online any time of the day so students and parents have this resource constantly available to them which is especially useful if the student misses classroom instruction due to being absent.

While providing video tutorials as an additional mathematics resource offers powerful potential, what have other studies shown? The findings from the research in the current literature that has previously been conducted on using video tutorials vary substantially. Why do these previous studies reveal such varied results? With all the different technology software programs and instructional designs, there is little consistency in what was studied. The studies vary based on the subject area and grade level that the research was conducted. Technology changes, it seems daily, so many of the studies were conducted on what is now considered outdated technology. It takes time to conduct credible research and by the end of the research period, the technology that was studied may be already outdated. While the few studies that have been conducted on using video tutorials offer inconsistent results as to student achievement and/or perception improvement, no study was found on using video tutorials that were produced by the student's own teacher, therefore, matching the instruction on the videos to the instruction that was taught in the classroom by the same teacher.

Today, it is much easier for a teacher to produce and stream an online video tutorial today than just a few months ago. Being a math teacher in a high-poverty county in Georgia that deals with chronic absenteeism, low achievement scores are a big concern. In concerning all the variables that facilitate low math scores, I became very excited about attempting to produce my own instructional videos and offering them online to my students and their parents. I have wanted to do this research for the past few years and the technology part of this research always halted the process, either I did not have the right equipment to record a video with the correct sound quality, the video tutorial was too large to upload, or websites were not available for the quantity of videos that I needed to upload. I found that Khan Academy, a free website that offers instructional videos in mathematics to empower students to study at their own pace in and outside of the classroom, was the closest website that did what I wanted to do, but I wanted the students to have their own teacher on the videos teaching in the same way and saying the same things they heard in the classroom, so I waited to do this research until I found the technology to allow for this. At this point in time, technology exists for this to happen, making it easier for other teachers and researchers to make their own video tutorials for their subject areas, so there is a great opportunity for future research in this area.

Once more teachers are producing their own video tutorials, more research will need to be conducted, including what qualities make good video tutorials. Do positive results stem from good video design? If so, the video tutorials need to be produced with these qualities in mind. Tutorial videos are a great new medium with little research available on what makes an effective instructional design. While other studies have neglected to consider the instructional design features of the videos, this study assessed the characteristics of what makes good video tutorials in an effort to produce effective tutorial videos for this research. Students and parents weigh in on what they liked and did not like about the instructional design of my video tutorials. The need for the research in this study is that it fills the gap in the literature on teacher made video tutorials and adds to the knowledge of what makes an effective instructional design of these videos.

Efficacy of Math Video Tutorials on Student Perception and Achievement

Problem Statement

In this study, I contend that specific targeting of the student's skills and the teaching of current grade level Common Core Mathematical Standards can be delivered through teacher-made instructional videos. I further assert that with the consistent availability of these online video resources, students and parents have the tools needed to facilitate attitude changes. The teacher-made instructional videos provide remediation and enrichment to students, as well as support for the parents. When the perceptions that parents and students have about mathematics improve, I contend the students' achievement scores will improve. Although the primary goal of this research study is to improve students' achievement in mathematics, additional goals are to improve students' perceptions about mathematics, improve parents' perceptions about mathematics, identify factors that enable/impede the videos, learn how the videos are used, and be able to help other teachers construct their own effective tutorial videos for their subject areas.

These teacher-made instructional videos will be available to parents in an effort to provide parents a readily available student/parent friendly resource to change their attitudes about mathematics by having the resources necessary to abate their excuse "I don't know how to do it". My research will incorporate surveys on the perceptions that parents and students have about mathematics before and after my teacher-made instructional videos are provided and used as resources. I will produce these instructional videos myself, which allows me to target the mathematical areas that I identified as especially problematic for my seventh grade students. I will provide my students with instructional mathematics videos to give them step-by-step, continual, support of the Common Core Mathematical Standards in an effort to increase student achievement and to change their attitude of "I can't do this" to "I think I can, I think I can."

When analyzing these results for seventh grade at this middle school, the section of the CRCT that students had the most difficulty was in the area of data and probability, with 65 percent of the students answering less than half of the questions correctly (Georgia Department of Education, 2015). To address this problem, this research studied the strategy of providing teacher-made instructional video tutorials, which targeted the students' problematic areas in the

Georgia Performance Standards Common Core probability unit. With this in mind, the purpose of this mixed methods research study is to explore four dimensions related to the construction, implementation, and effectiveness of teacher-made video tutorials in one middle school mathematics classroom. The researcher will utilize both qualitative and quantitative methods to (1) *better understand how students and parents use the available videos* and (2) *identify factors that enable/impede the effectiveness of the video tutorials*. The researcher will also implement quantitative, quasi-experimental design to investigate the relationship of the video tutorials on (3) *student self-efficacy* and (4) *student achievement in mathematics*.

The teacher produced instructional video tutorials and made these videos available online to parents and students so they would have resources available for remediation, acceleration, missing skills, or for students who were absent. To monitor for a change in the perceptions that students and parents have about mathematics, surveys are given before and after the use of the tutorials. The videos were produced in an effort to improve the perceptions parents and students have about mathematics. The study will determine if the videos changed the attitudes parents and students have about mathematics to an "I think I can, I think I can" attitude. The study will further research if a change in attitude correlates to an increase in the students' achievement scores and impacts the students' leaning. Pre and post assessments are used to determine if there was a significant increase in student achievement for the probability unit.
Ultimately, this study will share those features with other teachers in an effort to help them produce effective videos for their own classrooms.

This mixed methods research study explored four dimensions related to the construction, implementation, and effectiveness of teacher-made video tutorials in one middle school mathematics classroom. The researcher utilized both qualitative and quantitative methods to answer the research questions that follow:

(1) How are students and parents using the video tutorials?

(2) What factors enable/impede the effectiveness of the video tutorials?

The researcher will also implement quantitative, quasi-experimental design to investigate the research questions that follow:

(3) Is there a significance increase in students' self-efficacy levels after the use of the video tutorials as an instructional resource as measured by increased scores on the Likert scale survey and the video survey?

(4) Is there a significance increase in students' achievement levels for the experimental group after the use of the video tutorials as an instructional resource as measured by increased scores on the pre-post assessment?

The upcoming chapter will present the conceptual framework for this research, the current literature on the use of video tutorials and the lack of literature on teacher-made video tutorials. Subsequent chapters will outline the methodology used for this investigation as well as the results and implications for the use of teacher-made video tutorials on students' self-efficacy and achievement in mathematics. Finally, chapter five will present conclusions, discussions, and suggestions for further research.

CHAPTER TWO

CONCEPTUAL FRAMEWORK

The specific perspective in which a given researcher uses to explore, interpret or explain events or behavior of the subjects or events she or he is studying is what constitutes a conceptual or theoretical framework (Imenda, 2014). Researchers synthesize the existing findings in the literature concerning a given situation, in which, this synthesis becomes their conceptual framework or integrated way of looking at the problem. This conceptual framework brings together a number of related concepts to explain or predict a given event or provide a better understanding of the phenomenon of interest or the research problem. Imenda (2014) stated a conceptual framework is synthesized from a number of concepts, research findings and theoretical perspectives – some of which may be in opposition or competition with one another. The reason for this is that, typically, in most social science research – in contrast to research in the natural sciences, there is no one theory that can adequately guide the researcher to satisfactorily answer the research questions being pursued. According to Imenda, the purpose of a conceptual framework is as follows:

(a) Helps the researcher see clearly the main variables and concepts in a given study;

(b) Provides the researcher with a general approach (methodology – research design, target population and research sample, data collection & analysis);

(c) Guides the researcher in the collection, interpretation and explanation of the data, where no dominant theoretical perspective exists

(d) Guides future research – specifically where the conceptual framework integrates literature review and field data (2014).

In the field of education, the conceptual framework used in a study assists the researcher in making claims, as well as, to guide the education profession towards action.

Imenda explains that different researchers from different walks of life who are watching the same event will likely have different interpretations of that event. It depends on the "spectacles" each of them is wearing to view the event, as to how they interpret what they see. Imenda goes on to say that each person's viewpoint, or point of reference is his/her conceptual or theoretical framework. The researcher's conceptual or theoretical framework becomes the soul of their research study. Imenda dwells deeper into the importance of understanding the conceptual or theoretical framework that a researcher approaches his/her research by stating that it is this framework that determines how that researcher formulates the research problem, how they go about investigating the problem, and what meaning they attach to the data resulting from the research (2014).

As Imenda alluded, it is important to recognize the conceptual or theoretical framework that the researcher for this particular study used in her approach to this research. The researcher in this project wears the "spectacles" of a 7th grade mathematics teacher who is actually down in the trenches teaching students, around the age of twelve and thirteen years old, mathematics on a daily basis where the rigor and complexity of the math problems are rising every year. The trenches are being bombarded with increased importance being placed on the students' ability to master the contents on the state's mathematics assessment. The depth of knowledge expected of today's students leaves little time for teacher of missing skills directed remediation or additional enhancement given the time constraints of the contemporary classroom. To further compound the dilemma, many students have little support after school hours in developing their math skills to the level required.

So, the question arises, how can one help students learn? Several learning theories identify that learning happens during social interaction, observation, imitation and modeling. Albert Bandura and Lev Vygotsky are both major contributors to this philosophy, known as the social learning theory, where learning occurs in a social context. Bandura's social learning theory asserts learning is influenced by not only the instructional delivery but also by the interactions between the students and the teacher that takes place in that classroom. Vygotsky's social development theory concludes that students can learn vicariously through others' experiences and that language plays a major role in processing this interaction with others. Whereas, Jean Lave's situated learning theory focuses more on a student learning in their environment by contending that learning is situated, being that learning is embedded within an activity, context and culture. All these theories emphasize the key importance of social learning. Today in education, technology, particularly the computer, offers new dimensions to social connectivity, deeming technology as a useful tool that needs to be harnessed to create new powerful learning environments that enable students to learn in a social context.

Observational learning is an important component to the theories of social learning. Learning can take place through observation. Modeling specific techniques and behaviors allows students to process information cognitively and learn through others. By observing instruction, students are able to make symbolic representations through these cognitive processes of a skill being modeled and use this skill later as a guide for future presentations and situations requiring the use of the same skill. Modeling in everyday situations, including modeling through the use of technology and the social media in particular, have influential roles in shaping students' behaviors and ability to exhibit skills from observation learning. Enhancement to learning is inevitable with the advancements that are being made in technology today and the endless opportunities that technology offers students for social interaction. Online social interactions and learning can occur between students-to-students or between students-to-teacher communications, such as video tutorials. “[One] can also facilitate depth of understanding by integrating technologies into the fabric of teaching as intellectual tools that students use to study, learn, and communicate with others in their classes as well as others in different locations” (Sherman & Kurshan, 2005, p. 12).

The research for this paper considers the social cognitive theory (SCT), a psychological model of behavior that emerged from the work of Albert Bandura (Bandura, 1977). The SCT emphasizes that learning occurs in a social context where much of what is learned is from observation. The SCT is widely used in research on classroom motivation, learning, and achievement. The core premise of SCT is that learning happens through observation. Albert Bandura’s Social Learning Theory (SLT) from the 1960s evolved into the SCT after the addition of the key construct of self-efficacy. Boston University of Public Health (2013) synthesizes the other five major constructs of SCT. SCT centers on the construct of reciprocal determinism in which learning occurs in a social context with a dynamic and reciprocal interaction of the person (individual with a set of learned experiences), environment (external social context), and behavior (responses to stimuli to achieve goals) known as triadic reciprocal causation. The construct of behavioral capability refers to a person's actual ability to perform a behavior by possessing the essential knowledge and skills of knowing what to do and how to do it. Another construct of SCT is observational learning where if an individual observes a behavior by others, such as modeling provided by video tutorials, then, the individual will be able to reproduce that behavior successfully. The constructs of reinforcements and expectations shape whether a person will engage in a specific behavior and the reasons why a person engages in that behavior.

This research is on self-efficacy, which is a prominent concept within SCT. Self-efficacy reflects individuals' beliefs about whether they can achieve a given level of successfulness at a particular task (Bandura, 1997). Self-efficacy is unique to SCT in that it places emphasis on social influence, as well as, on external and internal social reinforcement. Denler, Wolters, and Benzon state that students with greater self-efficacy are more confident in their abilities to be successful when compared to their peers with lower self-efficacy (2014). Self-efficacy is useful in understanding students' motivation and achievement in academic contexts. This is the main basis for this research to see if the video tutorials can provide greater self-efficacy and give the students more confidence in their abilities to be successful in mathematics, thereby, giving the students the "I think I can, I think I can" perspective about mathematics.

As Bandura accentuated the importance of observing in that learning occurs in the social context of observation, the closely related theories of Vygotsky and Lave emphasized the key importance of social learning. Teachers' use of language guides students' creative and critical thinking and leads them to the next level of learning (Vygotsky, 1978). Research suggests that the application of Vygotsky's theory of the Zone of Proximal Development (ZPD) could improve mathematical achievement (Christmas, Kudzai, & Josiah, 2013). Vygotsky envisioned the ZPD as a means to instructional enhancement and classroom change in mathematics. According to Vygotsky (1978), the zone of proximal development is the distance between the actual development level as determined by independent problem solving and the level of potential development as determined through problem solving under adult guidance or collaboration of more capable peers. Vygotsky (1978) opined that the ZPD is the current or actual level of development of the learner and the next level is attainable through the use of environmental tools and capable adult or peer facilitation. The actual level is what a student can do alone at a particular point in time. The next level is the level of potential development that student can achieve if given the benefit of support, adult guidance or collaboration of peers. In this research to achieve the next level, the students will have the benefit of support from the video tutorials and the adult guidance from their own teacher that produces the video tutorials. The video tutorials can be viewed with other students or the students' parents to provide the collaboration of peers that Vygotsky mentioned.

Vygotsky (1978) viewed assisted instruction and scaffolding whereby the teacher models the desired learning strategy as ways that the responsibility for learning would gradually shift to the students. According to Vygotsky (1978), problem solving should be under the guidance of a competent adult or capable peer. Implications from Vygotsky's research would identify mathematics as an enjoyable subject if there is expert intervention and this intervention is readily rendered. When students receive collaboration, direction or some kind of help, they are able to accomplish more mathematical tasks independently.

Bandura's (1977) work emphasizes that people learn from each other by observation, imitation, and modeling. The SCT focuses on students learning by observing someone else model what they are to learn. Spector (2012) stated that modeling requires the attention of the learner, the retention of what has been observed, the ability to reproduce the action observed and the motivation to engage in the previous three processes. He goes on to say that the situation in which the learner is engaged is critical and, therefore, linked to the situated learning theory.

In addition to Vygotsky's theory complementing Bandura's work on social learning, it concentrates on the key component of situated learning theory as well. In the real world context, theorist value situated learning. Jean Lave's (1988) situated learning theory focuses on the unintentional and situated aspects of learning. Spector (2012) states that while much learning occurs in structured classroom environments a great deal of learning occurs in everyday activities involving human actions and performances. Brown, Collins, and Duguid's (1989) cognitive apprenticeship is based on the instructional design theory based on situated learning in which learners are given a great deal of support or scaffolding, whereas more advanced learners are provided more freedom to explore and devise their own solutions.

Technology makes it possible for students to learn using a computer and have constant availability of instructional video tutorials for the mathematics students. Interaction through the computer between individuals, outside and inside the school, through collaborative social interaction is one way to make situated learning more successful. According to the National Council of Teachers of Mathematics, NCTM, all schools and mathematics programs should provide students and teachers with access to instructional technology—including classroom hardware, handheld and lab-based devices with mathematical software and applications, and Web-based resources—together with adequate training to ensure its effective use because the strategic use of technology strengthens mathematics teaching and learning (2011). Technology provides the availability and use of instructional video tutorials to mathematics students, thereby, allowing for modeling, observation, collaboration with peers, and the building of self-efficacy that the theorists describe as needed in social learning.

According to Denler, Wolters, and Benzon, this process is described as vicarious learning or modeling because learning results from watching the behavior and consequences of models in the environment (2014). Tutorial videos are forms of modeling. In the SCT, learning by observation involves the processes of attention, retention, production, and motivation. These are processes that the use of tutorial videos seeks to activate among students. Video tutorials are a form of the modeling described by Spector where much of today's learning occurs outside the classroom.

The video tutorials provide collaboration, direction, and help for the students, which include instructional assistance for the students and their parents as the students work on their homework. Christmas, Kudzai, & Josiah (2013) found that it is quite common for teachers to give students a lot of mathematical tasks as homework, without considering the sort of assistance that is available to the learner. They reported that the high rate of mathematical failure might be an indication that not sufficient collaboration is done to assist the learners' mathematical understanding. Teachers have the propensity of giving students voluminous homework, without ascertaining whether the learner will be able to get instructional assistance from adults at home. Their research found that in most cases where students work on their own that the student's individual performance was not raised (2013).

But, what makes a good tutorial video for mathematics? Tutorial videos should be designed to help students develop and sustain their self-efficacy for learning. The videos should provide prerequisite knowledge and strategies that the students need to be successful in mathematics and to attempt more complex and rigorous mathematical concepts. The videos should be designed to provide the students with incremental levels of success that fosters and overall positive level of self-efficacy. Denler, Wolters, and Benzon (2014) state that students exhibit more effort and are more effective learners when they are confident in their ability to complete academic tasks successfully.

A tutorial video needs an effective instructional design to guide and support the students as they learn. While there are numerous traditional instructional design models, there are few that apply strictly to the production of effective video tutorials. Therefore, a few of the traditional instructional design models that are applicable to video tutorials will be explored. The first of these is the ADDIE model, which stands for Analyze, Design, Develop, Implement, and Evaluate. During the analysis phase, the researcher identifies the audience for the tutorial videos, begins to identify the needs of that audience, the skills levels and current knowledge that the audience possesses, and the goals and outcomes that the researcher desires of the tutorial videos. It is during the design phase that the researcher plans how and what to present in these videos to meet the students' needs. The videos are produced during the development phase and uploaded to the Internet or other avenue for the audience during the implementation phase. It is during the evaluation phase that the researcher assesses the effectiveness that the tutorial videos had on the targeted goals for their intended audience and makes improvements for future videos.

Another effective instructional design for production of the tutorial videos is the Dick and Carey model. Similar to the ADDIE model, the Dick and Carey model takes the position that the audience needs to engage in their learning process and integrates the audiences' needs and skills into their design. The Dick and Carey Model took the five phases of the ADDIE model and developed it into ten components. This model is an effective instructional design for the tutorial videos since it starts with the goal for the audience and interconnects the other components of the model. The model accounts for the audiences' prior knowledge, current misconceptions, and their needs in designing the videos to accomplish the intended learning expectations.

Dick and Carey contributed greatly in the area of instructional design by applying a systems view of instruction as opposed to instruction being a sum of isolated parts. In their model, the systems view of instruction focuses on the interrelationship between context, content, learning and instruction. According to Dick and Carey (2009), "Components such as the instructor, learners, materials, instructional activities, delivery system, and learning and performance environments interact with each other and work together to bring about the desired student learning outcomes".

The Dick and Carey model is based heavily on the theoretical principles of learning and is commonly applied in education. The model is used for e-learning to guide the audience to engage with the content in order to acquire the knowledge and skills presented. By applying the systematic processes of the Dick and Carey model to the creation of the tutorial videos, the learning experiences of the audience lead to the desired learning outcomes. A weakness of this model is the amount of time and thought that must go into the design of the videos. Even if the teacher puts in the time required for successful videos one year, that teacher's students for the following year will have a different set of preconceived notions and prior knowledge. Therefore, more time may be required to produce new tutorial videos for the following year's students.

To achieve the desired learning outcomes of tutorial videos, a research base or theoretical framework is needed to answer these basic questions. What role does technology play in promoting student learning? Does effective instructional design work the same across various environments, such as classroom-based and computer-based environments? Do students learn more deeply from the tutorial videos when this resource is made available for enrichment and remediation for the students?

Richard Mayer's theoretical framework for the cognitive theory of multimedia learning is presented in Figure 1 (2003). Prior knowledge needed for the online learning is activated.

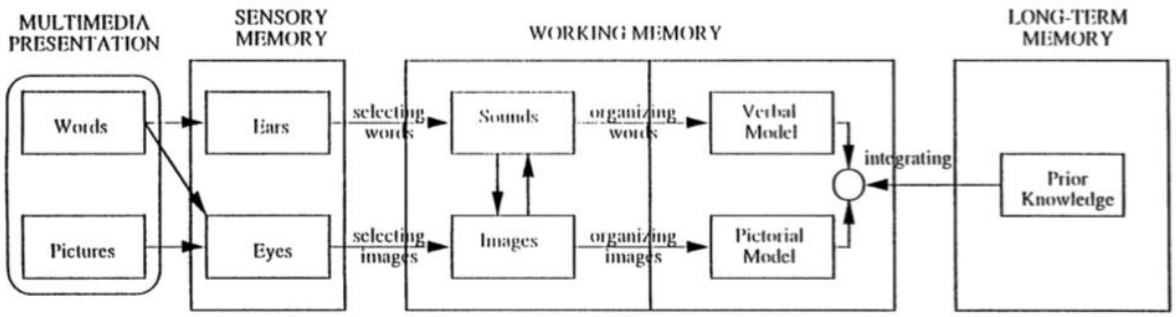


Figure 1: Richard Mayer's theoretical framework for a cognitive theory of multimedia learning (2003).

Ruth Clark and Richard Mayer are among the few researchers in the empirical testing of online learning. Their e-Learning and the Science of Instruction (2003) covers seven design principles; multimedia, contiguity, modality, redundancy, coherence, personalization, and practice opportunities. Their findings found that less is more in online learning, in which brief and concise online learning resulted in far more effective learning for the student. Their motto in online learning is "less is more". Their research aids in the production of the tutorial videos used in this research paper. Their research found effective ways to produce good online learning. These include the use of shorter video lessons rather than longer versions designed to educate and not to entertain. The dialogue of the instructor in the tutorial videos should be more like a conversation and less like a lecture. Simple relevant graphics and concise text aids learning whereas animation, background music and elaborate uses of graphics and text distract and actually hamper that learning experience of the online learner.

Since today's students are accustomed to turning to the web for information and social interaction, a few new innovated teaching ideas have evolved. One of these ideas is the flipped or inverted classroom where the teacher places the lectures online for the students to view at home so more classroom time is then available for the teacher to work math problems with the students and give feedback. Another innovated design is the blended classroom where face-to-face instruction and lecture is blended with technology and online learning, giving the student more control over the pacing of their learning, as well as, where and when they chose to view the online instruction. According to Goodwin and Miller (2013), there is a lack of hard scientific evidence that these new ideas impact student learning, but if teachers only implemented strategies supported by decades of research, they would never try anything new. Until proven evidence is available, the best strategy for a teacher, such as this researcher who is trying something new, is to be sure the video tutorials reflect research-based principles of effective teaching and learning.

Jonathan Bergmann and Aaron Sams, developers of the flipped classroom, see instructional videos as powerful tools for teachers to create content, share resources, and improve practice time for students. Khan Academy, an online library of instructional videos, is currently changing the way many students learn in the flipped and blended classrooms. Bill Tucker (2012) noted that one of the nation's leading thinkers on educational technology and the director of the UCEA Center for the Advanced Study of Technology Leadership in Education saw the reason that Sal Khan is so visible right now is that Khan is doing video tutorial nobody else is doing, even though it would have been great if the National Council of Teachers of Mathematics had been the ones to produce the math tutorials. Since that did not happen, someone from the outside, Khan, filled the vacuum. His guidance to educators was to "Start making!" their own video tutorials.

As an educator, "Start making" was advice taken and the teacher made mathematics tutorial videos were produced to begin this research. Before and after the video tutorials were used by the students as an instructional resource, the students rated their confidence levels for mathematics by recording a number from 1 to 5 using the Academic Efficacy subscale from PALS, Patterns of Adaptive Learning Scales, as listed below:

Not true at all 1	 2	Somewhat true 3	 4	Very true 5

Academic Efficacy subscale from Patterns of Adaptive Learning Scales (PALS)

Midgley et al., (2000)

This is a measurement of the cognitive process used to acquire knowledge and understanding in mathematics. It describes the student's beliefs and attitudes toward mathematics and the level of "I think I can" that the student possesses to successfully complete homework assignments and review mathematical skills needed for the new Georgia Milestone Assessment. Bandura believes that self-efficacy measures this belief and attitude that students need toward mathematics and their level of "I think I can" needed in today's mathematics classroom. Interviews with the parents provided more specific knowledge about the beliefs and attitudes parents had toward the mathematic video tutorials. The qualitative data from the parent and student surveys was analyzed to determine if there was an increase in the motivation of the students. Since the researcher was directly involved in this research by producing the video tutorials, the researcher pursued objectivity by recognizing the possible effects of these biases.

Analysis and Discussion

This mixed methods research study explored four dimensions related to the construction, implementation, and effectiveness of teacher-made video tutorials in one middle school mathematics classroom. The researcher utilized both qualitative and quantitative methods to answer the research questions that follow:

(1) How are students and parents using the video tutorials?

(2) What factors enable/impede the effectiveness of the video tutorials?

The researcher also implemented quantitative, quasi-experimental design to investigate the research questions that follow:

(3) Is there a significance increase in students' self-efficacy levels after the use of the video tutorials as an instructional resource as measured by increased scores on the Likert scale survey and the video survey?

(4) Is there a significance increase in students' achievement levels for the experimental group after the use of the video tutorials as an instructional resource as measured by increased scores on the pre-post assessment?

There is little to no research on instructional videos, particularly teacher made instructional videos and the results from the studies that have been conducted have varying results. Therefore, the research studies were analyzed and grouped into three sections, research on tutorial videos, video tutorials to improve student achievement in mathematics, and video tutorials to improve perceptions of parents and students about mathematics. It includes the variety of tutorial programs found for teaching and remediating in mathematics and then narrows down the tutorial programs that would work to address the low mathematics scores in the 7th grade, in particularly in the probability unit. These tutorial programs must be ones that this county's middle school has the option of using to improve student achievement.

Research on Tutorial Videos

This section includes the studies and research found on tutorial videos. It includes the variety of tutorial programs found for teaching and remediating in mathematics. The What Works Clearinghouse (WWC) researched what really works in middle school math. They reviewed 158 empirical studies on 34 middle school math programs interventions that were intended to promote middle school students' math knowledge and skills (2007). Altogether, the WWC looked at 34 interventions, only seven of the interventions met the WWCs evidence screening. The curriculums of grades six through nine were studied for one semester or more in the core content areas of numbers and operations, algebra, geometry, measurement, or data analysis and probability. The students' curriculum was a combination of text materials, manipulatives, computer software, videotapes, and other materials. Math achievement outcomes were measured by three different measurements. These measurements included the following:

- Standardized, nationally normed achievement tests
- Standardized state or local tests of math achievement
- Research-based or locally developed tests or instruments that assess students' mathematical concepts or skills

The results found that the I Can Learn® Pre-Algebra and Algebra and the Saxon Middle School Math computer-based program had positive effects on students' math achievement. Potentially positive effects were found in the Cognitive Tutor, UCSMP Algebra, and The Expert Mathematician computer-based programs. Two of the other programs studies only resulted in mixed effects on the students' math achievement.

The issues of lower than expected mathematics scores on the State assessments' across the U.S. have been at the forefront of concern for education leaders and policymakers. Tienken and Maher (2008) conducted a quantitative, quasi-experimental study on the influence that computer-assisted instruction had on eighth grader's mathematics achievement. They studied middle school students in a school in New Jersey who received computer-assisted instruction on the curriculum standards with a control group of students who did not receive the computer instruction. Their research results indicated that using the computer to assist in math instruction did not improve student achievement significantly.

In contrast, Woody's (2013) study focused on the mathematics achievement of fourth through eighth-grade students in a metropolitan school district that use a computer based mathematics program, Education Program for Gifted Youth (EPGY) Stanford Math. There have not been many studies conducted on Web-based mathematics programs that provide an individualized, self-paced experience in mathematics. This study focused on the use of a Web-based mathematics program for instruction or remediation and assessed the results by the scores received on the mathematics section of the Tennessee Comprehensive Assessment Program (TCAP). The sample consisted of over 25,000 students in a metropolitan school district. The data analyzed by ANOVA showed significant gains made in TCAP Mathematics scores of fourth-through eighth-grade students who used the EPGY Stanford Math Program. This study on a particular computer-assisted instruction, EPGY, reported very different findings than the general study by Tienken and Maher. The results of these studies support the idea that school leaders should evaluate the specific computer-assisted instruction used for intervention in their curriculum for its demonstrated success.

The study by Cavalluzzo, Lowther, Mokher, and Fan (2012) found similar results when a rigorous evaluation of the Kentucky Virtual Schools hybrid algebra I curriculum was conducted. The hybrid class curriculum combined traditional face-to-face algebra instruction with an online program to teach Algebra 1. This yearlong study consisted of 6,908 students, 61.4 percent of whom were in rural schools, whereas these schools were randomly assigned to be in either a control or treatment school. As reported in the study, "Effects of the Kentucky Virtual Schools Hybrid Program for Algebra I on Grade 9 Student Math Achievement," researchers found the students' scores in the fall of grade 10 on the pre-algebra/algebra portion of the American College Testing (ACT) PLAN® assessment (PLAN), which measures students' math achievement, showed no more effectiveness at increasing student achievement than the control classes, which did not use the computer program. The study also revealed that students taught in the hybrid classes were not significantly more or less likely than students in the control group to enroll in a math course above algebra 1 the year after the intervention.

Lloyd and Robertson (2012) noted that while the use of computer-assisted instruction has drastically increased over the last few years, there was little empirical research evaluating those computer programs, specifically those tutorials teaching statistics. The researchers studied the effects that teaching with screencast tutorials had on the students' statistical knowledge, application, and interpretation. Students from a statistics course were randomly assigned to a control text tutorial or an experimental video tutorial group and were tasked with completing a statistics problem. The results did find that the students taught with the screencast tutorials scored significantly better than the students taught with the traditional instructional techniques. In this study, screencast tutorials were found to be efficient tools for enhancing student learning, especially for higher order conceptual statistical knowledge. This is one of the few studies similar to the research in this paper.

Fede, Pierce, Matthews, and Wells (2013) examined the effects of a computer-assisted, schema-based instruction on the math problem-solving skills of 32 fifth grade students with below average problem-solving skills. Sixteen of the students were given a 12-week computer-assisted, schema-based intervention, while 16 other students in the control group received state math test preparation review in their regular classroom. Results demonstrated that the computer-assisted, schema-based instruction group showed greater gains over the control group on items from the Massachusetts Comprehensive Assessment System. They also showed an increase in growth on biweekly examiner-made probes. Although, when it came to application of the math concepts, there was no difference in the gain scores between the two groups.

Deficiencies in students' basic math skills are responsible for many of the errors made by students when solving math problems. Hudson, Kadan, Lavin, and Vasquez (2010) stated three common causes for these deficiencies were found to be lack of prior knowledge, negative attitude towards math, and lack of varied teaching methods being used. Their research targeted using technology to improve the basic math skills for students in the fourth, fifth, sixth, and ninth grades. When pre and post assessments were compared the researchers did find a noticeable increase in student mastery of basic mathematics.

Maloy, Edwards, and Anderson (2010) researched 125 Massachusetts fourth graders and their teachers in three rural school districts during the 2007-2008 school year that used the new web-based mathematics tutoring system, 4MALITY. They did claim that these interventions proved successful, with 70% of students improving their performance from pretest to posttest, a statistically significant gain in test scores, but clarified that they did not use a control group. The program provided the students with strategies for learning math problem solving using a combination of computer-based activities, learning games, and creative writing.

Video tutorials to improve student achievement in mathematics

This section includes studies and articles on video tutorials to improve achievement in mathematics. Since there are no studies on teacher-produced videos that are made available to parents and students online for mathematics, this section includes other tutorials that are readily available. Online math tutorial resources, such as Khan Academy, have restructured the math classrooms of today. Lessons are tailored to the individual student's needs and online tutorials are available on each math topic. Students work at their pace and are provided immediate feedback on their accuracy. These video tutorials are reimaging the look of the math classrooms of today. They are empowering teachers and students by providing a personalized, mastery-based, and interactive learning environment for the students to learn, anytime, anywhere. Khan Academy is a non-profit educational organization created in 2006 by educator Salman Khan to provide a free world-class online education that is accessible online to anyone in the world (Schaffhauser, 2013). Khan Academy is known for its extensive collection of instructional videos. It originally covered the subject of mathematics. Now, it has expanded to other academic fields of study. Math exercises are available with step-by-step hints, related videos, and immediate feedback to whether the question was answered correctly. Depending on factors like access to computers, the Internet and available time set aside in the curriculum, teachers have developed a wide variety of ways to use Khan Academy in their classrooms. Students have access to math exercises, a series of practice problems that weave a narrative from basic arithmetic through calculus, to refine their math skills, remediate, or move ahead at their pace

(Schaffhauser, 2013). While working on math exercises, students can use step-by-step hints, watch related videos, and find out immediately whether they answered a question correctly. The videos in the site are scaffolded to show the student the pre-requisite skills needed and what skills they should learn next in the natural progression of math skills.

In researching Khan Academy, June Kronholz (2012) reported the test results from the first two pilot schools, Los Altos and Envision, that signed on to use Khan Academy in their math classrooms which both reported that Khan Academy worked. Los Altos reported the 7th graders who were in the pilot program in 2010–2011, all of which were remedial students, scored 41 percent at the proficient or advanced levels on the California Standards Test compared to 23 percent the year before. Among the 5th graders in the pilot project, 96 percent using Khan were proficient or advanced compared to 91 percent in the rest of the district. The success of Khan Academy must be measured by student achievement. The sample size of this pilot was small and it was too early to claim that Khan Academy would increase students' achievements in math. This initial research did give promising results and even mentioned an increase in student engagement and the students' perceptions of math improved.

After more schools began implementing the video instructions, the standard look of the normal math classroom changed. Khan and Slavitt (2013) described the look of the new bold math classroom that was piloted in Summit San Jose in the fall of 2011, which used the Khan Academy mathematics' videos to enable students to learn at their own pace. During the pilot year, the school used the videos during the last few minutes of the math class period. By the school year 2012-2013, Summit used the diagnosis tests to provide each student with an individualized math plan using the Khan Academy videos. The school demonstrated the bold new look of their math classroom as they experimented with teaching math with technology, organizing their class time, and intensely focusing on the math needs of each student. Summit plans to implement deeper integration into video tutorials and individualized learning plans for all of their students.

Zhang, Trussell, Gallego, and Asam (2015) studied the use of math apps as an effective way to provide instructional supports for struggling students within general education classrooms. They researched whether math apps could be used to improve student learning and close the achievement gap between struggling students and typical students. Prior research has shown that struggling learners benefit from computer-enhanced math intervention (Burns, Kanive, & DeGrande, 2012), but little research had been conducted on the effectiveness of math apps. Math apps provide the struggling math student with self-pacing programs, immediate feedback, and instructional videos that break down complex processes into small steps. Zhang, Trussell, Gallego, and Asam stated the pre and posttests showed that well-designed math apps were effective for struggling students to achieve the Common Core State Standards for Mathematics, improve student learning in mathematics, and reduce the achievement gap between struggling students and typical students. Eighteen fourth grade students from the southwestern United States used three math apps that employed different scaffolding strategies to support learning of decimals and multiplication.

Traditional math classroom teachers are faced with the challenge of preventing boredom for their students as they deliver instruction to this generation of video playing, media-rich, and interactive technology that the typical student is exposed to daily. Gillispie, Martin, and Parker (2010) researched the effects on middle school student achievement in mathematics from playing the highly interactive 3-D video game, Dimension-M. It is a problem-based game in which players assume the role of a college student who lands ashore on a deserted island. The players must use their skills in pre-Algebra and Algebra to solve various situations that arise on the island in order to ultimately escape. Mathematics instruction and practice are integrated into the storyline of the game, in which each player must master certain pre- Algebra and Algebra skills to progress through the game. Tutorials on the math concepts are provided for them to pass the quizzes to the next mission. The study was conducted at a middle school in the southeastern United States on their students who achieved below proficient levels on their state end-of-grade mathematics exams. The 28 sixth to eighth grade students played the game as their mathematics remediation on the concepts of prime numbers, even and odd patterns, and perfect squares. The students received no direct mathematics instruction during the research period in order to test the impact of the game alone. Pre and post-tests, as well as, pre and post attitude surveys were administered. A significant gain in achievement was shown. Although the surveys did not show a significant increase in the students' attitudes, the teachers indicated that there was a positive impact on students' mathematics performance in their regular math classes as well as a positive impact on students' self-efficacy in mathematics as the students responded enthusiastically to the video game environment.

Educators are using these advances in technology with game-based learning applications and wireless Internet to create exciting interactive learning opportunities for their students. Unlike the findings of Gillispie, Martin, and Parker, who researched a particular instructional game, Carr's (2012) research did not find the significant improvement in student achievement in the 5th grade students at two rural Virginia elementary schools who used iPads during their math instruction time. The quantitative and quasi-experimental study was to examine the effects of iPad use as a 1-to-1 computing device on 104 fifth-grade students' mathematics achievement. The experimental group used the iPads for one academic quarter of nine weeks daily during mathematics class while the control group members did not. The change from pretest to posttest was not significantly different between the two groups.

Video tutorials to improve perceptions of parents and students about mathematics

The section includes studies and articles on whether video tutorials improve the perceptions parents and students have about mathematics. A limitation to this research is the necessity of Internet after school hours for the parents and students to view the tutorials. Mayes (2011) conducted research in response to struggling math students and parents who became frustrated while trying to help their child with their math homework at home. He addressed a need that still remains for a strategy that can increase math success and lower the anxiety level associated with math. The rationale for his research is an attempt to increase students' math success by the introduction of teacher-assisted video instruction into the instructional process. His research aligns closely to this research, as both are based on the same assumption that with the technology available today—such as a videos posted on a teacher's website—parents and students may perceive a math program more positively. He studied whether these videos could reduce math anxiety, improve the homework environment by providing a timesaving help to parents, and link the concepts taught at school. Mayes conducted his research on the entire fifth grade population, 40 students, of a large Christian school in Largo, Florida (Indian Rocks Christian School). Mayes analyzed the cumulative results from two parent surveys, given at the beginning and end of the year, and one student survey, given at the end of the year. Results indicate that the parents placed a high level of importance on math compared to other subjects. Sixty-five percent (23) of the parents felt the videos were beneficial for their own learning purposes. Parents' most common use of the videos was to help their child with their homework.

Students rated the use of the videos even higher at an 87.5% (35) approval rating. Mayes found that not only did the videos help students when stuck on a homework problem, but also students used them to keep up with assignments when absent, and to gain a head start on learning. The teacher in this study observed benefits such as improved relationships with parents when the parents could use the video to see how lessons were being taught, and a less anxiety between the parent and the student during homework sessions, both of which are the desired outcomes of creating the teacher-made videos for this research study.

Much like the design of this study on middle school mathematics students, Kersaint, Dogbey, Barber, and Kephart (2011) conducted a similar research by investigating the achievement, attitude, and retention of college algebra students who had access to an online tutoring resource using a pre-posttest control group design. Their results revealed that students in the experimental group who used the online tutoring service had content knowledge scores significantly higher than the students in the experimental group that did not use the service, as well as better attitudes about seeking help. While tablet PCs have been increasingly used in undergraduate courses to create recorded lectures, Yoon and Sneddon (2011) research revealed that students are largely positive about the availability of tablet PC recorded lectures when surveyed on their use of recorded lectures in two large undergraduate mathematics courses.

Spradlin and Ackerman (2010) had yet a different outcome from the previously mentioned studies, when they found no statistically significant difference in the posttest scores of Intermediate Algebra students at an eastern university who received traditional instruction and those students who received traditional instruction supplemented with computer-assisted instruction. Although, their results did reveal that 71% of the traditional students and 59% of the students supplemented with computer-assisted instruction reported feeling positive or very positive toward using computers for educational purposes.

Gürbüz, Çatlioglu, Birgin, and Toprak, (2009) based their study on a similar premise to this research, in which they believed traditional instructional methods fail to overcome difficulties when teaching the subject of probability. They studied the use of information and communication technology as a useful approach to overcome these obstacles. The results of their study on the 8th grade students in a school in Turkey revealed positive opinions of the computer assisted instruction by making the subject of probability more concrete and associated with real life. Although Sargent, Borthick, and Lederberg's (2011) study was based on accounting students at a large university, this research project deals with similar issues for low performance of middle grade students as those they researched on college level students; intimidating class environments, low aptitude, and low motivation. Their study showed promising results for using ultra-short online videos. Students using the tutorials had significantly lower course drop rates and higher exam scores that correlated with better pass rates.

Efficacy of Math Video Tutorials on Student Perception and Achievement

This study utilized the basic implications of SCT by providing the students unlimited access to the mathematics instruction through the online availability of video tutorials, which provided the students with models of the knowledge and skills they are expected to learn. The students' own teacher produced and provided these videos, models of instruction, online. The teacher exhibited her enthusiasm for mathematics in the videos to help promote motivation and for the students to adopt a similar interest in mathematics. In the tutorial videos, the teacher used mnemonics and learning strategies, similar to what they had heard in the classroom, to aid in the retention of the material by the students. The examples and practice problems that were modeled in the videos were geared to seventh graders to make the material more personal and relevant to the students.

The current research that has been studied showed little consistency in their results, partly due to the studies being conducted on different technology software programs and instructional designs. The studies varied based on the subject area and grade level that the research was conducted. Technology changes, it seems daily, so many of the studies were conducted on what is now considered outdated technology. It takes time to conduct credible research and by the end of the research period, the technology that was studied may be already outdated. While the few studies that have been conducted on using video tutorials offer inconsistent results as to student achievement and/or perception improvement, no study was found on using video tutorials that were produced by the student's own teacher, therefore, matching the instruction on the videos to the instruction that was taught in the classroom by the same teacher.

The need for the research in this study is that it fills the gap in the literature on teacher made video tutorials and adds to the knowledge of what makes an effective instructional design of these videos. Research shows that technology has opened new doorways for educators to provide the modeling and assistance that students and parents need outside the classroom. Little, if any, research has been conducted on teacher-made video tutorials. Since the technology exists now for teachers to more easily produce and upload their own tutorials, hopefully, more research will be performed as more teachers make use of this innovative process to provide their students with video tutorials that they make for their own subject areas. The research in this study is much needed and will help the education community move forward in this direction.

Conclusions and Recommendations

Over the last few years, an increasing number of websites and software companies have provided video tutorials for mathematics on the Internet. While some of these are free and available to everyone with Internet, some require the computer software program to be purchased. According to (Woody, 2013), there have not been many studies conducted on web-based mathematics programs that provide an individualized, self-paced experience in mathematics. In response to the research questions, this review included the research on the use of computer programs and tutorials to assist instruction and improve students' achievement scores in mathematics. Most studies were only conducted on one specific computer tutorial software program. In reviewing the findings of the various studies, there was not a consensus in the research on the video tutorials' implementation into the classroom increasing student achievement in mathematics. While some programs did show a significant gain in student achievement in mathematics, some did not. There was more of a consensus in videos improving the perceptions that students had on mathematics. An extremely limited amount of research exists on the use of teacher-made tutorials that are used to target problematic areas for students in mathematics, such as in this research paper.

Khan and Slavitt (2013) described the look of the new bold math classroom that used the Khan Academy mathematics videos to enable students to learn at their own pace. By being free and available to everyone who has Internet, the Khan Academy videos are a viable option in the classroom. Future studies need to include more independent research conducted to verify whether the videos improve student achievement in mathematics. Specific video tutorial programs need to be researched by the individual schools, when possible, to provide the schools with the most helpful information. Schools that provide Internet after hours to their students will be able to use the videos for remediation for all of their students. A limitation on the use of the videos is that all students do not have access to the Internet after school hours. The videos can be used for those students who have been absent or homebound. They can be used for remediation and enrichment.

In an effort to find an instructional strategy to increase the low achievement scores on the CRCT in mathematics that have been problematic for the State of Georgia, this particular county, and this particular middle school, this paper researched the efficacy of mathematic tutorials on students' achievement scores and on the perceptions that the parents and students have about mathematics. For this particular county's middle school, the research revealed Khan Academy, math games, and math apps as viable options to be further explored. The reason these were chosen to help improve or alleviate the low achievement scores in mathematics was because Khan Academy is free and readily available and this particular county's middle school has a classroom set of iPads for each mathematics classroom. This would allow for the use of Khan Academy, math games and math apps that include video tutorials to be used as a way to try to improve the students' low achievement scores in mathematics.

More research is needed on video tutorials produced by the classroom teacher. These videos have the advantage of the teacher knowing the exact problematic areas for their subjects. These videos contain the same language and vocabulary that the student hears in the classroom since the same teacher delivers both formats, the classroom lecture and the online video tutorials. As negative attitudes abound among parents and students when it comes to the subject of mathematics, the strategy of providing online teacher videos should be researched more to see if the videos are a viable way to change these perceptions. With the dramatic increase in technology over the last few years, there is a greater feasibility to producing these videos, greater number of families with Internet at home to view the videos, and greater interest in online studies. There is a need to research what instructional design is needed for the tutorial videos to be an effective resource for students and parents, alike. This is a new avenue that is worth the attention of researchers to determine if this is a way to change the perceptions of “Math is too hard, I can’t do this” to “I think I can, I think I can”.

CHAPTER THREE

METHODS

Research Design

The purpose of this mixed methods research study was to explore four dimensions related to the construction, implementation, and effectiveness of teacher-made video tutorials in one middle school mathematics classroom. The researcher utilized both qualitative and quantitative methods to (1) *better understand how students and parents use the available videos* and (2) *identify factors that enable/impede the effectiveness of the video tutorials*. The researcher also implemented quantitative, quasi-experimental design to investigate the relationship of the video tutorials usage to (3) *student self-efficacy* and (4) *student achievement in mathematics*.

The researcher selected a mixed methods design for a variety of reasons. According to Creswell and Plano Clark (2007), the central premise for using mixed methods is that the use of quantitative and qualitative approaches, in combination, provides a better understanding of research problems than either approach alone. A mixed methods approach also allows the researcher to select methods most appropriate to the individual research questions guiding the study. According to Creswell and Plano Clark (2007), mixed methods research is a research design with philosophical assumptions as well as methods of inquiry. As a methodology, it involves philosophical assumptions that guide the direction of the collection and analysis and the mixture of qualitative and quantitative approaches in many phases of the research process. As a method, it focuses on collecting, analyzing, and mixing both quantitative and qualitative data in a single study or series of studies. The design of this study centers on this fundamental premise that the collection of quantitative and qualitative data, in combination, provided the researcher a more comprehensive understanding of research problems than either approach alone (Creswell &

Plano Clark, 2007). While one form of data collection may suffice, scholars increasingly utilize this methodology, since both quantitative and qualitative data collection provide a complete picture. Making use of both forms of data can afford the researcher more conclusive evidence and offset the limitations of one form of data collection alone (Creswell & Plano).

By including qualitative research in this study, it allowed the researcher to give voice to the students and the students' parents about the use and implementation of the video tutorials. Qualitative research methods are valuable in providing rich descriptions of complex phenomena; tracking unique or unexpected events; illuminating the experience and interpretation of events by actors with widely differing stakes and roles; giving voice to those whose views are rarely heard; conducting initial explorations to develop theories and to generate and even test hypotheses; and moving toward explanations (Sofaer, 1999). Qualitative research is well suited for capturing the unique and social context that the tutorials were intimately embedded. Data was collected in the natural setting and by multiple surveys and interactive interviews. Because of this, the researcher was better equipped to provide multi-dimensional representations about the construction, use and implementation of the teacher-made video tutorials. With the qualitative methods, the researcher was able to inform and be informed by the data resulting from the quantitative research and provide ways to make reliable observations that would not otherwise be possible with only a quantitative research. While structured by the specific research questions, qualitative inquiry can accommodate unexpected directions and emerging themes (Marshall & Rossmann, 2010).

By including the quantitative research in this study, it allowed the researcher to collect numerical data to explain particular phenomenon about the teacher-made video tutorials. Logs showing patterns of when and how often students and parents accessed the videos augmented self-reported data on video use. Research questions related to students' self-efficacy and achievement were measured using pre and post assessments administered to both an experimental group using the videos and a comparison group. Quantitative research allowed the researcher to test research hypotheses and include the analysis of all the numerical data. Quantitative research was aimed at identifying general trends. With the addition of qualitative methods in this study, it provided for in depth profiling of what was happening under the skin of the phenomenon of making and using effective video tutorials. In this study the quantitative and qualitative methods have equal status. This study falls under Robson's theory that there are situations and topics where a scientific quantitative approach is called for and others where a qualitative naturalistic study is appropriate, but, like in the case of this study, there are situations which will be better served by the marriage of the two traditions (2002). The mixed methods design fits this research study the best because the triangulation of the quantitative and qualitative data from the same research topic complements the findings and brought together the different strengths of the two methods.

The quasi experimental designs are used to evaluate the effectiveness of an intervention when the intervention has been implemented by educators prior to the evaluation procedure having been considered and when researchers want to dedicate greater resources to issues of external and construct validity (Shadish, Cook, & Campbell, 2002). Much consideration was given prior to beginning this quasi-experiment to the type of comparison group that would be utilized. The comparison group did not receive access to the video tutorials, the treatment that the experimental group received. The purpose of a comparison group was so that the researcher could determine what outcome may have occurred had the experimental group not received the treatment. It was important to the research that the comparison group be as alike as possible to the treatment group of students. This study used the quasi-experimental creative design techniques to reduce the various threats that could cause a study's findings to be invalid or unreliable. This study was designed to compare the achievement scores from the seventh grade probability unit of those group of students who did and did not utilize the teacher-made video tutorial resources and to explore how these videos impacted the students' perception of mathematics, as well as, how these videos impacted the parents' perceptions of mathematics.

In summary, this mixed methods study employed a balance of both forms of data collection, quantitative and qualitative, based on the data requirements needed to pursue all of the research questions of this study. The making and use of the teacher-made video tutorials was exploratory and the researcher sought feedback from the participants. The results of the pre and post assessments on achievement were coupled with more information collected by qualitative means. The researcher used the quasi-experimental design to assign a comparison group to the treatment group in an effort to attain the data needed to best answer the research questions in this study. The inclusion of interviews and surveys added a more rich and intricate view of the construction, implementation and use of the teacher-made video tutorials.

Setting and Context

The population of this study was all of the seventh grade students who attended the middle school in a small rural town in southern central Georgia. The Atlanta Journal-Constitution reported that this county in South Georgia (population around 13,000) is among the poorest counties in the state and one of the poorest counties in the country, according to five years of census data analyzed by 24/7 Wall St (Carlson, 2015). The school is designated as a Title 1 school with the 100 percent of the students qualifying for free lunch. Due to the poverty conditions of the county, many students come from homes without access to Internet. Since this study revolved around the use of online video tutorials after school hours, Internet availability was a variable that needed consideration. Methods were needed to find ways to make the videos available to the students outside school hours for those students who do not have access to the Internet. The video hosting site provided a link to the video resources. This link could be added to Facebook, the researcher's classroom website, and sent home to the parents in a letter. The researcher utilized "Remind", which the parents and students had signed up to receive texts and emails daily from the teacher. The researcher sent the links on "Remind" and attached the video clips. Smart phone apps are one avenue this researcher explored to offer access to the teacher-made video tutorials. The links to the videos were available on Smart phones through texts, emails, Facebook, "Remind" and the researcher's classroom website. Other avenues included making sure students had library access to free Internet after and before school hours. The extended hours were posted in the halls and on "Remind" for parents and students to know about the additional open hours that were available for Internet access.

The school is the only public middle school for the entire county, serving sixth, seventh, and eighth grade students. At the time of this study, there was not a private or charter school in the county. Except for the very few students who were home-schooled, this study evolved around all the seventh graders in this county, 126 students. At this school, the students were divided into two pods, which were each taught by seasoned, highly qualified mathematics teachers. These two mathematics teachers that participated in the study also had similar levels of professional experience, exceptional administrative evaluation scores, and instructional practices. Both teachers held at least a master's degree and a professional, endorsed sixth through eighth grade mathematics teaching certification from the state of Georgia. In addition, both teachers taught three periods, 90 minutes each, of seventh-grade mathematics classes five times per week.

The Georgia Department of Education's Common Core curriculum map for seventh grade mathematics contains a unit on probability. This Common Core instructional framework unit emphasizes key standards that assist students to develop a deeper understanding of numbers, in which the students learn to express different representations of rational numbers (e.g., fractions, decimals, and percent's), and also discover the concept of probability. The students are expected to expand their knowledge of simple probabilities and are introduced to the concept of compound probability (2015). According to the Georgia Department of Education (2015), due to evidence of frequent difficulty and misunderstanding associated with the seventh grade probability unit, instructors should pay particular attention to these probability concepts. When analyzing the 2013-2014 CRCT results for seventh grade at the school this research was conducted, the section of the CRCT that students had the most difficulty was in the area of data and probability, with 65 percent of the students answering less than half of the questions correctly (Georgia Department of Education, 2015).

To address this problem, this research studied the strategy of providing teacher-made instructional video tutorials, which targeted the students' problematic areas in the Georgia Performance Standards' Common Core probability unit. As Willis (2010) stated, the first step to success in math is a positive attitude. The unit was taught in a six-week time frame. The teacher produced six instructional video tutorials. These videos were available online to parents and students so they would have continuous resources on the probability unit available for them to use as remediation, acceleration, missing skills, or for instruction that they missed because of absences.

The production of the tutorial videos used the following instructional designs that the research from this study deemed effective for teaching and learning. According to Dick and

Carey (2009), "Components such as the instructor, learners, materials, instructional activities, delivery system, and learning and performance environments interact with each other and work together to bring about the desired student learning outcomes". The Dick and Carey model is based heavily on the theoretical principles of learning and is commonly applied in education. The model is used for e-learning to guide the audience to engage with the content in order to acquire the knowledge and skills presented. By applying the systematic processes of the Dick and Carey model to the creation of the tutorial videos, the learning experiences of the students lead to the desired learning outcomes. Ruth Clark and Richard Mayer (2003) are among the few researchers in the empirical testing of online learning and their research guided the production of the teacher-made video tutorials used in this research. Their findings on what makes an effective online tutorial video include the use of shorter video lessons rather than longer versions designed to educate and not to entertain. They found the dialogue of the instructor in the tutorial videos should be more like a conversation and less like a lecture and the text or graphics should be simple.

The tutorial videos were produced on a Smart podium that is an interactive whiteboard. A PowerPoint that the teacher prepared beforehand by scaffolding instruction and examples played during the tutorials. The teacher worked out every example onto the whiteboard so the viewer would have step-by-step instructions. A camera recorded the teacher as she worked these problems and talked throughout the tutorial. This video of the teacher as she talked and provided instruction for the tutorial played in the bottom right hand corner of the final product tutorial with the PowerPoint video. At all times the teacher appeared in the tutorials, speaking in conversation style and appearing to speak directly to the viewer. After this research study was completed, the tutorials were made available to everyone at the website address listed in Appendix J.

The researcher herself produced these teacher-made tutorial videos. She adhered to these findings on instructional designs to make effective tutorial videos. As a classroom teacher, the researcher knew where the students typically had the most trouble understanding the probability unit. She was in the videos and conducted the tutorials more like a conversation and less like a lecture. She had tried to keep these videos short, less than ten minutes long each. They were labeled by their content so the students could refer back to them often as they work problems within that content area. The researcher produced a video for each section of the probability unit that follows:

1. Probability of a simple event
2. Theoretical and experimental probability
3. Probability of compound events
4. Simulations and permutations
5. Fundamental counting principle
6. Independent and dependent events.

These videos were placed online on a video hosting site, known as SproutVideo, as continuous resources for the students and parents of the students in the treatment group. The researcher appeared in each of the videos. The online website where the videos were housed provided a link that required a login to access for use. Each student and parent in the treatment group received his or her own individual passwords. They were asked not to share these passwords with anyone to order to minimize the risk of contamination of the research and so the researcher could gather better data about who was viewing the videos and how often. The video hosting site collected data on the usage of each video such as how many individuals were watching the videos, whether they were being played on a mobile or desktop device, how many plays each video receives, which videos were getting the most plays, and whether the parents or students were viewing the videos more. The consent/assent letters informed participants that the researcher would be collecting this type of electronic use data. Data was kept confidential, except in the case of where a parent might request data on their child. Children were informed that their parents have the right to access their use data.

The researcher informed the students and the parents of the students in the treatment group that these videos were available by sending a letter home to the students and their parents. The letter stressed that viewing the videos was not for a grade. The videos were provided as a resource that could help the students and their parents with the concepts taught in the probability unit. The researcher requested the letter to be signed by the parents that they did see the letter and were aware of this resource being available to them. The researcher added the link to the videos on her “remind” texts and emails that she sends the students and parents. This link required the use of their passwords to view the videos.

Groups, Participants and Sample Selection

The sample used in this study consisted of 120 of these 126 seventh grade students. Of these 120 students, the experimental group contained 55 students who were taught by the researcher in her three mathematics classes. The control group contained 65 students taught by the other highly qualified mathematics teacher in the opposing pod in his three mathematics classes. The other six students in the population of the seventh grade were taught in a self-contained classroom and were not required to take the new Milestone assessment, since they were assessed with the GAA, Georgia Alternate Assessment in math. The mathematics achievement of students in the experimental and control group were very similar in their mean achievement levels.

In the spring of 2015, the participates in the sample for this study were given the M-COMP, an eight minute timed assessment that focused on the students' proficiency in their foundational mathematical computation skills needed to support their performance at their current grade level. Cognitive research has shown that students who do not have solid foundational skills in computation will struggle to integrate current grade level content because their attention and cognitive processing will be focused on below-grade level computing rather than rigorous conceptual content. The students were also given the ten-minute M-CAP assessment that focused on the students' foundational conceptual understanding on all 5 National Council of Teachers of Mathematics, NCTM, process standards. In both assessments, the questions were assigned a certain number of points if the correct answer was given. These points were added together to get a score on each assessment. The scores were inputted into the AIMSweb online website. This website analyzes all the scores into class distributions and percentiles. The school used the results from these two assessments to place these students into which seventh grade pod they would be taught. The overall mean scores of the students were matched for the different pods' mathematics teachers. The overall mean of scores for the researcher in this study consisted of all the gifted students, all the students scoring "well about average", all the students scoring "well below average", and a few students scoring "above average" and "below average". This group of students was the treatment group and hereafter is referred to as the treatment or experimental group. The other highly qualified mathematics teacher received students totaling the same overall mean scores. This teacher received all the students scoring “average” and the remainder of the students scoring “above average” and “below average”. This group of students was the control group and hereafter is referred to as the control group.

During the participant selection and/or recruitment, the researcher chose the students in her three mathematics classes due to convenience. The control group was chosen due to the similar overall mathematical ability of the group as a whole to the overall mathematical ability of the treatment group. The control group and the treatment group were comparability based on the students’ overall mathematical skills and achievement levels. These groups were chosen for the study based on their similarities in mathematical ability. The age of the participating students in the study, on average, were 12 or 13 years of age.

Potential participants were selected via a convenience sample from students and parents in the researchers’ classroom/school. Actual participants were identified through an IRB-approved informed consent process to use data from pre-and post- mathematics assessments and self-efficacy scales. Student and parent participants in the experimental group were offered levels of participation, as whether they would like to complete open-ended surveys and participate in focus groups and/or interviews. Since student participants were under-age minors, informed consent was attained from their parents. Since participants were of sufficient age and cognitive ability to understand the research, informed assent was also obtained from student-participants. Both parental consent and student assent were requirements for participation in the study.

Informed Consent

Before any data collection took place the researcher applied for the determination of the Institutional Review Board (IRB) that the research had been reviewed and approved to be conducted at all institutions within the constraints of the research study. Federal regulations required that all research involving human subjects be reviewed and approved by a local IRB prior to conducting the research. The major purpose of the IRB is to protect the rights and welfare of the subjects involved in the research (Miser, 2005). The surveys and interview questions were developed, along with the pre and post assessments on the probability unit that were used for this study. Since minors were to be surveyed and interviewed, assent letters and consent letters were formatted. All of this material was included in the IRB request for permission to research.

In the consent and assent letters, the researcher stressed that the students would not receive a grade for viewing the video tutorials. The videos were provided to the treatment group as a resource to help the students and their parents. These letters included the option of a level of participation. They gave the students and their parents the opportunity to select their level of involvement such as to view the videos, be included in the surveys, and/or be included in the pool of candidates that the researcher purposefully selected those she would interview. The consent and assent letters also sough permission to data being collected on their usage of the videos. The consent and assent letters stated that participation could be terminated at any time with no consequences.

Since the researcher is also the classroom teacher for the students in the experimental group, the risk of parents/students feeling compelled to participate was minimized by stressing the voluntary aspect of participation; not linking participation with grades; offering assurances of confidentiality on data and participation; ensuring access to the videos regardless of participation; and emphasizing that participation could be terminated at any time with no consequences. Both consents forms were received from 100 percent of the potential participants in the study for both the experimental and control groups.

Research Questions

This mixed methods research study explored four dimensions related to the construction, implementation, and effectiveness of teacher-made video tutorials in one middle school mathematics classroom. The researcher utilized both qualitative and quantitative methods to answer the research questions that follow:

(1) How are students and parents using the video tutorials?

(2) What factors enable/impede the effectiveness of the video tutorials?

The researcher also implemented the quantitative, quasi-experimental design to investigate the research questions that follow:

(3) Is there a significance increase in students' self-efficacy levels after the use of the video tutorials as an instructional resource as measured by increased scores on the Likert scale survey and the video survey?

(4) Is there a significance increase in students' achievement levels for the experimental group after the use of the video tutorials as an instructional resource as measured by increased scores on the pre-post assessment?

Overview and Procedure

In an effort to prepare a comprehensive outline of this entire procedure for other teachers who may want to produce their own video tutorials for their students, a recap of the order of events for this study follows. First, the IRB was submitted and approval was documented before any research began. The teacher used a Smart board and an iPad to generate the teacher made video tutorials for the probability unit. This was one way to make the videos, although other methods of video production could have been used. The videos were placed on a video hosting site that provided passwords for the viewers of the videos. The website also collected data on the usage of the videos. A control group was selected to match the ability level of the treatment group as closely as possible. Consent and assent letters were sent home for parents and students to sign. Notification that the student's grade would not be affected by whether or not they agreed to watch the videos was included in the letters. These letters contained levels of involvement so that the students and parents could feel comfortable agreeing to participate. They had the choices of not being included at all, receiving access to the videos, participating in the surveys, and/or agreeing to a potential interview. The study was deemed to be one of minimal risk to participants and the probability and magnitude of harm or discomfort from participating in the research was not greater than any ordinarily encountered in daily life or taking a routine survey and interview.

The treatment and control group took the pre assessment for the probability unit. These scores were recorded on an excel spreadsheet. To gain access to the video tutorials, the experimental group and their parents were provided passwords; in addition to letters explaining the great opportunity the videos offered them as resources for the probability unit. The participants in both the control and experimental groups who agreed in the consent and assent letters to be surveyed were given the Midgley's el al (2000) scale of self-efficacy to rate their beginning confidence level for mathematics. The probability unit was taught and the videos were placed on the video hosting site. At the end of the unit, both the control and treatment group took the post assessment for the probability unit. These scores were placed on the excel spreadsheet to analyze the achievement levels for both groups to see if the videos were effective in increasing achievement. The participants and their parents in the treatment group that agreed were given the surveys to check on which videos were the most effective and how they felt about having videos as a mathematical resource for probability. At the end of the probability unit, the students in the control and experimental groups were also given the Midgley's el al (2000) self-efficacy scale to rate their confidence level for mathematics, in order for the researcher to examine whether the videos provided the participants a higher level of self-confidence in the probability unit. The researcher purposely selected from the pool of participants that agreed to possibly being interviewed. These interviews were conducted to provide the researcher more in-depth information on qualities that viewers saw as needed to produce effective video tutorials. The data was collected from the qualitative and quantitative sources to analyze the effectiveness of the tutorial videos.

Scores for the perceptions and self-efficacy measures from the student and parent surveys given before and after the probability unit were evaluated using the SPSS software package. Paired t-tests were used to examine perception values. Interviews were analyzed using a simple pattern-seeking method to identify commonalities among responses to further explain barriers or benefits of having the teacher-made video tutorials as a resource for the mathematics students and their parents. The independent group t-test was used in paired comparisons between the control and experimental groups. The differences between the mean achievement scores of the control and experimental groups were analyzed to see if a significance difference between the two existed. T-tests were used to compare the mean scores between the students in the two groups.

Data Collection

The research involved data from an experimental and a comparison group. The experimental group consisted of all students in the researchers' seventh-grade math class (n=55). The comparison group consisted of all the students enrolled in another teachers' 7th grade math class (n=65). Together, the experimental and comparison groups comprised all seventh grade regular education math students in the school. Students and parents in the experimental group had access to the teacher-made videos. Students and parents in the comparison group did not have access to the videos. In cases where home Internet access and computers were limited, the instructor provided information on before/after school access opportunities at school; access through smart phones, checking out devices, and public access hours.

The tutorial videos were uploaded to Sprout, a website that collected analytics on the usage of the videos. A video tutorial was provided for each of the six main topic areas in the probability unit for the students and for the parents. From there, I used a website, SproutVideo, to house all my videos and gave separate usernames and passwords for log-ins to each parent and each student. As seen in Appendix H and I, when the participant logged-in to the website, they had access to all six videos I had produced on the probability unit. Therefore, Sprout housed twelve video tutorials, six for the students and six for the parents. The videos for the students and the videos for the parents were identical except for the identifying title, such as "Probability of Simple Events" for the students' video and "Probability of Simple Events-parent" for the parents' video. The videos were identified with these labels in order for analytics to be kept on each individual video and on whether a student or a parent viewed the video. The videos were added two, student and parent version, at a time to the website before the lesson was taught in the classroom. Once a video had been put on the website, it remained there for the duration of the math year.

Both, quantitative and qualitative data were collected for this research study. Quantitative data was collected from (1) pre- and post assessment scores on mathematics unit assessments for the experimental and comparison groups; (2) pre- and post assessment scores on mathematics self-efficacy scale for experimental and comparison groups; (3) analytics on video use from experimental group. Qualitative data was collected from surveys and interview questions with students and parents in the experimental group related to video use/preferences and perceptions about mathematics. The researcher also observed students in class and engaged in informal conversations with students about video use/math achievement/math self-efficacy. Observations and conversations were recorded as researcher field notes.

To measure student achievement, students' scores from a pre and post assessment in the probability unit were collected from both the experimental and comparison groups. These pre- and post unit assessments were required components of regular educational practice and were administered to both the experimental and comparison groups regardless of research. In addition to the pre and post math assessments, students in the experimental and control groups completed questions on a pre- and post likert-scale instrument related to self-efficacy in mathematics.

The researcher addressed the research question " Is there a significance increase in students' achievement levels for the experimental group after the use of the video tutorials as an instructional resource as measured by increased scores on the pre-post assessment?" Pre and post assessments were used as the quantitative data to determine if there was a significant increase in student achievement for the probability unit. The same pre test was given to the control group and the experimental group of students before the two teachers began the probability unit. Both teachers followed the same lesson plans for the six-week unit on probability. The experimental group had the teacher-made video tutorials as resources to use after school hours for remediation and enrichment for her students. The parents of these students had the videos to view as resources to use to remediate their skills and to provide them knowledge of how the probability concepts were taught by the teacher. These tutorial videos were given to help the parents have more confidence in helping their child with homework and their own perceptions of mathematics. The videos provided instruction to those students absent from class. At the end of the probability unit, both the experimental and control group of students took the same post assessment.

Social cognitive theories of learning (Bandura, 1986; Vygotsky, 1978) emphasized that students will learn from each other by observation, imitation, and modeling. The video tutorials took into account the students' prior knowledge and were used as modeling for primary knowledge transfer and teaching of the concepts. The video tutorials in this research were forms of modeling as described by Spector (2012) for the students to retain what they observed and have the ability to reproduce the action of working the math problems out for themselves. The researcher addressed the research question, "Is there a significance increase in students' self-efficacy levels after the use of the video tutorials as an instructional resource as measured by increased scores on the Likert scale survey and the video survey?" The experimental and control groups completed questions on a pre- and post likert scale instrument related to self-efficacy in mathematics. To monitor for a change in the perceptions that students had about mathematics, surveys were given before and after the probability unit was taught with the available online resource of the tutorials. Before and after the video tutorials were used by the students as an instructional resource, the students rated their confidence levels for mathematics by recording their answers to five questions using Midgley's el al (2000) confidence scale listed below:

Not true at all 1	2	Somewhat true 3	4	Very true 5

Midgley's el al (2000) Academic Efficacy subscale from Patterns of Adaptive Learning Scales (PALS) is a measurement of self-efficacy that measures the beliefs and attitudes that students have toward mathematics and the level of "I think I can" that the students possess to successfully complete classwork and homework assignments and review mathematical skills needed for the new Georgia Milestone Assessment.

Midgley's el al (2000) Academic Efficacy subscale from Patterns of Adaptive Learning Scales (PALS), which has an alpha of .78, was chosen as the instrument used to measure self-efficacy for its rating on reliability and validity. The Patterns of Adaptive Learning Survey (PALS) was under development for over a decade. In its current form, it contains highly reliable and valid measures of students' personal mastery, performance-approach, and performance-avoidance goal orientations. These measures have been used repeatedly in both cross-sectional and longitudinal samples. Downloadable manuals and documentation for the PALS are available on the World Wide Web at http://www.umich.edu/~pals/pals/ (Anderman, Urdan, and Roeser, 2003).

The videos were hosted on a third-party hosting site called SproutVideo. A unique password was provided to each student and parent participant in the experimental group. As mandated by federal FERPA and COPPA laws, no personal information for minors, including email addresses, was collected or stored by the hosting service. The video host provided automated analytics on student and parent video use (frequency, time of use, and type of device, mobile/handheld vs. computer). No IP addresses were collected, thus making location detection impossible. All individual use data remained confidential, unless a parent requested individual use data on a child. The children were informed that if their parent requested their individual use data, it would be provided to them. Individual participants were able to review their own use data. Video use was entirely voluntary and not related to student grades in any way. Participation or non-participation in the study did not affect access to instructional videos for students and parents in the experimental group.

Parents and students in the experimental group participated in surveys, interviews, and focus groups designed to gather qualitative information related to video use and preferences/perceptions about math. Interviews with the students and parents were conducted after the video tutorials were used as resources during the probability unit to address the research question “How are students and parents using the video tutorials?” These interviews provided more specific knowledge about the beliefs and attitudes that the students and parents had toward the mathematics video tutorials. The qualitative data from the parent and student interviews was analyzed to determine if there was an increase in the motivation of the students. Since the researcher was directly involved in this research by producing the video tutorials, the researcher pursued objectivity by recognizing the possible effects of these biases. The videos were produced in an effort to improve the perceptions parents and students had about their ability to be successful in mathematics. The study would determine if the videos changed the attitudes parents and students had about mathematics to an “I think I can, I think I can” attitude.

The experimental group was surveyed to rate their confidence levels for mathematics again after the probability unit was over and they had the opportunity to use the teacher-made resources. To use for comparisons, the students in the control group were surveyed to rate their confidence levels for mathematics again after the probability unit was over. Interviews with the parents and students were conducted to provide more detail information from the surveys on their perceptions of their ability to be successful in mathematics after having the availability of the teacher-made video tutorials to aid with this unit on probability. The research addressed the research question "What enables/impedes the tutorial videos?" The interviewer was seeking information on what factors enabled or impeded the effectiveness of the tutorial videos. Data was collected in two different categories: qualitative and quantitative.

Data Analysis

The quantitative and qualitative data was analyzed according to established research practices. The process and procedure of analysis sought an explanation, understanding, and interpretation of the research. The research questions were used to group data and identify similarities and differences. The analysis of the qualitative data drew out patterns while the analysis of the quantitative data was used to test the hypotheses and support conclusions. According to Miles and Huberman (1994), qualitative data collection and analysis usually proceed simultaneously; ongoing findings affect what types of data would be collected and how it would be collected. Making field notes, as the data collection and analysis proceeded, was an important data analysis strategy. The field notes traced the thoughts of the researcher and helped guide the interpretations of the observations to help answer the research questions and offer a theory as an explanation for the answers. Coding of the qualitative data assisted in the analysis of the data, as suggested by Miles and Huberman (1994) in data reduction (extracting the essence), data display (organizing for meaning), and drawing conclusions (explaining the findings).

In analyzing the qualitative data gathered from the research through surveys, interviews, observations, field notes, and informal conversations with parents and students, descriptive themes, trends, and patterns were generated. A list of "start codes" developed from the research questions and conceptual framework were used as a foundation for initial data analysis, but, as the study progresses, these start codes were amended, revised, and abandoned, as needed (Miles & Huberman, 1994). Open coding was used on the data collected, in order for the data to be scrutinized for commonalities so categories or themes in the data would emerge. Open coding aided in the process of reducing the data to a small set of themes that appeared in the qualitative data collected. These themes were used to describe the phenomenon that was under investigation and answer the research questions being studied. Coding allowed for semi-structured interviews, yet, allowed for the interviews to go in directions that the researcher may not have considered. Interviews were transcribed before the coding process began. These interviews were conducted to provide the researcher more in-depth information on qualities that viewers saw as needed to produce effective video tutorials. Data was analyzed to evaluate the effectiveness of the video tutorials. Interviews were analyzed using a simple pattern-seeking method to identify commonalities among responses to further explain barriers or benefits of having the teacher-made video tutorials as a resource for the mathematics students and their parents.

Data from the rich everyday conversations with the students and parents who watched the videos were recorded in a journal for coding. Observations by the researcher of students viewing or discussing the video tutorials were recorded in the journal. These field notes, memos and journals were used to chronicle the events and promote ongoing reflection and data analysis. Reflection of the data allowed the researcher to write about the significances found in the qualitative data.

The data from the pre-post Likert scale, as well as the pre-post content assessment, administered to the experimental and control groups, was analyzed using independent group t-test for paired comparisons. Scores for the perceptions and self-efficacy measures from the student and parent surveys given before and after the probability unit were evaluated using the SPSS software package. Paired t-tests were used to examine perception values. The variations in pre and post assessments scores were analyzed for the control and experimental classrooms. The variations in scores for the experimental group were compared to previous variations in their pre and post assessments that were given for the two previous units, rational numbers and algebraic expressions-equations units. These scores were placed on the excel spreadsheet to analyze the achievement levels for both groups to see if the videos were effective in increasing achievement. The independent group t-test was used in paired comparisons between the control and experimental groups. The differences between the mean achievement scores of the control and experimental groups were analyzed to see if a significance difference between the two existed. T-tests were used to compare the mean scores between the students in the two groups. The website hosting the videos provided analytics on the video usage, such as how many times the videos are watched, the engagement of the viewer, and the type of device the viewer was using to watch the videos. Tables, spreadsheets and graphs were used to display this quantitative data from the research. The quantitative data produced by the automated analytics were analyzed in graphs and charts to make comparisons and identify trends and patterns.

The data for each research question was collected and analyzed as follows:

Research Questions	Hypothesis	Data Collection	Data Analysis
How are students and parents using the video tutorials?		Surveys; Interviews; (Qualitative &	Descriptions, trends, and patterns

		Quantitative) Analytics from video hosting website (Quantitative)	Results were coded and analyzed for trends and patterns
What enables/ impedes the videos?		Surveys; Interviews; Observations; Conversations; Field Notes (Qualitative)	Descriptions, trends, and patterns Results were coded and analyzed for trends and patterns
Is there a significance increase in students' self-efficacy levels after the use of the video tutorials as an instructional resource as measured by increased scores on the Likert scale survey and the video survey?	H1: Yes, the self-efficacy levels will increase from the before and after the participants used the video tutorials as an instructional resource	Pre-post content Likert scale administered to experimental group and the control group (Quantitative) Surveys (Quantitative)	Independent group t-test/paired comparison
Is there a significance increase in students' achievement levels for the experimental group after the use of the video tutorials as an instructional resource as measured by increased scores on the pre-post assessment?	H1: Yes, the students' achievement levels for the experimental group will increase greater than the achievement levels for the control group	Pre-post content assessment administered to control and experimental groups (Quantitative)	Independent group t-test/paired comparison

Researchers' position

Self-efficacy, the belief students have about their skills, is useful in understanding students' motivation and achievement in academic contexts, particularly in the area of mathematics. With increased self-efficacy, students are more likely to try to work mathematics problems, and with more effort will come higher levels of achievement. The researcher aimed to produce effective video tutorials that would be useful instructional resources for the students. If this happened, the researcher would produce more videos for other units in the math curriculum and provide guidance for other teachers to produce their own effective video tutorials for their subject areas. Therefore, the main basis for this research was to see if the video tutorials could provide greater self-efficacy and give the students more confidence in their abilities to be successful in mathematics, thereby, giving the students the "I think I can, I think I can" perspective about mathematics.

Limitations

One limitation to consider is the internal validity of the research study, which is the extent to which the research's design and the data that was yielded allowed the researcher to draw accurate conclusions of the cause and effect. The experimental and control groups were taught by two similar, but different, teachers. One was a female, and one was a male. There surely would have different personalities and teaching styles. The two classes contained different students with differing motivation levels and personalities. Subtle differences existed in the temperature, noise levels, and interpersonal dynamics in the two classrooms. To maximize internal validity, the researcher considered the variables that existed in the two classes.

A limitation that cannot be overlooked was that the researcher was actively involved in the making of the videos and needed to remain diligent in being objective and keenly aware that bias could exist. Parents and students, alike, may have given bias answers in the surveys and/or interviews since the researcher, who is also the student's teacher, conducted these. Internet availability after school hours was another limitation. Other avenues, such as an app for smart phones needed to be explored, since smart phones were more prevalent than computers in the homes of most of the students in the population for this study.

CHAPTER FOUR

RESULTS

The seventh grade students at this school had the most difficulty on the mathematics section of the CRCT in the area of data and probability, with 65 percent of the students answering less than half of the questions correctly (Georgia Department of Education, 2015). To address this problem, this research studied the strategy of providing teacher-made instructional video tutorials, which targeted the students' problematic areas in the Georgia Performance Standards Common Core probability unit. With this in mind, this mixed methods research study investigated the four dimensions related to the construction, implementation, and effectiveness of teacher-made video tutorials in one middle school mathematics classroom. The researcher utilized both qualitative and quantitative methods to (1) *better understand how students and parents use the available videos* and (2) *identify factors that enable/impede the effectiveness of the video tutorials*. The researcher also implemented a quantitative, quasi-experimental design to investigate the relationship of the video tutorials on (3) *student self-efficacy* and (4) *student achievement in mathematics*.

The purpose of this chapter is to report the findings of this study. Both the qualitative and quantitative research reached the same conclusion that students used the video tutorials more often and for a variety of more reasons than their parents. The study revealed students' self-efficacy levels increased when given the tutorials as additional resources for them to use. Also, the qualitative and quantitative data identified higher confidence levels for both parents and students after the use of the tutorials. While student achievement scores did not show marked improvement when tutorial videos were used, they did display interesting results. This study also assessed the factors that helped and the factors that hindered the effectiveness of the tutorial videos. A big finding was that students and parents liked the videos to be under ten minutes in length to keep their attention. The results of the analysis of data for each of the four dimensions in response to the four research questions that guided this study will be presented. Chapter five will then analyze these findings and the implications this research has on students, educators and the future use of tutorial videos in teaching. It will also offer suggestions for future research on tutorial video usage and production.

Research Questions

This mixed methods research study explores the four dimensions related to the construction, implementation, and effectiveness of teacher-made video tutorials in one middle school mathematics classroom. The researcher utilized both qualitative and quantitative methods to answer the research questions that follow:

(1) How are students and parents using the video tutorials?

(2) What factors enable/impede the effectiveness of the video tutorials?

The researcher also implemented a quantitative, quasi-experimental design to investigate the research questions that follow:

(3) Is there a significance increase in students' self-efficacy levels after the use of the video tutorials as an instructional resource as measured by increased scores on the Likert scale survey and the video survey?

(4) Is there a significance increase in students' achievement levels for the experimental group after the use of the video tutorials as an instructional resource as measured by increased scores on the pre-post assessment?

The investigation process and findings for each of these research questions will subsequently be discussed individually, including the data collection tools used, the data analysis, and the results of the research. The chart presented at the end of the data analysis section in chapter three contained how the data for each research question was collected and analyzed. These research findings will be reported in this chapter in the same sequential order as in this chart. The outline of how these results are reported follows:

Research Question One
- Quantitative Data – Parent and Student Video Surveys – Issue One
- Quantitative Data – SproutVideo
- Qualitative Data – Interviews – Parents
- Qualitative Data – Interviews – Students

Research Question Two
- Quantitative Data – Parent and Student Video Surveys – Issue Two
- Qualitative Data – Interviews, Observations, Conversations, and Field Notes - Parents
- Qualitative Data – Interviews, Observations, Conversations, and Field Notes - Students

Research Question Three
- Quantitative Data - Parent and Student Video Surveys – Issue Three
- Quantitative Data- Pre Post Self-Efficacy Likert Survey

Research Question Four
- Quantitative Data – Pre and Post Assessments

Research Question One - How are students and parents using the video tutorials?

In search of the answer to “How are students and parents using the video tutorials?”, different avenues were used as data collection tools. Qualitative and quantitative data was collected from surveys and interviews, while the analytics from the video hosting website provided additional quantitative data. The qualitative data was analyzed and coded to identify descriptions, trends, and patterns. The results of the quantitative data collected will be reported first.

Quantitative Data – Parent and Student Video Surveys Issue One

"Issue One" of the student and parent surveys contained eight questions and the results reported how the videos were used in response to research question one. The entire student survey, as seen in Appendix C, and the entire parent survey, as seen in Appendix D, were given to the participants from the experimental class after the unit on probability was taught with the students and parents having access to the video tutorials as additional resources available online to them continually throughout the unit.   Data collected from these first eight questions were in response to research question one on "How are students and parents using the video tutorials?" These eight questions for the students and parents are as follows:

Student Survey	Parent Survey
Issue 1: Use of videos	**Issue 1: Use of videos**
Q1. I watch the videos daily	Q1. I watch the videos daily
Q2. I watch the videos to help me learn	Q2. I watch the videos to help me learn
Q3. I watched the videos for enrichment and to learn more	Q3. I watched the videos as enrichment to help my child
Q4. I watched the videos because I missed the lesson in class	Q4. I watched the videos because my child missed the lesson in class
Q5. I watched the videos before the teacher taught the lesson	Q5. I watched the videos before the teacher taught the lesson
Q6. I watched the videos after the teacher taught the lesson	Q6. I watched the videos after the teacher taught the lesson
Q7. I used the videos to help with homework	Q7. I used the videos to help my child with homework
Q8. I used the videos to help me prepare for a test	Q8. I used the videos to help my child prepare for a test

For "Issue One – Use of Videos" in the video survey, the reliability statistic from the Cronbach coefficient alpha for the eight items from the post-survey was .89. The Pearson correlation coefficients for the post survey found all eight items were significantly correlated with one another at $p < .001$. A coefficient of .70 or higher is considered good reliability. The responses were scored on a Likert Scale from one (strongly disagree) to five (strongly agree). Table 1 displays the combined mean and standard deviations for both the parents and the student responses for Issue One.

Table 1: Mean and Standard Deviation for Student and Parent Video Survey Issue One

Question	Students		Parents	
	M	SD	M	SD
VS1	3.18	1.06	3.35	1.00
VS2	4.25	.89	3.56	1.01
VS3	4.02	1.01	3.76	1.07
VS4	3.02	1.33	2.94	1.04
VS5	2.53	1.18	2.98	.99
VS6	4.02	1.01	3.51	.96
VS7	3.75	1.36	3.75	1.02
VS8	3.76	1.33	3.75	1.04
VSC	3.57	.83	3.45	.81
C-G	3.26	.87		
C-NG	3.73	.78		

Note. M=Mean. SD=Standard Deviation. VS1- VS8 = Question #1 – Question #8. VSC=Video Survey Questions Combined. C-G=Combined gifted means. C-NG=Combined non-gifted means. Scores ranged from one (strongly disagree) to five (strongly agree).

Students and parents were surveyed on their use of the video tutorials in questions one through eight on the video survey, VS1-VS8. The second question on the video survey, VS2, for the students was "I watch the videos to help me learn." Responses from the students were scored from one to five going from strongly disagree to strongly agree. For the students, the highest rated question was question two, which scored a mean of 4.25 by the students. This corresponded to the interview data where students stated that they used the videos to learn more about the probability topic. The parent survey revealed that the third question on the video survey, VS3, which read "I watched the videos as enrichment to help my child" rated the highest scores from the parents with a mean of 3.76. Again, this corresponded to the comments from the parent interviews where parents commented that they used the videos to help their child learn or to enable them to view the tutorials with their child to offer enrichment at home to the mathematics lessons that the student learned in the classroom.

For the student responses, VS5, "I watched the videos before the teacher taught the lesson", was the lowest scoring question by the students with a score of 2.53. Students commented during the interviews that they had rather hear the lesson from the teacher in the classroom first and then use the tutorials as a refresher or enrichment to further enhance what they had heard in the classroom. The only time that the interviews provided different results was when students had been absent and were unable to hear the teacher in the classroom first. Since the student missed the lesson in the classroom, the video tutorial that they watched was their only form of instruction. The parents scored the fourth survey question, VS4, the lowest with a mean score of 2.94, which stated, "I watched the videos because my child missed the lesson in class." During the interviews, parents appreciated the lessons being available if their child was absent from class and they made sure their child watched the video tutorials, but the parents did not comment that they watched the videos since their child was absent from class. Again, this goes back to parents biggest concern that their lack of time did not allow them to view the videos as much as they may have wanted to view them.

The overall combined mean of the answers from the questions about the use of the tutorial videos from the nineteen gifted students was 3.26 on a scale of one to five with five being "strongly agree" and a mean of 3.73 for the thirty-six non-gifted students in the treatment group who received the video tutorials as the added instructional resource. The non-gifted students rated their mean use of the videos higher than the gifted students. This included watching the videos daily, using the videos to review for upcoming tests, completing their homework, and to help them learn. The mean identifies that both groups used the videos but the non-gifted students used them more frequently and/or for more varied reasons.

Overall, the combined mean from questions one through eight on the video survey for the students had a mean of 3.57 and for the parents a mean of 3.45. These questions all centered on the use of the video tutorials. The scores indicate that the students did record using the videos slightly more than the parents reported. The parent mean of 3.45 seemed to be skewed since the quantitative data from SproutVideo does not show that many parents, actually only around 30, signing into SproutVideo under their own logins to view the tutorials. The explanation may be that the parent viewed the video with their child on the child's device under the student's login. While parents were asked to use their own logins, it easily could happen that they just looked on with their child while the student already had the video playing on their phone or laptop under the student's login. This would account for the low number of parent views that SproutVideo provided as the actual data for the number of parent views per video. The parent interviews did indicate more parental views than were actually recorded with SproutVideo.

Quantitative Data - SproutVideo

Additional quantitative data was collected by the video hosting website, SpoutVideo, which was used to house the video tutorials and password protected for each individual student and each individual parent for the validity and reliability of the collection of analytics for each video. The website tracked viewer engagement to see how engaged the viewers were with the videos. The website recorded how many people clicked to play the videos, how much of a video was watched. SproutVideo tagged and tracked individual users to see which of the videos they watched. SproutVideo provided in-depth information about every single play of each video. It recorded how much of the video the viewer watched, if they watched certain parts of the video more than once and if they paused the video or skipped a section of the video. SproutVideo also dated and time stamped each view of the individual videos.

Table 2 lists the number of views for the six video tutorials for students and the six video tutorials for parents that were provided during the probability unit on each of the main topics discussed in that unit. The six videos are listed separately by title for the students, such as "Probability of Simple Events" and as "Probability of Simple Events-parent" for the parents. Only students had access to the student videos and only parents had assess to the parent videos. The videos were the same exact tutorials. The reason the videos were divided into parent and student tutorials was strictly for the purpose of tracking separate data for the use of the videos by parents and the use of the videos by students. Table 2 shows the number of times each video tutorial was played and whether parents or students watched the videos more often. The data in the table shows that the use of the tutorials did not decline over time. This is an important finding and meaningful when assessing the engagement and use of the tutorials by the students and the parents.

Table 2 – Total Views of Video Tutorials by Parents and Students

Videos	Students' Views	Parents' Views
V1 Probability of simple events	108	35
V2 Theoretical and experimental probability	112	30
V3 Fundamental counting principle	137	11
V4 Probability of compound event	77	23
V5 Independent and dependent	95	10
V6 Simulations and permutations	111	13

Note. V=Video.

At a glance, one can visualize the vast difference shown in Table 2 in student and parent views of the tutorial videos. A few of the videos had over ten times as many student views as parent views. Consideration should be noted that parents may have been looking over the student's shoulder and viewing the videos with them as the student watched the video on their student login account. Even with that consideration, student views probably outweighed the parent views by a large margin.

The most watched student video was the third video, V3, on the fundamental counting principle with 137 views. The students commented that this was the most difficult concept, one that was confusing to them and they needed to view the video to review what they had heard in class. The first video, V1, on the probability of simple events had 108 student views. Since the first video for the students ended up being the fourth most viewed video that would dismiss the assumption that students were just watching for the novelty of seeing what the videos were like. This would correlate with the qualitative data that the students actually viewed the videos and used them for remediation and enrichment.

The video most watched by the parents was the first video, V1, on the probability of simple events with 35 parent views. The second most viewed video by the parents was the second video, V2, on theoretical and experimental probability with 30 parent views. This aligns with the qualitative data that the parents did like having the video tutorials but just did not have the time to help their child with homework and view the videos. By the first and second videos being the top two videos by the number of views, this would indicate that the novelty of the videos being a new math resource might have played a part in some of the parent views since the number of parents viewing the videos dropped after the first two videos.

SproutVideo tracked engagement to allow for new insight into how the viewers watched and interacted with the videos. SproutVideo provided engagement graphs of the aggregate data collected for each video. The actual graphics from SproutVideo are included to allow the reader to identify the level of analytics available online for educators to use in their decision-making. Table 3 presents the aggregate data for each video in an engagement graph that shows what percentage of people who watched the video were still watching at a given time. In other words, this graphic exhibits the percentage of viewers still watching a video as shown in a second by second continuous visual. For instance, in video one, over 100 percent of the students played the video at the beginning but only 50 percent of the students were still watching the video at the end of the video. This could be accounted for by reasons such as that the student realized they had already viewed the video, so they stopped the play or maybe they were just checking the video out to see if they needed remediation in that topic area. The graphs that are displayed in Table 3 are part of the analytics provided by the SproutVideo website. The graphs contain numerical data on the usage of each video. SproutVideo explains this aggregate data for each video as follows:

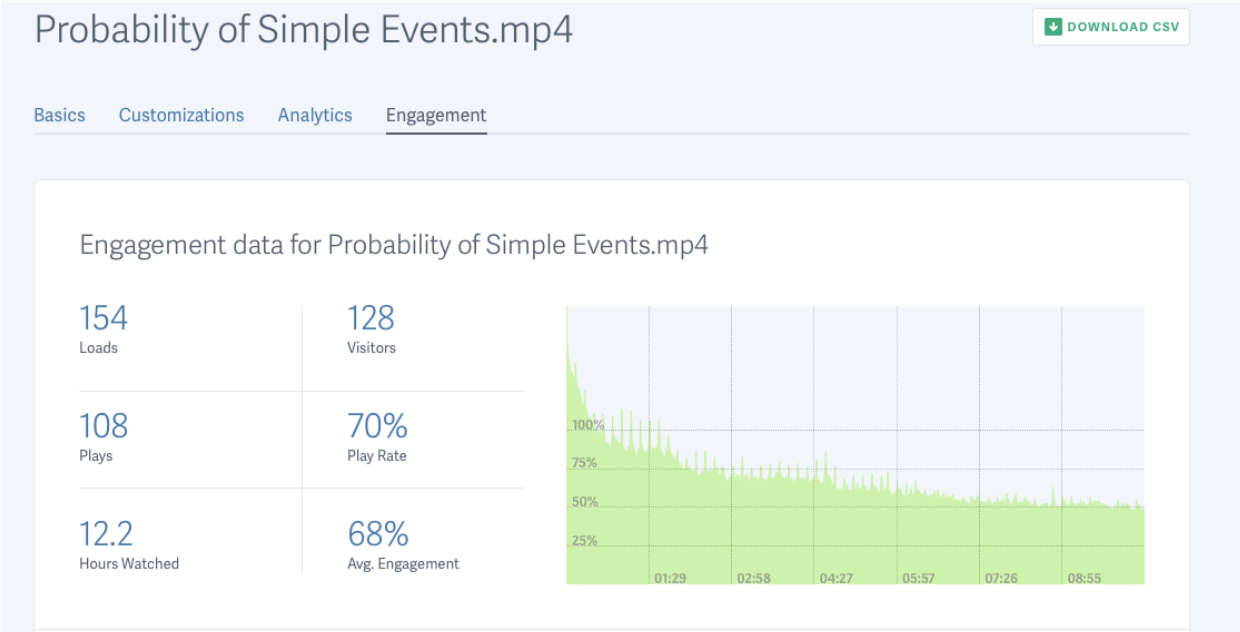
- **Loads** - This number indicates the number of times the video was displayed on a page. This number is an indication if you are doing good job getting people interested in checking out the video, whether they actually watch the video or not.
- **Visitors** - This number indicates the number of unique individuals who loaded the video from a specific device. If a student logged on from a mobile phone and from a desktop at different times, this would be considered as two visitors.
- **Plays** - The number of times viewers hit the play button on the video.
- **Play Rate** - The percentage of loads that resulted in plays. This number gives you a good indication of how compelling the poster frame image was or desire of the individual to actually play the video.
- **Time Watched** - This is the total amount of time viewers spent watching the video.
- **Average Engagement** - The average percentage of the video that viewers watched (SproutVideo).

Table 3 contains the aggregate data engagement graphs produced by SproutVideo for each of the six videos viewed by students and the aggregate data engagement graphs for each of the six videos viewed by parents. An explanation of the data provided in the graph for Video 1 will be provided in order to see the details of data SproutVideo provided for each video. The green graphics displays the percentage of viewers watching the video as each second mark throughout the duration of the video. The green graphic for video 1 exhibits over 100 percent of the students were watching the video for the first few seconds and by the end frame of the video only 50 percent of the students were still engaged. This data has the potential to lead to misleading conclusions. Many of the students mentioned in the interviews that they loaded the videos to check out different devices they wanted to use and then stopped the video once they saw that the device would play the video or that they were just checking the videos out. For whatever reason, it was noted that students did load the video and stop viewing but not due to disengagement or wanting to stop viewing the video. Many times the students mentioned loading the videos without having intention of viewing the entire video at that time. The graphics identify this by having a spike in the green graphic at the beginning of the videos. A few seconds into the video the green graphic levels out for the most part, identifying that those students who stayed on to watch the video actually watched the video to the end. The data revealed that video one had 154 loads. This means that the video was loaded onto a student's login page 154 times. The next data number was 108 plays, which means that for those 154 times that a student loaded video one, 108 students continued the process and pushed the play button. The play rate of 70 percent exhibits the percent of times that the154 loads actually ended up with the 108 plays. The total amount of time that this video, which was under ten minutes long, was viewed by all students was 12.2 hours. There were 128 different times logins were used for this video. This means that the video was watched more than once by many of the students since only 55 students in the experimental group received logins. The average engagement of 68 percent represents that on average students watched 68 percent of the video. By being an average number, it takes into account all the viewers, even those that hit the play button just to check out the video and then stopped the play. This aggregate data for each student and parent video is available in Table 3 as follows:

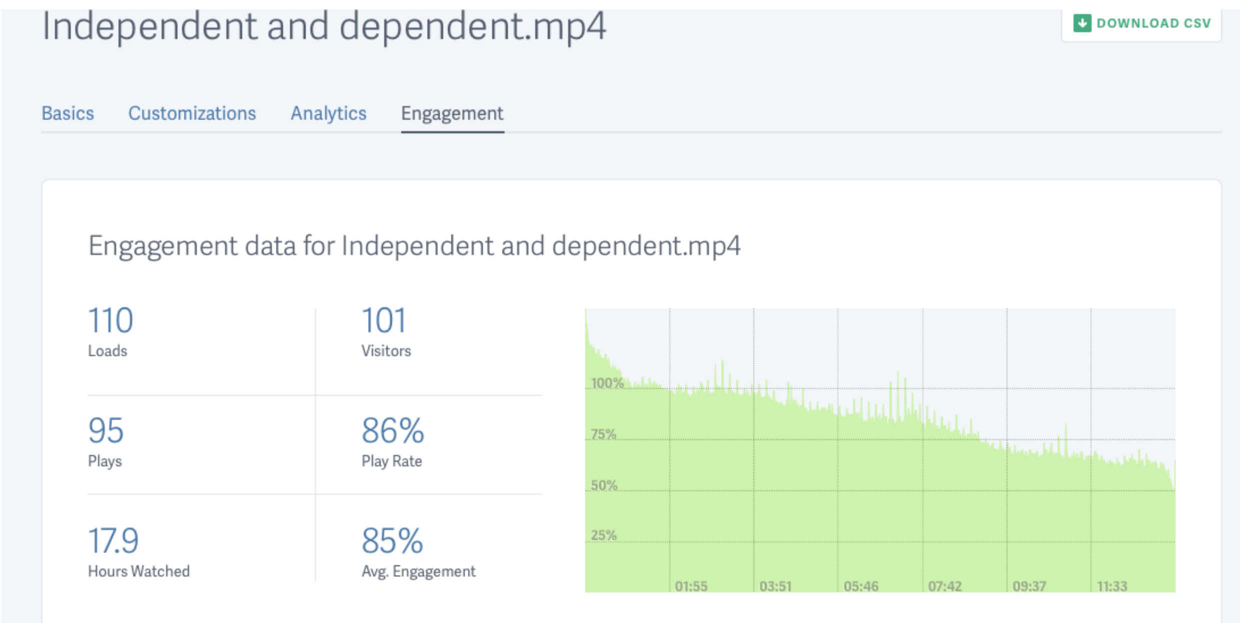
Table 3 – Aggregate Data for Video Engagement by Students and Parents

(Produced by SproutVideo)

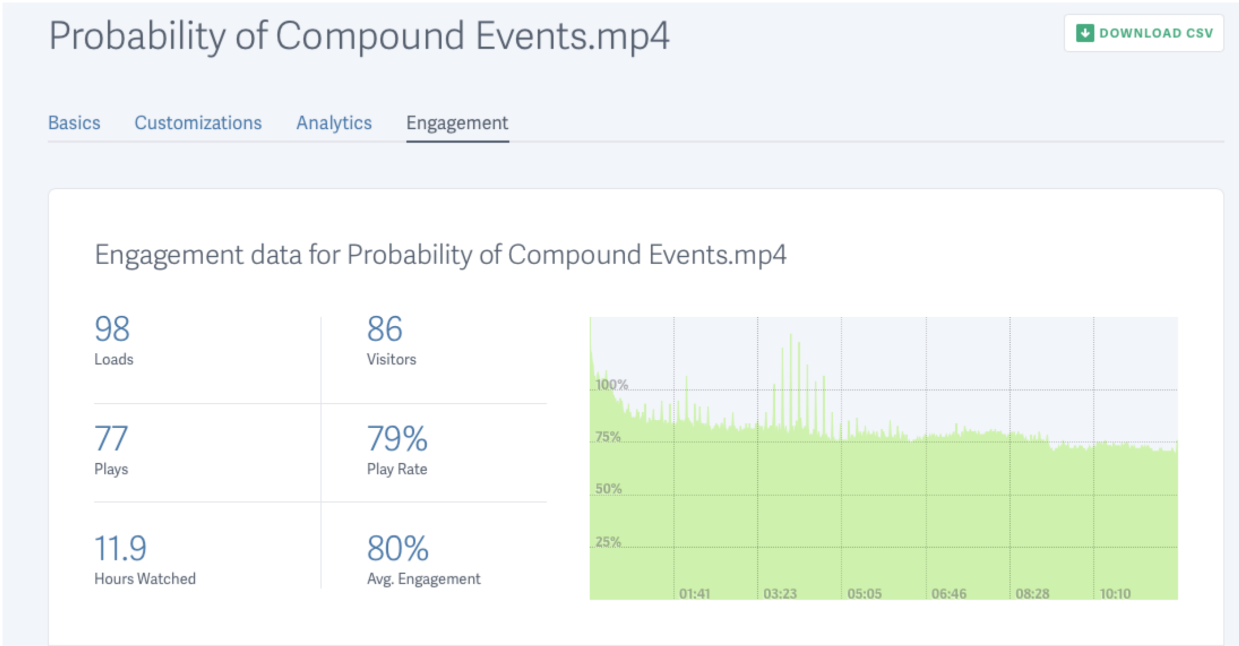
Video 1- Probability of Simple Events (Students)



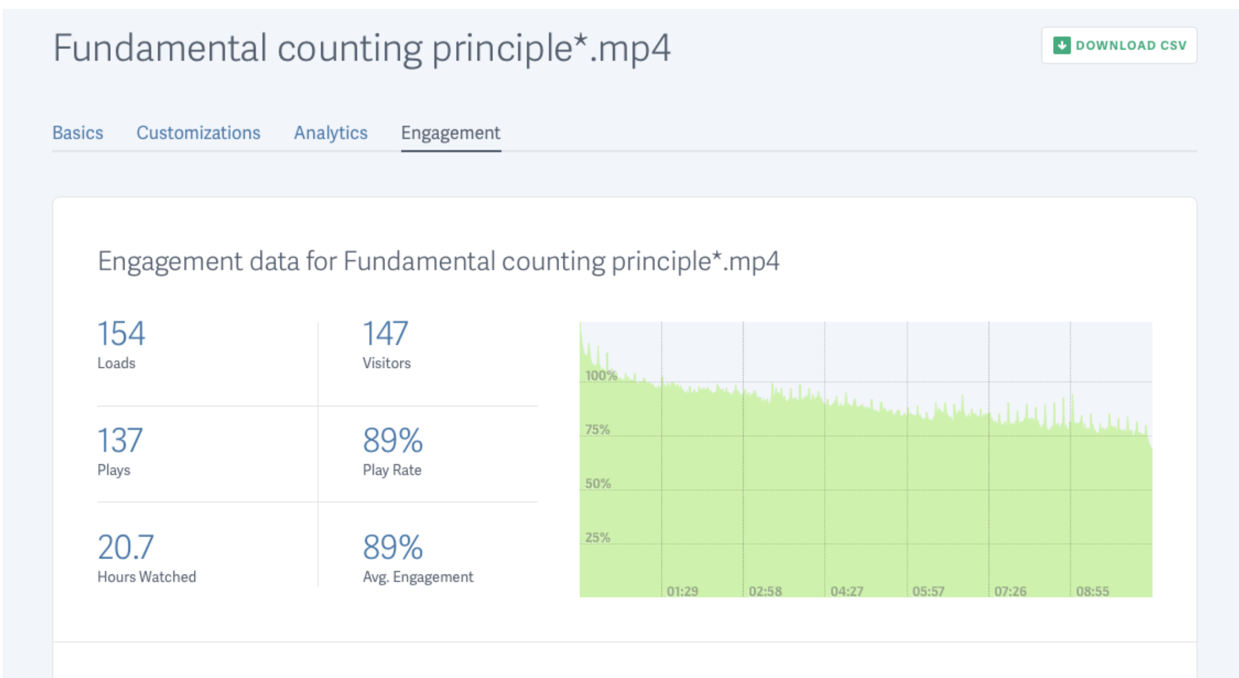
Video 2 – Independent and Dependent Events (Students)



Video 3 – Probability of Compound Events (Students)

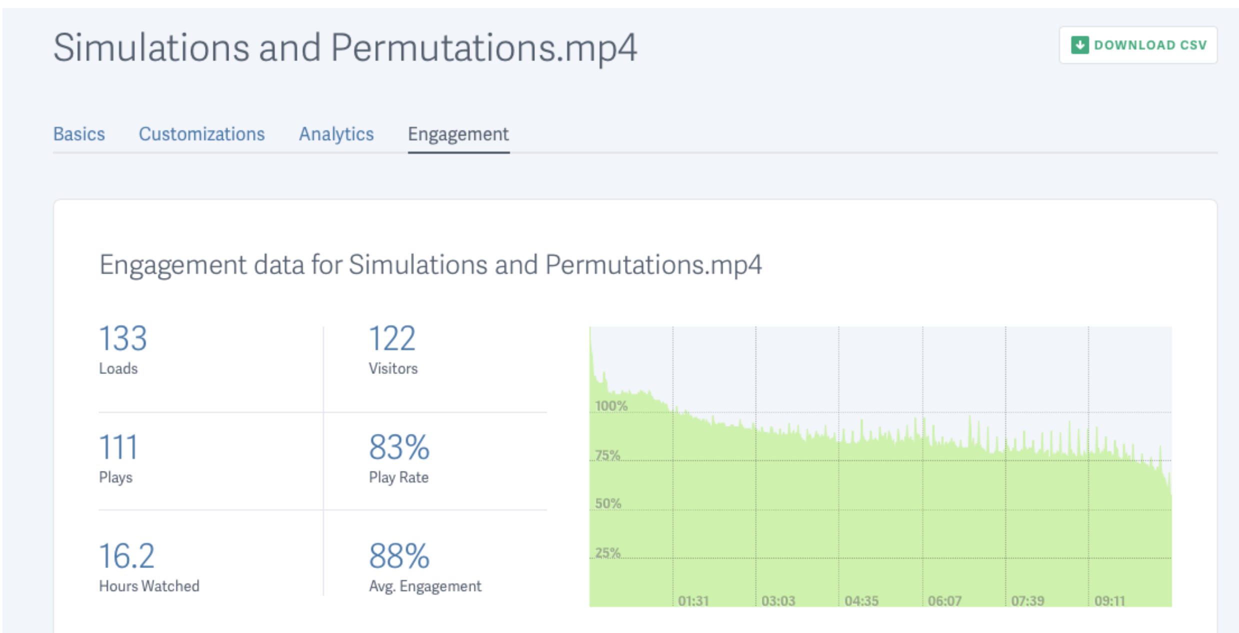


Video 4 – Fundamental Counting Principle (Students)



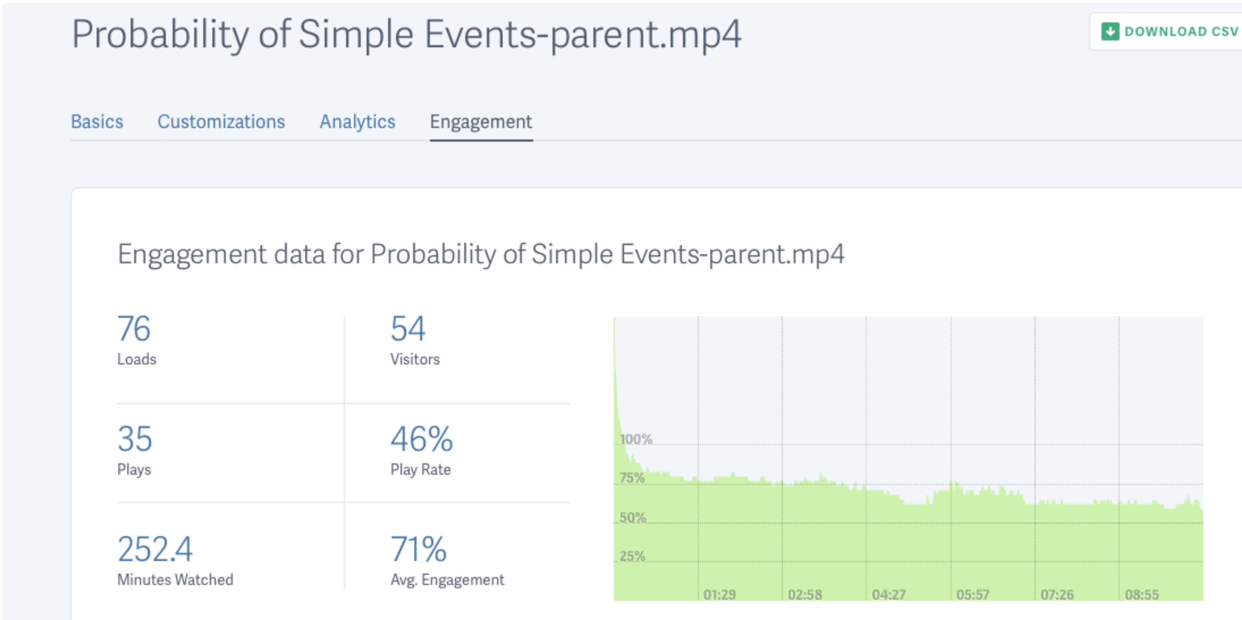
Video 5 – Theoretical and Experimental Probability (Students)

Video 6 – Simulations and Permutations (Students)

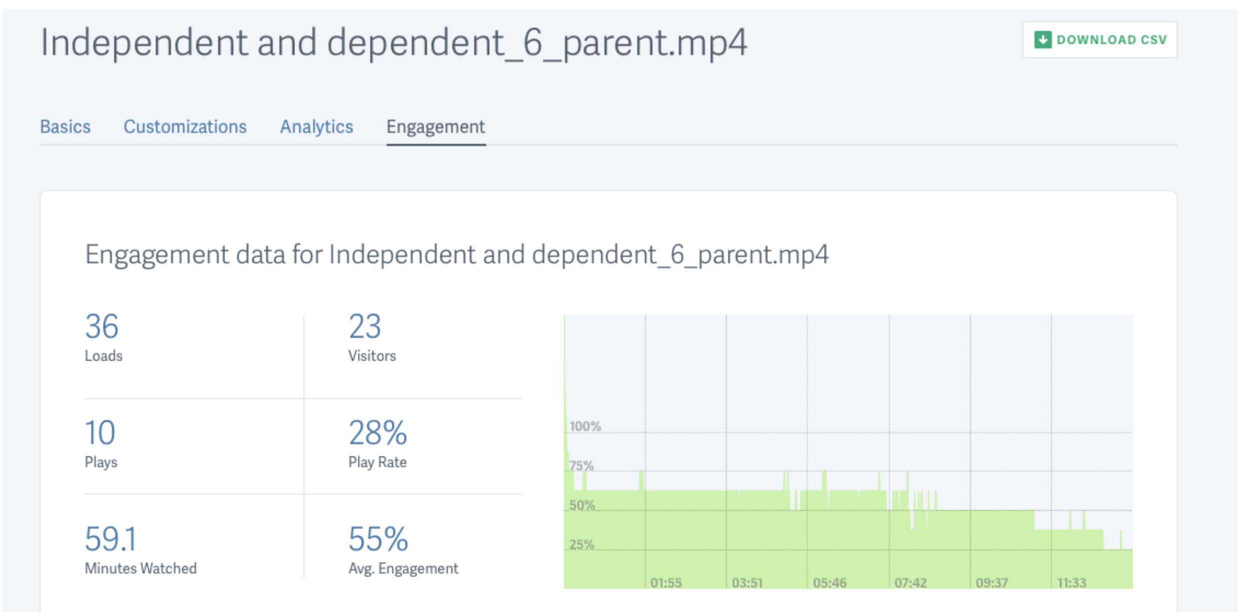


Aggregate Data for Video Engagement by Parents (Produced by SproutVideo)

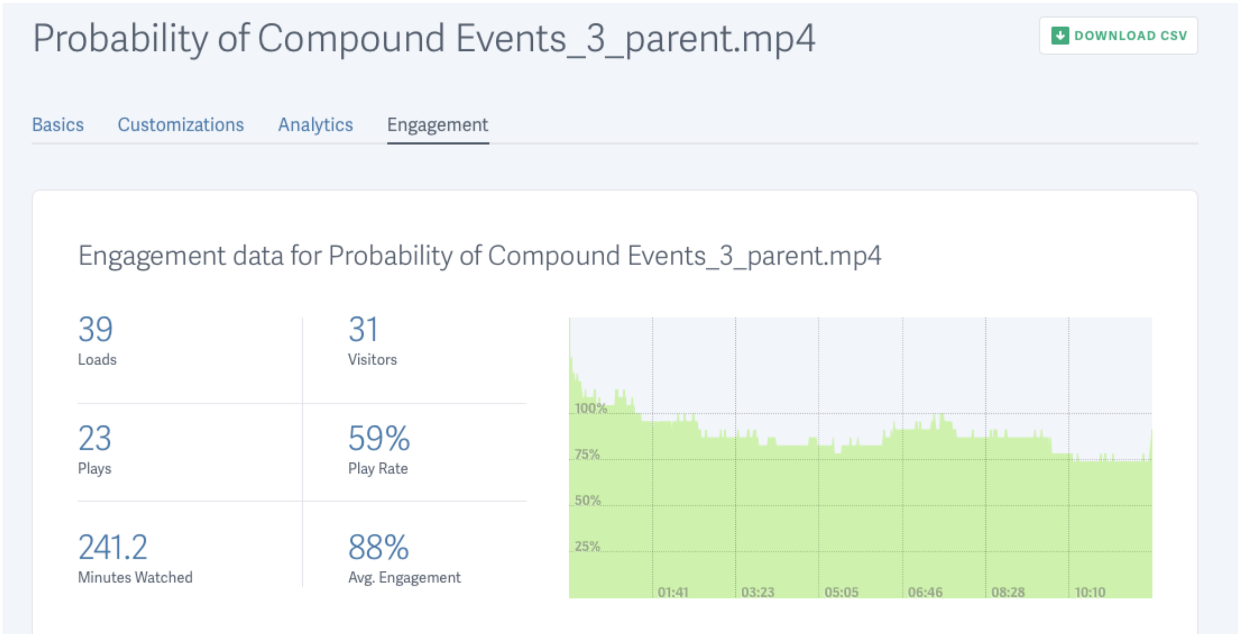
Video 1- Probability of Simple Events (Parents)



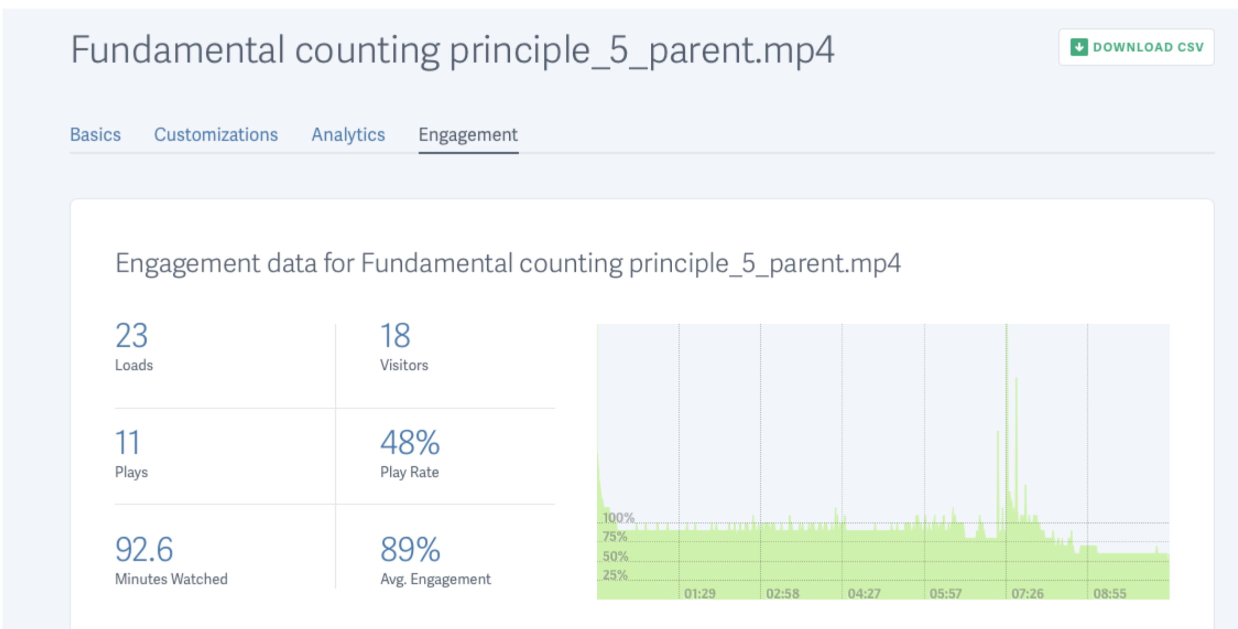
Video 2 – Independent and Dependent Events (Parents)



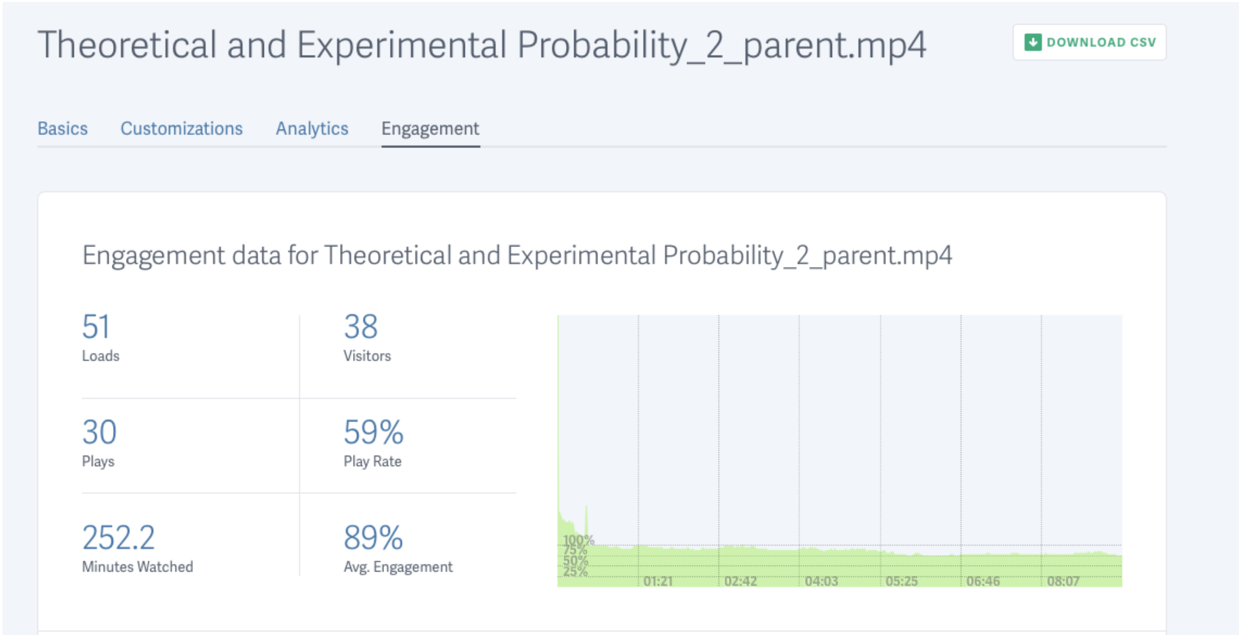
Video 3 – Probability of Compound Events (Parents)



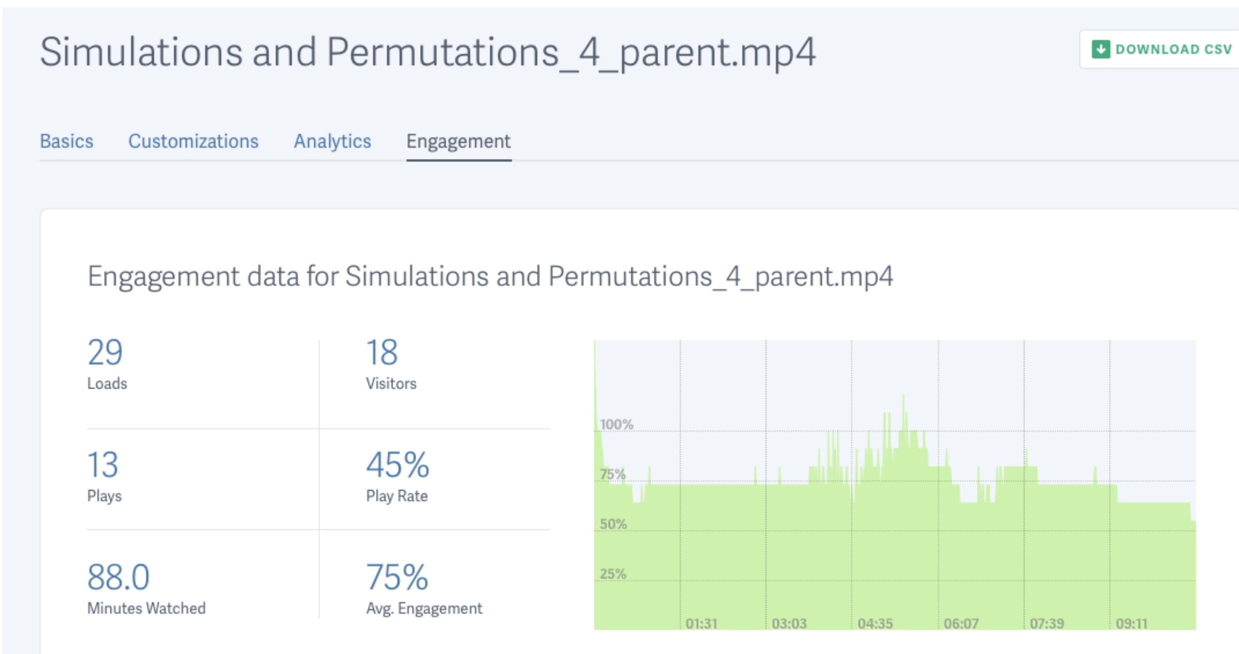
Video 4 – Fundamental Counting Principle (Parents)



Video 5 – Theoretical and Experimental Probability (Parents)



Video 6 – Simulations and Permutations (Parents)



Tables 3 presented the aggregate data for each video in an engagement graph that showed what percentage of each video parents and students watched, how many times the website was loaded, how many times the video was played and how many unique individuals watched the videos. Table 4 shows the combined averages of these statistics by student and parents.

Table 4 – Analytic Averages for Student and Parents for Video Engagement

	Loads	**Plays**	**Hours Watched**	**Visitors**	**Play Rate**	**Average Engagement**
Students	132	106.7	15.8 hours	118.7	80.8%	84.2%
Parents	42.3	20.3	2.74 hours	30.2	47.5%	77.8%

As reported in the interviews, Table 4 verifies that the video engagement was much greater for the students in this study than the parents. Although her sample size was too small for conclusive results, June Kronholz's (2012) initial research on Khan Academy, gave similar promising results that video tutorials increased students' engagement and their perceptions of math.

The play number indicates the average number of individuals who played the video. This is very informative showing an average of only 20.3 parents played each video while 106.7 students played each video. There were 55 students given access to the videos. This represents that some students watched the videos more than once. The play rate is the percentage of times a video was loaded that actually resulted in the viewer proceeding to play the video. The play rate was only 47.5 percent for parents. This could be explained by the fact that the average number of times a parent loaded any video on their device was 42.3 times but the average number of times they proceeded to hit the play button and actually play the video was only 20.3 times. This could show their interest in seeing what the videos looked like but not taking the time to actually view the videos as was pointed out in the interviews. This data matches the qualitative data collected that parents did not have or take the time to view the videos, but knew the fact the videos were there. The results also coincided with the students' responses in the surveys and interviews that they really watched the videos. The average number of loads per video by students was 132 times of which a whopping average of 106.7 times this ended in the student actually playing the video.

SproutVideo provided heat maps of each view of a video. The viewer engagement heat maps made it easy to see how the viewer watched the videos. At a glance, you can see which parts of the videos were watched, which parts were re-watched, and which parts were skipped. The colors of the heat lamps are as follows:

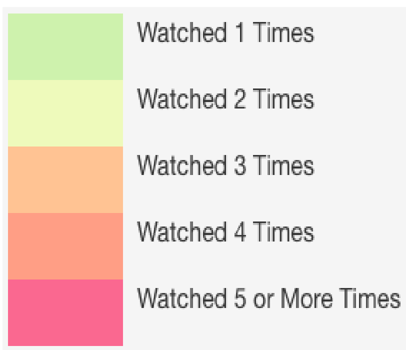
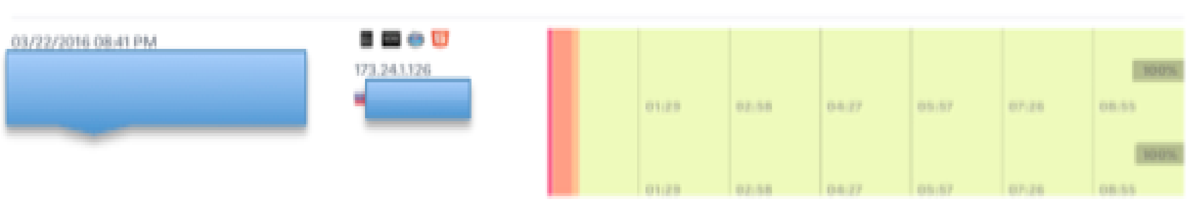
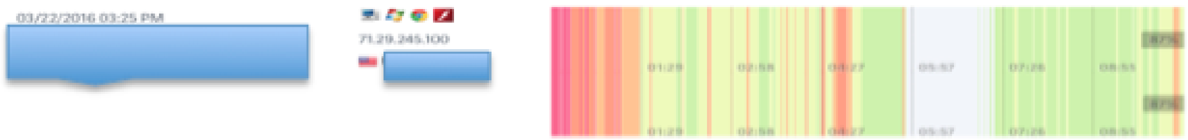
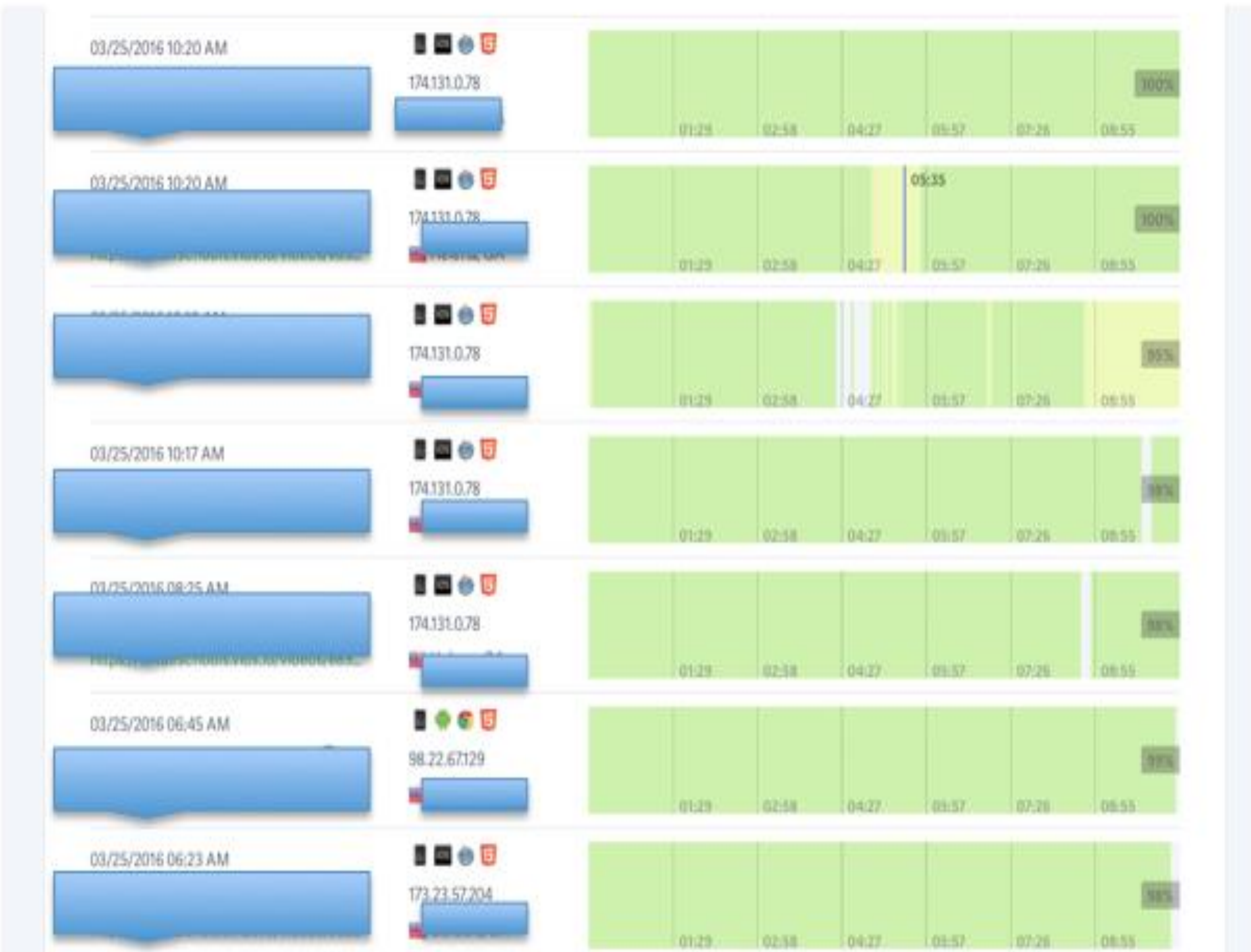


Table 5 demonstrates a few examples of what this data looked like from SproutVideo with all identifiable data boxed out.

Table 5 – Heat Maps Examples (Produced by SproutVideo)




03/22/2016 03:25 PM
71.29.245.100

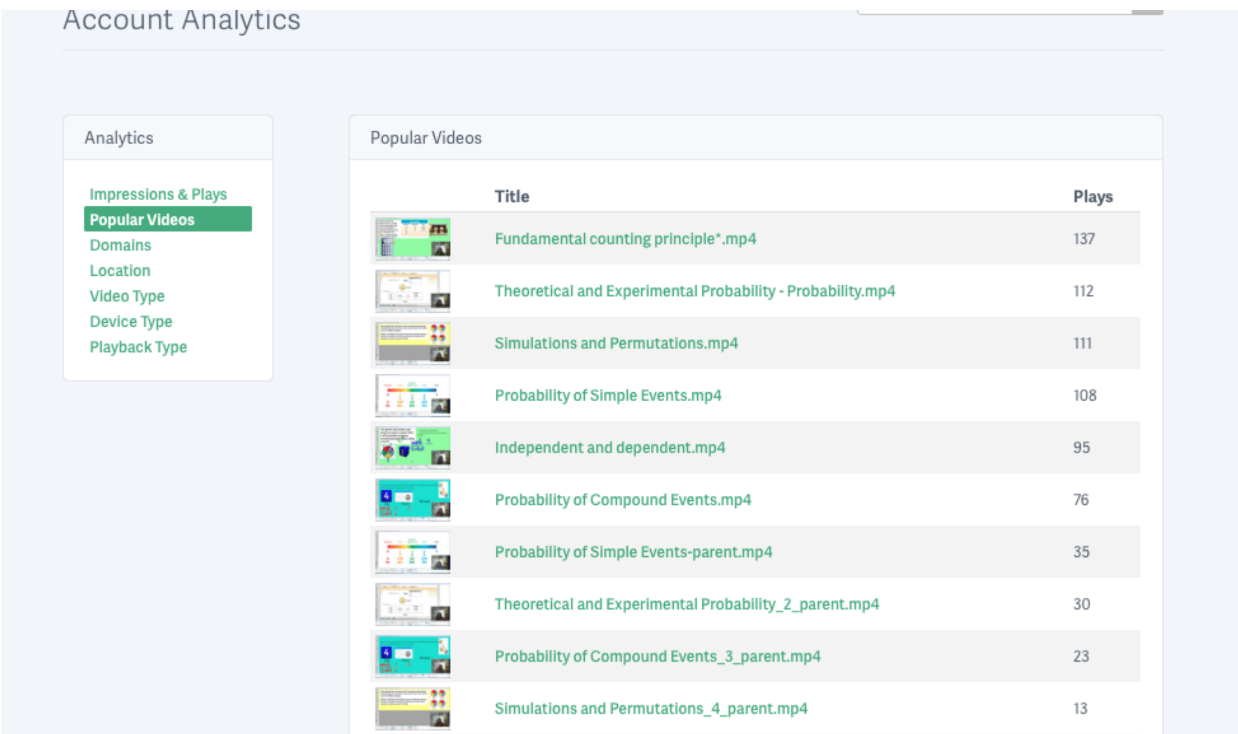

03/25/2016 10:20 AM
174.131.0.78
03/25/2016 10:20 AM
05:35
174.131.0.78
03/25/2016 10:17 AM
174.131.0.78
174.131.0.78
03/25/2016 06:45 AM
98.22.67.129
03/25/2016 06:23 AM
173.23.57.204

The data collected from the heat maps was used to analyze trends in how students and parents viewed the videos. The red sections on the heat maps represented sections that were viewed over five times. The majority of these sections were at the beginning of the videos. When asked why students viewed a section more than once, such as in the yellow sections in Table 5, students replied that they replayed sections of the videos that they did not understand. The yellow sections of the heat maps correlated to sections of the videos containing more difficult material and places in the videos that provided examples that the students would want to view more than once. The white spaces represent pauses in the video view. Students commented that the pause was to take notes of what was on the screen of the video that they were viewing or that they were called away from the video and had to pause the view. While the heat maps showed a trend that over half the students overall viewed parts of the videos more than once, only one-fourth of the parent views reported viewing any sections of the videos more than once.

By interpreting the results of the heat maps, the highest usage was at the beginning of the videos. This is probably due to the fact that many viewers were checking out the videos to see what they looked like or checking out their devices to be sure they would play the videos and then clicked off the video. But once the initial period of a few seconds into the video tutorials where these viewers that were checking things out and then stopped the video was over, the viewers remaining to watch the video usually watched the video in its entirety. The engagement percentage data was skewed due to the fact that it considered everyone who hit the play button. Therefore, if students or parents were checking to see if a video would play on his or her device or showed someone what the video looked like and then stopped the video after a few seconds, these plays were considered disengagement. In reality, if engagement did not consider these first few seconds during the time viewers had these cutoffs, the engagement percentages would have been much higher than reported.

SproutVideo collected analytics of the aggregate views of the videos. These analytics showed in Table 6 through Table 11 were of all the videos viewed by parents and students. The analytics included a list of the most popular videos judged by the combined number of views the videos received; a chart of domains indicating the different places on the web where the videos were played; a location map of the countries that the videos were viewed; a chart of video types that tracked whether the videos were watched in HD or SD and how many times the videos were played in either format; a chart for the type of device used indicating whether views were from a desktop or a mobile device; and the playback type indicating whether or not viewers watched the videos in Flash or HTML5.

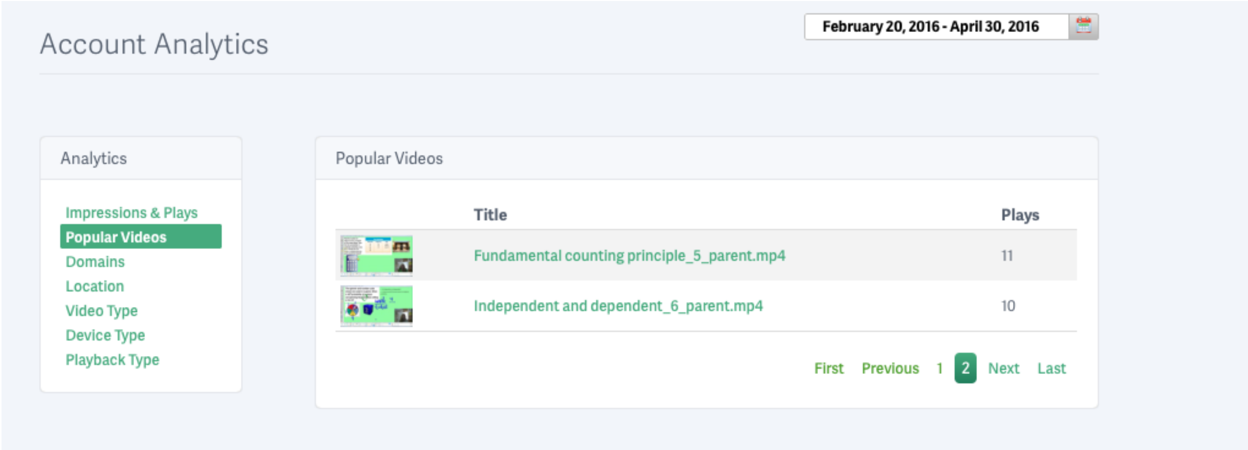
Table 6 – Popular Videos Analytics (Produced by SproutVideo)


Account Analytics

Analytics
- Impressions & Plays
- Popular Videos
- Domains
- Location
- Video Type
- Device Type
- Playback Type

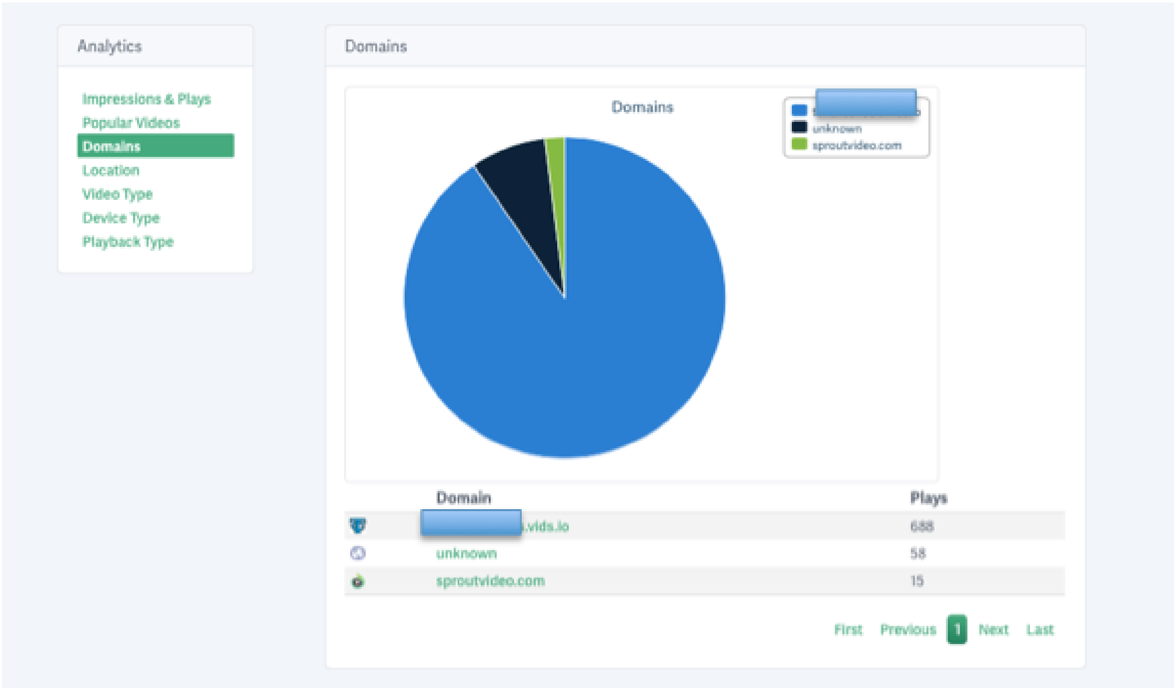
Popular Videos

Title	Plays
Fundamental counting principle*.mp4	137
Theoretical and Experimental Probability - Probability.mp4	112
Simulations and Permutations.mp4	111
Probability of Simple Events.mp4	108
Independent and dependent.mp4	95
Probability of Compound Events.mp4	76
Probability of Simple Events-parent.mp4	35
Theoretical and Experimental Probability_2_parent.mp4	30
Probability of Compound Events_3_parent.mp4	23
Simulations and Permutations_4_parent.mp4	13



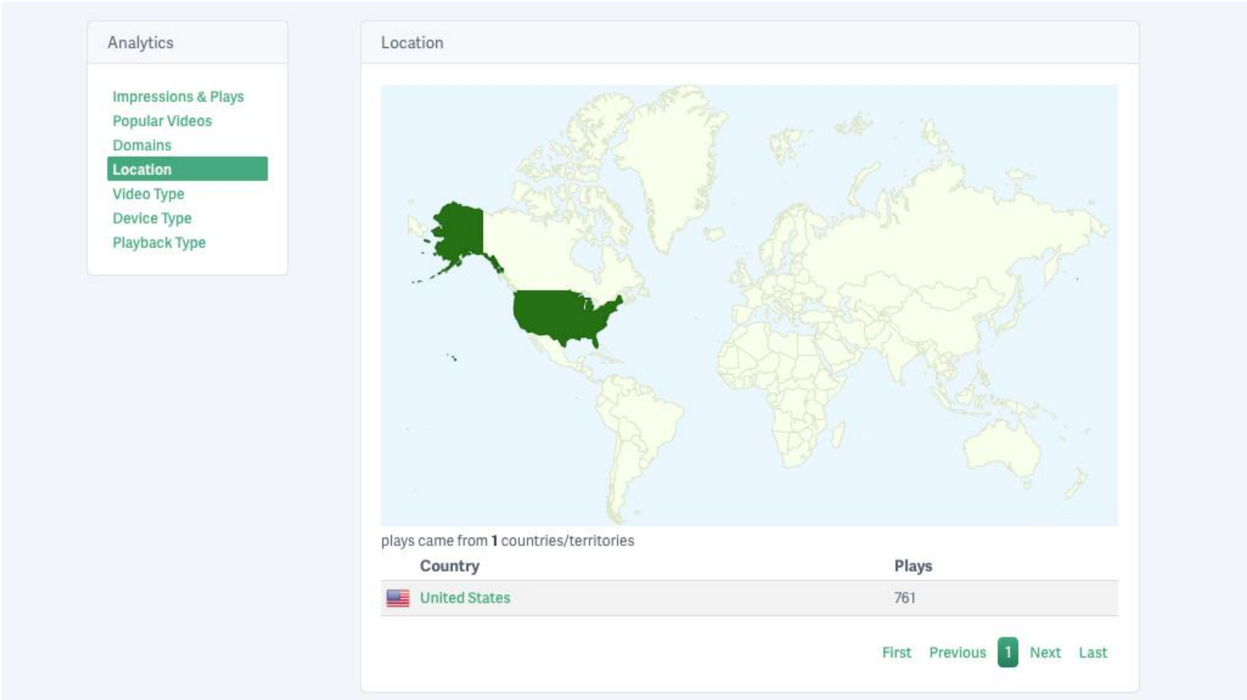
The six student videos and the six parent videos were all considered in the popularity graph in Table 6. This table illustrated the popularity of all the videos from the most popular video to the least popular video. The top six videos in popularity, as determined by number of views, were all student videos. The bottom six videos in popularity were the parent videos. This correlates with the qualitative data that revealed the students actually watched the videos more than the parents. The overall most viewed video was the student video on the fundamental counting principle. This also correlates with the qualitiative data where students revealed that this was the topic in the probability unit that they found to be the most difficult and utilzed the video tutorial the most as an additonal resource to learn the material.

Table 7 – Domain Analytics (Produced by SproutVideo)



In Table 7, the domains used to access the tutorial video were charted. The findings revealed that 688 video views used the school domain that housed their logins that the students and parents were provided for SproutVideo. The 15 views on the sproutvideo.com domain were logins used by the researcher in viewing the production of the videos before they were uploaded to the school's domain.

Table 8 – Location of Video Views Analytics (Produced by SproutVideo)



The chart in Table 8 identified that all 761 logins were from the United States. This correlates with the fact that all students and parents that received logins lived within the United States. One student's parent was stationed overseas and completed the consent form and requested a login for the videos but did not use the login during the time frame of this study.

Table 9 – Video Type Analytics (Produced by SproutVideo)

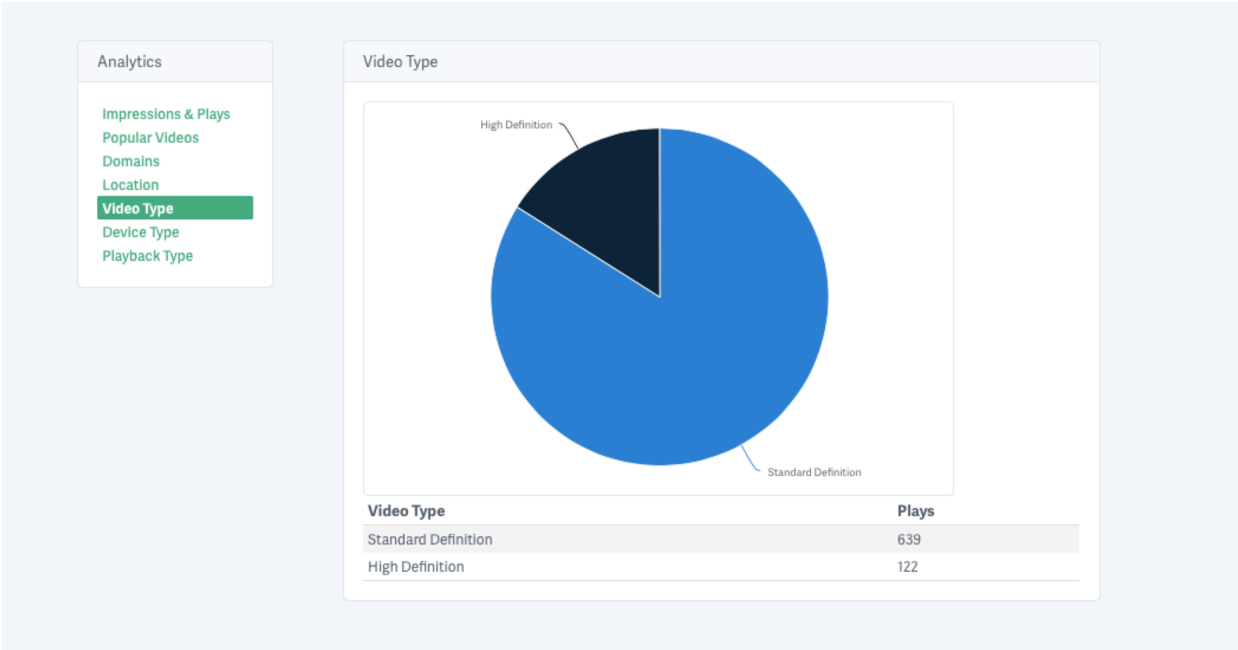
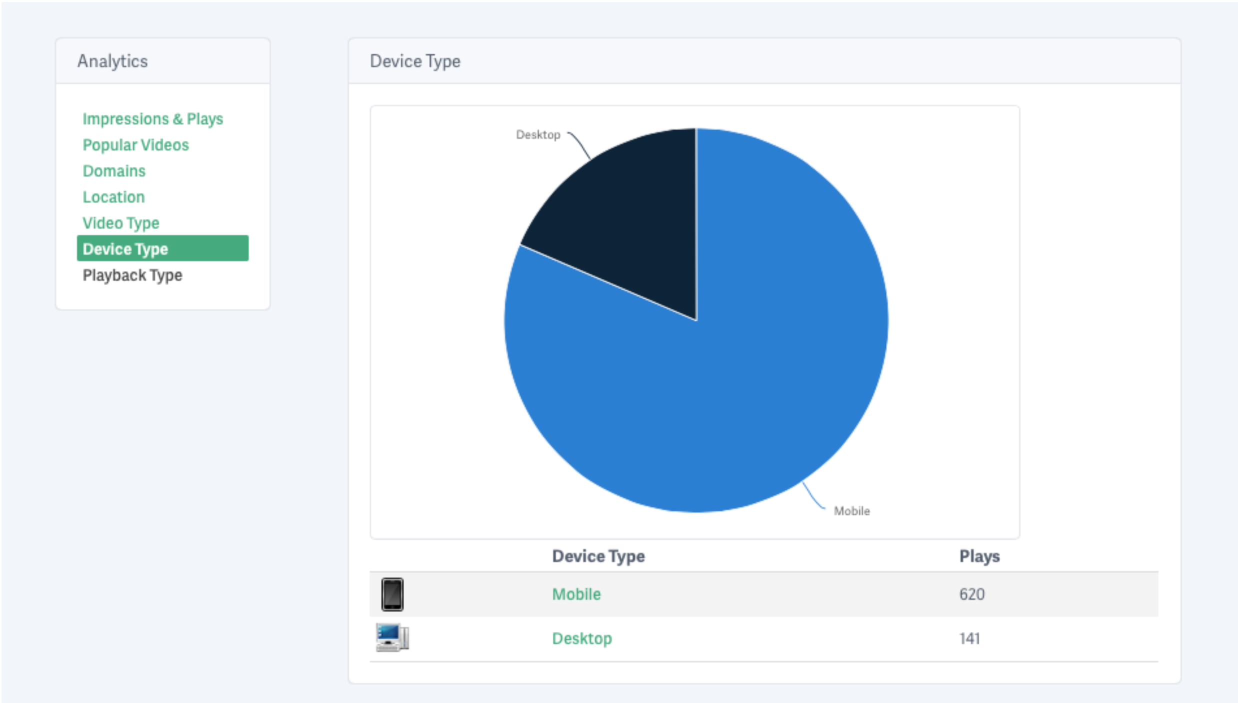


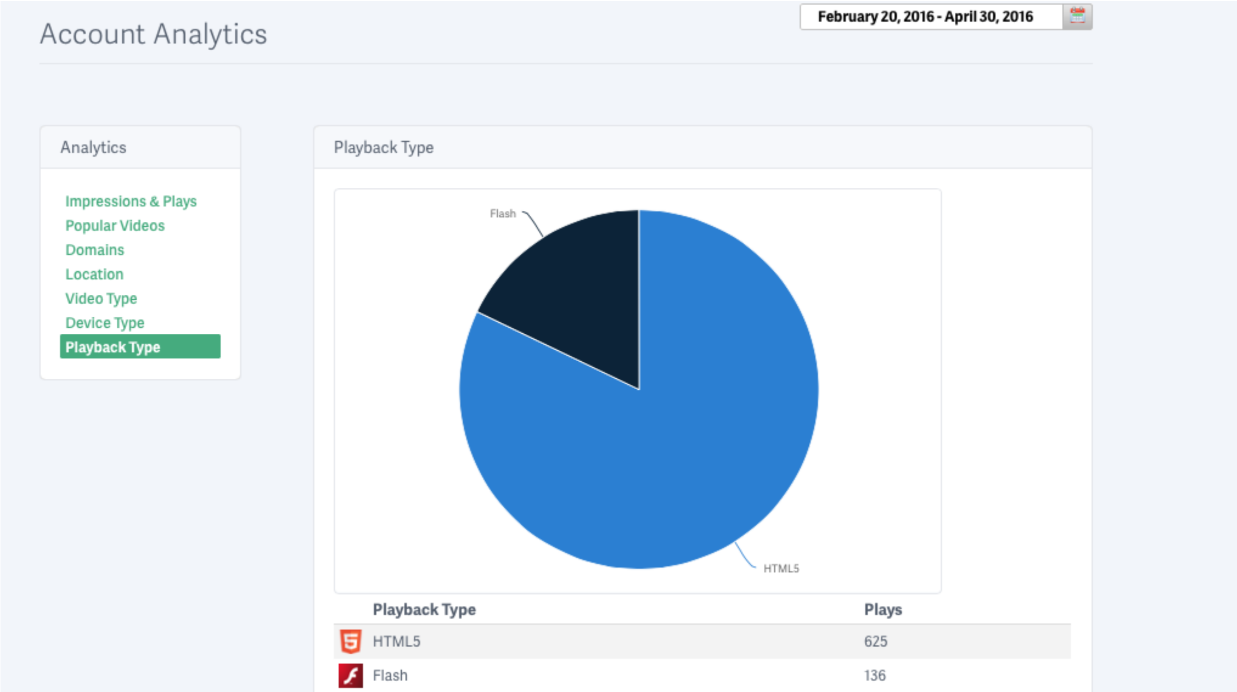
Table 9 shows that of the 761 total views of all the video tutorials, 639 of the views were in standard defintion, SD, and 122 were in high definition, HD. The difference in HD and SD images is the number of pixels contained in the image. HD images have more pixels per square inch than SD videos. Devices that play videos in HD are usually newer technology and cost more than devices in SD. Therefore, it is undestandable that the majority of plays were on devies in SD.

Table 10 – Device Type Analytics (Produced by SproutVideo)



One of the more interesting findings is shown in Table 10, which visually identifies the vast majority of tutorial views, 620 of the 761 total views, were on mobile devices while only 141 views were on desktop computers. When this study was in the planning stages, one of the biggest concerns of the researcher was if the households would have computers and how this should be addressed to give the students access to computers after school hours. Students were offered ipads and computers afterschool hours and the library was made available before and after school. The researcher did not realize that over 81 percent of the views would be made on mobile devices. The qualitiative data confirmed this finding as students and parents discussed how much they enjoyed the videos being available on their phones. The consenus was that the students and parents carried their phones everywhere and enjoyed being on their phones, so having the videos available on mobile devices was a top enhancement to the videos production mentioned in the surveys and interviews.

Table 11 – Playback Type Analytics (Produced by SproutVideo)



The data represented in Table 11 identifies that over 82 percent of the playbacks were with HTML5 over flash. The HTML5 technology has become big in the mobile device video plays. This is because HTML5 video content is better on battery life in contrast to flash, thereby, HTML5 is better on the battery life for smartphones, tablets and laptops. While battery life is an important feature for smartphone users, the high rate of playbacks being in HTML5 is not surprising.

Qualitative Data – Interviews - Parents

The process and procedure of analyzing the qualitative data from the interviews sought an explanation, understanding, and interpretation of the research. The analysis of the qualitative data drew out patterns found in the data collected. Coding of the qualitative data assisted in the analysis of the data, as suggested by Miles and Huberman (1994) in data reduction (extracting the essence), data display (organizing for meaning), and drawing conclusions (explaining the findings).

In analyzing the qualitative data gathered from the research through the interviews, observations, field notes, and informal conversations with parents and students, descriptive themes, trends, and patterns were generated. A list of “start codes” developed from the research questions and conceptual framework was used as a foundation for initial data analysis, but, as the study progressed, these start codes were amended, revised, and abandoned, as needed (Miles & Huberman, 1994). Open coding was used on the data collected, in order for the data to be scrutinized for commonalities so categories or themes in the data emerged. Open coding aided in the process of reducing the data to a small set of themes that appear in the qualitative data collected. These themes were used to describe the phenomenon that is under investigation and answer the research questions being studied. Coding allowed for semi-structured interviews, yet, it allowed for the interviews to go in directions that the researcher may not have considered. Interviews were transcribed before the coding process began. These interviews were conducted to provide the researcher more in-depth information on qualities that viewers see as needed to produce effective video tutorials and how the videos were used.

A full list of the semi-structured questions used for the interviews of both the students and the parents is found in Appendix B. The questions from this list that were used for research question one, “How are students and parents using the video tutorials?” are as follows:

- What would you say was the main purpose you watched the tutorials?
- How often did you watch the tutorials?
- Would you use the tutorials if they were available for all the units in math?

The parents interviewed were chosen from the list of parents who gave their consent in the consent letters to be interviewed. Common themes emerged as the data was reduced and coded from the interviews.

Table 12 – Emerging Themes from Parent Interviews

Parent Interviews	**Themes from Parent Answers**	**Most Frequent Answer**	**Why**
What would you say was the main purpose you watched the tutorials?	• So I would be able to help my child with math • Learn myself • Because my child asked me to watch the videos	• So I would be able to help my child with math	• My child struggles with math • I am not good at math myself • So I will know what my child is learning
How often did you watch the tutorials?	• Every time a new video was posted • Once in a while • Never	• Every time a new video was posted	• Wanted to see new video
Would you use the tutorials if they were available for all the units in math?	• Definitely • Sometimes • No	• Sometimes	• Yes, I want to learn • I would get my child to watch

	them all • Only when my child needed extra help • No, not enough time

The interviews with the parents of the students in the experimental class provided data on how the video tutorials were being used. The answer given most often was that parents watched the video tutorials so they could help their child with math. Several excerpts from the parent interviews follow:

"I had forgotten how to do probability and the videos were a lot of help."

"I think I enjoyed them as much or more than my child."

"I looked forward to you putting up a new video."

"My daughter actually sat in my lap and we watched the videos together. That is something we have not done since she was little."

"Helping my son with his homework was a lot easier after we watched the videos."

One unusual story about the videos came to me by way of the custodian at my school. She came by my room one morning and told me that a grandmother of one of my students had stopped her as she came out of Dollar General and asked her to please tell that math teacher that is doing the videos that they are wonderful help for her grandson. She went on to say that the grandson had recently come to live with her and his grades had dropped. She had been searching for some way to help her grandson. She told the custodian that the videos were the greatest thing ever because they watched the videos together, everyday. They gave her a clue what was going on in math class and even if she could not do the math, it showed him that she cared by sitting there with him. It became a ritual for them to watch the videos everyday and it gave him something for review when it came time for homework and to study for a test. She went on to say that she thought every teacher in the school should provide tutorials and hoped he had them for the rest of this year. On a side note, his grades in class drastically improved during this time. Before the custodian came forth about this student, a very noticeable difference had been observed with this student after receiving the passwords to the videos in his participation level during instruction time in his math class. He raised his hand often and added to the discussion and he was usually right!

On the other side of the spectrum, a smaller theme emerged from the parent interviews. Parents' quotes that were jotted down during the parent interviews were as follows:

"I watched them because me child asked me to watch them"

"I do not have time to watch them, but I am glad they are there if my child needs help"

"I probably will never watch them because I work"

"We do not have Internet"

"We were out of data on our phones"

A comical quote about how parents used the video tutorials actually came from one of my students during an informal conversation. My gifted math class had entered the classroom and we were getting ready for class to start. The students loved talking about the new videos that they had watched the previous night. On this particular day, a girl spoke up and said, "I think my parents are liking these videos way too much! It is all they want to talk about. The first thing my mom asked me when I got home was, 'did your teacher put up a new video today?' I think my mom is obsess with these videos." A few students jokingly spoke up and said that were not sure they liked having their parents know what they were learning in class because now the parents asked them questions about class and they could no longer use the excuse that the teacher did not explain how to do the lesson.

When asked how often the parents would use the video tutorials if they were provided for all the units in math, the theme of the majority of responses was "Sometimes." The majority of parents stated that while they are very glad that they and their child received this resource, they would probably only watch the video tutorials when their child was struggling with the math concepts taught and their child needed help. Time was their greatest deterrent. They wished that there were enough time in the day to watch the videos and help their kids, but most of the parents only ranked the videos as priority when their child showed signs of struggling. The parents stated they did like the way the videos were given titles so it was easy to find the video of the lesson that their child needed the extra instruction.

Qualitative Data – Interviews – Students

All 55 students in the experimental group were interviewed and the common themes that emerged as the data was reduced and coded from the interviews are shown in Table 13. If a similar response or topic was given in more than 50 percent of the interviews, it was considered a commonality or a theme.

Table 13 – Themes from Student Interviews on Research Question 1

Student Interviews	Themes from Student Answers	Most Frequent Answer	Why
What would you say was the main purpose you watched the tutorials?	• Pull up grade in class • Remediate concepts • Review for test • Learn more • Help with homework • To get caught up with lessons due to being absent	• Learn more • Remediate concepts	• Attain higher grades • Want help when I struggle with lessons • So I will learn what I need to go on to the 8th grade
How often did you watch the tutorials?	• Daily • Every time a new video was posted • Once in a while • Never	• Every time a new video was posted	• Wanted to learn more • Wanted to see new video • Only watch videos when I struggle with a

			concept • Not enough time • No internet
Would you use the tutorials if they were available for all the units in math?	• Definitely • Sometimes • No	• Sometimes	• I want to learn • I would watch them if I had been absent or if I struggled with a lesson

The interviews with the students in the experimental class provided an even greater wealth of data on how the video tutorials were being used. The answers given most often was that students watched the video tutorials so they could learn more or have remediation over areas that they struggled. Several excerpts from the student interviews follow:

> "I liked to watch them when I got home from school to learn the things that I did not understand when you went over it in class. At home, I could pause the video and take notes or go back and watch a part again."
>
> "I watch them after you teach the lesson first."
>
> "I use them to help improve my math grade."
>
> "I watch them on my phone."
>
> "I fell like they really helped me on the GMAS this year."
>
> "The videos help me learn better."

"I like not getting behind in class when I am absent."

There were many noteworthy stories from the students during informal conversations. Two of these stories will be shared. The first story is about one student who sat in the last seat on the last row as far away from the instructor and other students as he could get. He struggled all year in math. He worried if he would pass. He rarely participated in class. Yet, he probably became the most excited student in the study when the videos came out online. He told the instructor that he got up early at six o'clock each morning to watch the videos. Doubtingly, the insructor checked SproutVideo, which records the time and name of each viewer for the videos. Sure enough, he did. He watched them religiously. He was so excited that he was starting to understand concepts and could answer questions in class. He started participating more and more in class and slowly his grades were improving. He was one true success story.

The other story centers around a young honor roll student. She was sick for a few days in a row and had to miss school. The students received a "Remind" text about homework and what was covered each day in class. While she was out of school, she watched the video lessons for the topics that she missed in class because she was absent. When she returned to school, she was caught up with eveyone else and stated how nice it was not to be behind in math class. With all the examples and instruction in the video tutorials, she said she was able to stay caught up with everything she missed while she was absent and not feel lost. Being very grade conscience, she added that she liked that her grades did not suffer because she was absent since she was able to stay caught up with the class since she had the video tutorials available at her home.

Research Question Two - What factors enable/impede the effectiveness of the video tutorials?

Qualitative methods included interviews, observations, conversations and field notes.

Quantitative Data – Parent and Student Video Surveys Issue Two

"Issue Two" of the student and parent surveys contained seven questions and the results on these characteristics that enable/impede the effectiveness of the tutorials were used in response to research question two. The student survey, as seen in Appendix C, and the parent survey, as seen in Appendix D, were given to the participants from the experimental class after the unit on probability was taught with the students and parents having access to the video tutorials as additional resources available online to them continually throughout the unit. Data collected from these seven questions under "Issue Two" were recorded in response to second research question on "What factors enable/impede the effectiveness of the video tutorials?" These seven questions for the students and parents are as follows:

Student Survey
Issue 2: Characteristics of the videos
Q9. I was able to learn more from the video since I was able view at my own pace and to rewind and review portions I did not understand the first time.
Q10. I found the videos that were more like lectures helpful
Q11. I found the videos that solved math problems (step-by-step) helpful
Q12. I liked seeing my teacher in the videos
Q13. I liked just seeing the blackboard and writing in the videos
Q14. I missed being able to ask questions during the videos.
Q15. I found it hard to watch the videos because Internet access is a problem

Parent Survey
Issue 2: Characteristics of the videos
Q9. I was able to learn more from the video since I was able view at my own pace and to rewind and review portions I did not understand the first time.
Q10. I found the videos that were more like lectures helpful
Q11. I found the videos that solved math problems (step-by-step) helpful
Q12. I liked seeing my child's teacher in the videos
Q13. I liked just seeing the blackboard and writing in the videos
Q14. I missed being able to ask questions during the videos.
Q15. I found it hard to watch the videos because Internet access is a problem

The last question under issue two was deleted from the study because it had reversed wording. The question read where a very positive answer would have needed to been scored a one, whereas, in all of the other questions, a very positive answer would have been scored a five. I dealt with this omission by including the question in the qualitative interviews.

For “Issue Two – Characteristics of the Videos” in the video survey, the reliability statistic from the Cronbach coefficient alpha for the seven items from the post-survey was .83. The Pearson correlation coefficients for the post survey found that most items were significantly correlated with one another at $p < .05$ except for questions 11 and 13, the third and fifth questions under issue two. A coefficient of .70 or higher is considered good reliability. The responses were scored on a Likert Scale from one (strongly disagree) to five (strongly agree). Table 14 displays the combined mean and standard deviations for both the parents and the student responses for Issue Two.

Table 14: Mean and Standard Deviation for Student and Parent Video Survey Issue Two

Question	Students		Parents	
	M	**SD**	**M**	**SD**
VS9	4.20	.99	3.78	.92
VS10	3.58	1.18	3.47	.92
VS11	4.18	.92	3.85	.89
VS12	3.87	.98	3.96	.86
VS13	2.89	1.33	3.35	.97
VS14	3.38	1.19	3.13	.77
VS15	~~2.25~~	~~1.43~~	~~2.73~~	~~1.57~~
VSC	3.79	.70	3.63	.70
C-G	3.72	.58		
C-NG	3.83	.76		

Note. M=Mean. SD=Standard Deviation. VS9-VS15 = Question #9 – Question #15. VSC=Video Survey Questions Combined. C-G=Combined gifted means. C-NG=Combined non-gifted means. ~~( )~~= Deleted Data. Scores ranged from one (strongly disagree) to five (strongly agree).

Students and parents were surveyed about the characteristics of the video tutorials on questions VS9 – VS15. The ninth question on the video survey, VS9, for the students was "I was able to learn more from the video since I was able view at my own pace and to rewind and review portions I did not understand the first time." Responses from the students were scored from one to five going from strongly disagree to strongly agree. For the students, the highest rated question was question nine, which scored a mean of 4.20 by the students. This corresponded to the interview data where students stated that they used the videos to learn more about the probability topic and liked how they were in control of what they needed remediation on or what portion of the instruction they understood. They could pause the video and take notes or replay or skip certain sections depending on the differentiation that they needed in their learning. Students commented this was an important characteristic since it helped their understanding, therefore helping their academic grade in math class. The parent survey revealed that the twelfth question on the video survey, VS12, which read "I liked seeing my child's teacher in the videos" rated the highest scores from the parents with a mean of 3.96. Again, this corresponded to the comments from the parent interviews where parents commented that they loved seeing their child's own teacher on the videos and were able to see the exact way their child was taught how to do a math computation in class. The interviews revealed that parents had much rather see their child's own teacher than a professional on videos such as those on Khan Academy or the instructional videos provided my the mathematics textbook.

The lowest mean scores for both the student and parent responses were for question VS15 that reads, "I found it hard to watch the videos because Internet access is a problem." This question deemed to be written in reverse order and confused those taking the surveys, therefore the data provided by this question would distort the data set. Since this question would distort the data, it was totally omitted from being used in the data analysis. In Table 14, VS15 has a strike through the data since it was omitted. Therefore, the discussion in the next paragraphs will be about the second lowest scoring questions.

For the student responses, VS13, "I liked just seeing the blackboard and writing in the videos", was the second lowest scoring question by the students with a score of 2.89. Students commented during the interviews that they liked their teacher being in the videos and wanted more humor but no student mentioned the blackboard as important to them. The parents scored the fourteenth survey question, VS14, the second lowest with a mean score of 3.13, which stated, "I missed being able to ask questions during the videos." During the interviews, parents appreciated the lessons being available for their child but said they left it up to the student to ask questions about what they did not understand.

The overall combined mean of the answers from the questions about the characteristics of the tutorial videos from the nineteen gifted students was 3.72 on a scale of one to five with five being "strongly agree" and a mean of 3.83 for the thirty-six non-gifted students in the treatment group who received the video tutorials as the added instructional resource. The non-gifted students rated the characteristics of the videos slightly higher than the gifted students. This included items such as watching the video tutorials at their own pace, having their teacher work the problems out step-by-step on the videos, and having the videos available for them if they were absent from class. The means being so close to the same rating identifies that both groups rated the characteristics of the video tutorials similarly. Both groups gave the characteristics of the videos high ratings.

Overall, the combined mean from questions nine through fourteen, since fifteen was omitted, on the video survey for the students had a mean of 3.79 and for the parents a mean of 3.63. These questions all centered on the characteristics of the video tutorials. Since the students did view the tutorials more often, it is not surprising that they had more characteristics that they liked but these mean scores were very similar ratings and showed that many of the characteristics of the videos are liked by both the students and parents.

Qualitative Data – Interviews, Observations, Conversations, and Field Notes - Parents

The commonalities or themes that emerged from the parent interviews are represented in Table 15, while the commonalities or themes that emerged from the student interviews are represented in Table 16. If a similar response or topic was given in more than 50 percent of the interviews, it was considered a commonality or a theme. A full list of the semi-structured questions used for the interviews of both the students and the parents is found in Appendix B. The questions from this list that were used for research question two, "What factors enable/impede the effectiveness of the video tutorials?" are as follows:

- What features of the tutorials did you like best?
- Was Internet availability a problem?
- Were there features about the videos that you liked? If so, what were they?
- Were there features about the videos that you did not like? If so, what were they?

The parents interviewed were chosen from the list of parents who gave their consent in the consent letters to be interviewed. Common themes emerged as the data was reduced and coded from the interviews.

Table 15 – Themes from Parent Interviews on Research Question 2

Parent Interviews	**Themes from Parent Answers**	**Most Frequent Answer**	**Why**
What features of the tutorials did you like best?	• It is "how" my child learned the math concepts in school • It is my child's own teacher • I can watch it with my child	• It is "how" my child learned the math concepts in school	• The videos enable me to help my child work the math problems the same way they were taught in school

	• Plenty of examples and explanations		
Was Internet availability a problem?	• No • Once in a while • Yes	• No	• Had Internet at home or on my phone
Were there features about the videos that you liked? If so, what were they?	• It is my child's own teacher on the videos • It reminded me how to do the math problems • Liked all the examples and explanations • Available at home	• It is my child's own teacher on the videos	• The videos enable me to help my child work the math problems the same way they were taught in school
Were there features	• No	• No	• No, really

about the videos that you did not like? If so, what were they?	• Too long	enjoyed watching them with my child

In the interviews, the majority of parents stated that the feature that enabled the video tutorials to be effective for their use was that the tutorials showed them "how" their child learned the math skills. Examples of parents' comments from the major themes that emerged from the interviews follow:

- "I don't know how to do this new math." Parents talked about how math has changed over the years since they were in school. They consider that the math taught in seventh grade today harder than what they learned in seventh grade.
- "My child says that I don't solve the problems like the teacher." Some parents responded that their children did not want them to help them with their homework because the parent worked the math problems differently than the teacher. Some were worried that the teacher would count it wrong if the problem was worked differently. Other parents mentioned that their child got confused when shown a different way to work the math problems than the way the teacher had taught them in class. The parents said the students liked working problems with them when they worked the problems the same way that the student had been taught to solve the problems in math class by the teacher.
- "I'm not good at math. The videos show me how to work the problems." Some parents responded that they were not good in math when they were in school and

just were not able to help their child with their math homework. They said they used the videos to help them learn how to do the math problems.

- "I needed a refresher on how to do probability." Other parents stated that it was the topic of probability that was the problem. While they may be able to work some math problems, probability was a hard subject for them and they needed the refresher course on probability that the video tutorials offered them.
- "All the examples are what really helped." Parents liked the vast number and variety of examples that were demonstrated in the tutorial videos. Parents stated they like how the examples started out basic and developed into harder problems. With the quantity of examples and the growing complexity of the word problems in the videos, parents said they felt eased into feeling comfortable working harder problems and appreciated the way the examples were given and the quantity of examples showed worked out step by step.

While there is a wide variety of video tutorials for probability, the feature parents liked about these tutorials was that it was presented by the same teacher and in the same way that their child learned in class. Overwhelmingly, parents reported the reason that they watched these videos over others was that their child's teacher produced the videos. The content was exactly paired to what their child was learning and needed to know for 7th grade.

Qualitative Data – Interviews, Observations, Conversations, and

Field Notes – Students

The commonalities or themes that emerged from the student interviews are represented in Table 16. A full list of the semi-structured questions used for the interviews of the students is found in Appendix B. All of the qualitative data, interviews, observations, conversations, and field notes, were collected and analyzed as the students' responses to research question two, "What factors enable/impede the effectiveness of the video tutorials?" Students in the experimental group provided an abundance of data to answer this research question. The videos being added to the unit on probability excited the students. The students appreciated the resource being added for their learning. Therefore, the production of quality, interesting videos became very personal to them, so they voiced their opinions to try to help make the videos better. They wanted to share all the features of the videos that they liked and all the features that they did not like and how they thought the videos could be changed to become more effective.

All students in the experimental group were granted parental consent to be interviewed and gave their consent to be interviewed. Since the students were so anxious and excited to voice their opinions and offer suggestions, I interviewed all 55 students in the experimental group. Common themes emerged as the data was reduced and coded from the interviews.

Table 16 – Themes from Student Interviews on Research Question 2

Student Interviews	**Themes from Student Answers**	**Most Frequent Answer**	**Why**
What features of the tutorials did you like best?	• All the examples • That it is my own teacher on the videos • It is exactly	• I felt like my teacher was talking to me by asking questions • Available on	• It made me feel like my teacher was explaining it to just me. I even answered

	the same as being in the classroom • To get caught up with lessons missed due to being absent • Step-by-step explanations • I can stop video and take notes • Available all the time 24/7 • Available on my phone • Can watch at home in the quiet • I felt like my teacher was talking to me	my phone • That it is my own teacher on the videos	the questions back. • I like being on my phone • The videos teach me just like I learned in the classroom

	by asking questions		
Was Internet availabitity a problem?	• No • Sometimes • Yes	• No	• I have WiFi
Were there features about the videos that you liked? If so, what were they?	• Easy to use as review for tests • Liked how the teacher asked questions • I could watch and pause • Pleanty of examples • Free • Available on my phone 24/7 • Stay caught up if I am absent • I feel like my teacher is	• Liked how the teacher asked questions • Available on my phone 24/7	• I feel like my teacher is talking just to me • They can help me study and review

	talking just to me		
Were there features about the videos that you did not like? If so, what were they?	• None • Too long • I could not ask questions back	• None • Too long	• Liked them just like they are • Need to divide them into two shorter videos- one for examples and one for explanations

When interviewing the 7th grade students and asking their opinion about what features enabled/impeded the effectiveness of the videos, there was no shortage of opinions. Some excerpts from these interviews follow:

"I liked the way it felt like you were just talking to me."

"I liked how you asked questions during the videos."

"How did you know I got the question right?" (After I asked a question on the tutorials, I would something like, 'that's right - great job- I knew you could do it'.)

"I liked it being on my phone."

"I liked how I could watch it anytime anywhere."

"They seemed a little too long."

"I liked it being my own teacher on the videos."

"It sounds just like you in class."

A favorite topic as students came in my class was for them to talk about the video they watched the night before. During a class conversation, a student said the videos would be better if they were shorter, many students agreed. The students suggested breaking one complete tutorial video into two separate videos, one for instruction and one with examples.

Research Question Three - Is there a significance increase in students' self-efficacy levels after the use of the video tutorials as an instructional resource as measured by increased scores on the Likert scale survey and the video survey?

Data was collected quantitatively for the third research question, "Is there a significance increase in students' self-efficacy levels after the use of the video tutorials as an instructional resource as measured by increased scores on the Likert scale survey and the video survey?" I produced instructional video tutorials for the probability unit and made these videos available online to parents and students so they would have resources available for remediation, acceleration, missing skills, or for students who were absent. To monitor for a change in the perceptions that students and parents have about mathematics, surveys are given before and after the use of the tutorials. The videos were produced in an effort to improve the perceptions parents and students have about mathematics. My hypothesis was that the self-efficacy levels will increase from before and after the participants used the video tutorials as an instructional resource. The null hypothesis was that there would no difference in the self-efficacy levels from before and after the participants used the video tutorials as an instructional resource.

Quantitative Data – Parent and Student Video Surveys Issue Three

"Issue three" of the student and parent surveys contained four questions in response to research question three. The entire student survey, as seen in Appendix C, and the entire parent survey, as seen in Appendix D, were given to the participants from the experimental class after the unit on probability was taught with the students and parents having access to the video tutorials as additional resources available online to them continually throughout the unit. Data collected from these questions under "Issue Three" were recorded in response to research question three on "Is there a significance increase in students' self-efficacy levels after the use of the video tutorials as an instructional resource as measured by increased scores on the Likert scale survey and the video survey?" These four questions for the students and parents are as follows:

Student Survey	Parent Survey
Issue 3: Confidence	**Issue 3: Confidence**
Q16. The videos helped me learn	Q16. The videos helped me learn
Q17. I have more confidence in my math ability now that I have the videos	Q17. I have more confidence in my math ability now that I have the videos
Q18. I understand the math concepts better by watching the videos	Q18. I understand the math concepts better by watching the videos
Q19. I like having the videos as a math resource when I need it	Q19. The videos helped my child with math

For "Issue Three – Confidence" in the video survey, the reliability statistic from the Cronbach coefficient alpha for the four items from the post-survey was .82. The Pearson correlation coefficients for the post survey found all items were significantly correlated with one another at $p < .001$. A coefficient of .70 or higher is considered good reliability. The responses were scored on a Likert Scale from one (strongly disagree) to five (strongly agree). Table 17 displays the combined mean and standard deviations for both the parents and the student responses for Issue Three.

Table 17: Mean and Standard Deviation for Student and Parent Video Survey Issue Three

Question	Students		Parents	
	M	**SD**	**M**	**SD**
VS16	4.42	.83	3.84	.94
VS17	4.00	1.04	3.56	.86
VS18	3.98	.99	3.71	.81
VS19	4.40	.91	4.27	.85
VSC	4.13	.83	3.85	.73
C-G	3.79	.83		
C-NG	4.31	.79		

Note. M=Mean. SD=Standard Deviation. VS16- VS19 = Question #16 – Question #19. VSC=Video Survey Questions Combined. C-G=Combined gifted means. C-NG=Combined non-gifted means.Scores ranged from one (strongly disagree) to five (strongly agree).

Students and parents were surveyed about the confidence that the video tutorials provided for them on questions VS16 – VS19. The sixteenth question on the video survey, VS16, for the students was "The videos helped me learn." Responses from the students were scored from one to five going from strongly disagree to strongly agree. For the students, the highest rated question was this question sixteen, which scored a mean of 4.42 by the students. This also was the highest scoring question by the students out of all nineteen questions. This corresponded to the interview data where students stated that they used the videos to learn more about the probability topics and liked how they were in control of when they watched the tutorials for needed remediation and/or enrichment. They could pause the video and take notes or replay or skip certain sections depending on the differentiation that they needed in their learning. Students commented that the videos gave them more confidence in their math ability. The parent survey revealed that the nineteenth question on the video survey, VS19, which read "The videos helped my child with math" rated the highest scores from the parents with a mean of 4.27. This was also the highest scoring parent question from the entire survey of all nineteen questions. Again, this corresponded to the comments from the parent interviews where parents commented that they did think the video tutorials provided their child with more confidence in math that allowed the student to have the confidence they needed for math class.

For the student responses, VS18, "I understand the math concepts better by watching the videos", was the lowest scoring question by the students with a score of 3.98. The parents scored the seventeenth survey question, VS17, the lowest with a mean score of 3.13, which stated, "I have more confidence in my math ability now that I have the videos." All the questions in this section on confidence scored higher than the average of all questions on this survey and this section had the highest scores of all. While these scored the lowest for the issue of confidence, they were both not concerning since they were higher than the overall average scores. The lowest score from the parents was about their confidence level, this was not surprising since many parents expressed how the videos helped the student but did not comment on whether they needed the videos to improve their confidence levels.

The overall combined mean of the answers from the questions about confidence provided by the tutorial videos from the nineteen gifted students was 3.79 on a scale of one to five with five being "strongly agree" and a mean of 4.31 for the thirty-six non-gifted students in the treatment group who received the video tutorials as the added instructional resource. The non-gifted students rated the mean confidence they received from the videos higher than the gifted students. This included items such as the tutorials helping them learn, providing them more confidence in their own ability, and having the resource availability to them all the time. By the means of both groups being so high, this identifies that both groups rated their confidence higher by having the video tutorials as an additional resource.

Overall, the combined mean from questions sixteen through nineteen on the video survey for the students on confidence had a mean of 4.13 and for the parents a mean of 3.85. A mean of 4.13 for the students' responses is high when five meant strongly agree in the responses. In the qualitative data, students discussed how much the video tutorials provided them with more confidence in their ability by having an added resource that they could refer back to and remediate when needed. This matches the qualitative and quantitative data that identified higher confidence levels for both parents and students after the use of the tutorials. The confidence questions scored the highest responses of any of the questions on the survey for both the students and the parents. The survey as a whole identified higher ratings from the thirty-six non-gifted students that match their responses in the interviews and conversations that they really used the video tutorials and actually wanted additional tutorials to be provided for other mathematics units.

Quantitative Data- Pre Post Self-Efficacy Likert Survey

In the quest to discover "How does video tutorial usage relate to students' self-efficacy?", data was collected from the students in the experimental class with the Academic Efficacy subscale survey from Patterns of Adaptive Learning Scales (PALS). This survey appears in Appendix E and was given to the students before the start of the probability unit and after the probability unit had been taught with the tutorial videos used as an additional resource. For comparison, these same pre and post self-efficacy surveys were given to the control group and the experimental group of students.

Results of Pre Post Likert

For the five self-efficacy questions in the surveys, the pre and post differences were calculated and then these values were tested for the control class versus in the experimental class. The Pearson correlation coefficients for the pre survey found all five items were significantly correlated with one another at $p < .001$. The reliability statistic from the Cronbach coefficient alpha for the 5 items in the self-efficacy survey for the pre-survey was .83. The Pearson correlation coefficients for the post survey found all five items were significantly correlated with one another at $p < .001$. The reliability statistic from the Cronbach coefficient alpha for the 5 items in the self-efficacy survey for the post-survey was .88. A coefficient of .70 or higher is considered good reliability.

The five questions in the self-efficacy survey were scored by the students on a Likert Scale of one to five, where a score of one represented the statement not being true at all to a score of five which represented the statement being very true. The mean and standard deviation for the students' answers to all the questions is reported for both the pre and post self-efficacy surveys for the experimental and control class is show in Table 18.

Table 18: Mean and Standard Deviation for Combined Questions in Self-Efficacy Survey

Group	N	Pre		Post	
		M	**SD**	**M**	**SD**
Experimental	55	3.68	.93	4.31	.78
Control	65	3.90	.75	3.91	.84

Note. M=Mean. SD=Standard Deviation. Scores ranged from one (not being true at all) to five (very true).

The mean of the students' combined answers from questions one through five on the self-efficacy survey for both the pre and post surveys for the experimental and control class is shown in Table 18. The results from Table 18 showed that the mean for the control group only went from 3.90 for the pre survey, given before the probably unit was taught, to 3.91 for the post survey. The results showed that the mean for the experimental group went from 3.68 for the pre survey, given before the probably unit was taught, to 4.31 for the post survey. The control group did not have access to the video tutorials as an additional resource for this unit, whereas, the experimental group did have the videos as additional resources to use for this unit on probability. The mean of the pre survey results for the self-efficacy of the control group was higher than the pre survey mean of the experimental group. This could be a factor of the control group consisting of all the "average ability" students, while the experimental group consisted of the gifted students and all the below average students. The experimental group reported a much higher mean difference from the pre and the post surveys results. The experimental group was the only group that received the video tutorials as the additional resource to use during the probability unit. The study from Denler, Wolters, and Benzon found that students with greater self-efficacy are more confident in their abilities to be successful when compared to their peers with lower self-efficacy (2014). This was the main basis for this research to see if the video tutorials could provide greater self-efficacy and give the students more confidence in their abilities to be successful in mathematics, thereby, giving the students the "I think I can, I think I can" perspective about mathematics.

To dwell deeper into the data, the differences in the means from the control and experimental groups were analyzed for each individual question. The independent t-test procedure was used to compare these differences from the control and experimental groups and check for significance. Table 19 includes this data for both the control and experimental groups by individual question from the self-efficacy survey.

Table 19: Mean and Standard Deviation for Differences in Self-Efficacy Survey

Question	**Control**		**Experimental**		***t* -test**
	M	**SD**	**M**	**SD**	
ES1	.11	1.03	.82	1.07	-3.69***
ES2	.22	1.18	.84	1.12	-2.94**
ES3	-.09	1.09	.45	1.24	-2.57*
ES4	-.08	1.28	.51	1.05	-2.71**
ES5	-.08	1.19	.49	1.18	-2.61*
ESC	.02	.82	.62	.81	-4.06***

Note. M=Mean. SD=Standard Deviation. ES1- ES5 = Question #1 – Question #5.

ESC=Combine Questions #1-5

*$p \leq .05$. **$p < .01$. ***$p < .001$

The results from the independent t-tests were exhibited in Table 19. The student's mean change in efficacy was significantly higher in the experimental group than it was in the control group for each of the five questions in the self-efficacy survey. There was a significantly higher difference in the overall scores for the experimental group (M=.62, SD=.81) than the control group (M=0.2, SD=.82) conditions; $t(118) = -4.06$, $p < .001$. Since the p value was less than the significance level of $p < .05$, then I rejected the null hypothesis that there was no difference in the self-efficacy levels from before and after the participants used the video tutorials as an instructional resource. I accept that my study provided reasonable evidence to support my alternate hypothesis that the self-efficacy levels would increase from before and after the participants used the video tutorials as an instructional resource.

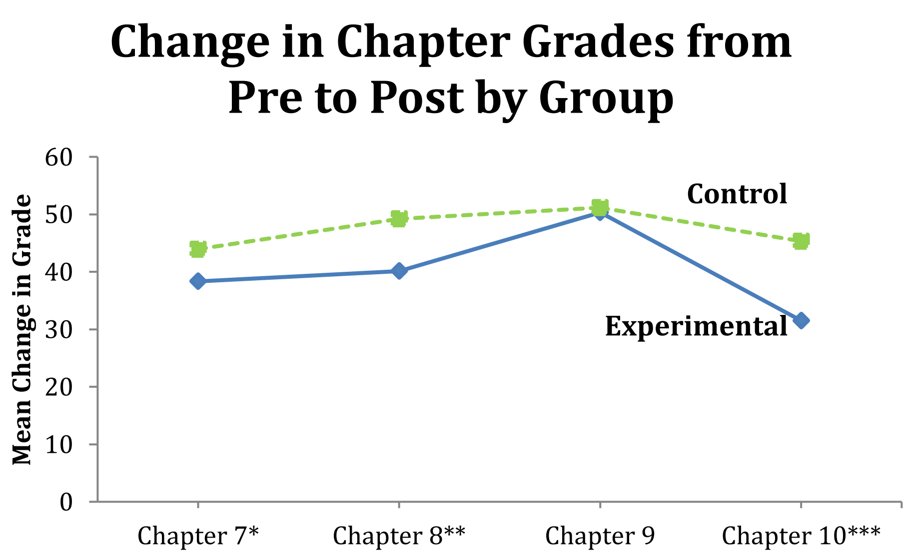
Research Question Four - Is there a significance increase in students' achievement levels for the experimental group after the use of the video tutorials as an instructional resource as measured by increased scores on the pre-post assessment?

Data was collected quantitatively for the fourth research question, "Is there a significance increase in students' achievement levels for the experimental group after the use of the video tutorials as an instructional resource as measured by increased scores on the pre-post assessment?" I produced instructional video tutorials for the probability unit and made these videos available online to parents and students so they would have resources available for remediation, acceleration, missing skills, or for students who were absent. To monitor for a change in the students' achievement levels, pre and post assessments for the probability unit were given to the students. For comparison, these pre and post assessments were given to the control group and the experimental group of students. My hypothesis was that the students' achievement levels for the experimental group would increase greater than the achievement levels for the control group. The null hypothesis was that there would be no change in the students' achievement levels for the experimental group and the control group.

Quantitative Data – Pre and Post Assessments

This research study centers on the probability unit, which was taught as Chapter nine. The research compared the differences in the mean achievement scores for chapter nine from the pre and post assessments for the control and experimental groups using paired *t*-tests. Teachers from both the control and experimental groups gave the same pre and post assessments. To add reliability to the study, pre and post assessments were given for chapter seven (Geometric Figures), chapter eight (Measure Figures), and chapter ten (Statistics) to both the control and experimental groups. The mean differences from the pre and post achievement assessments for all of these unit chapter assessments are displayed in Figure 1.

Figure 1:

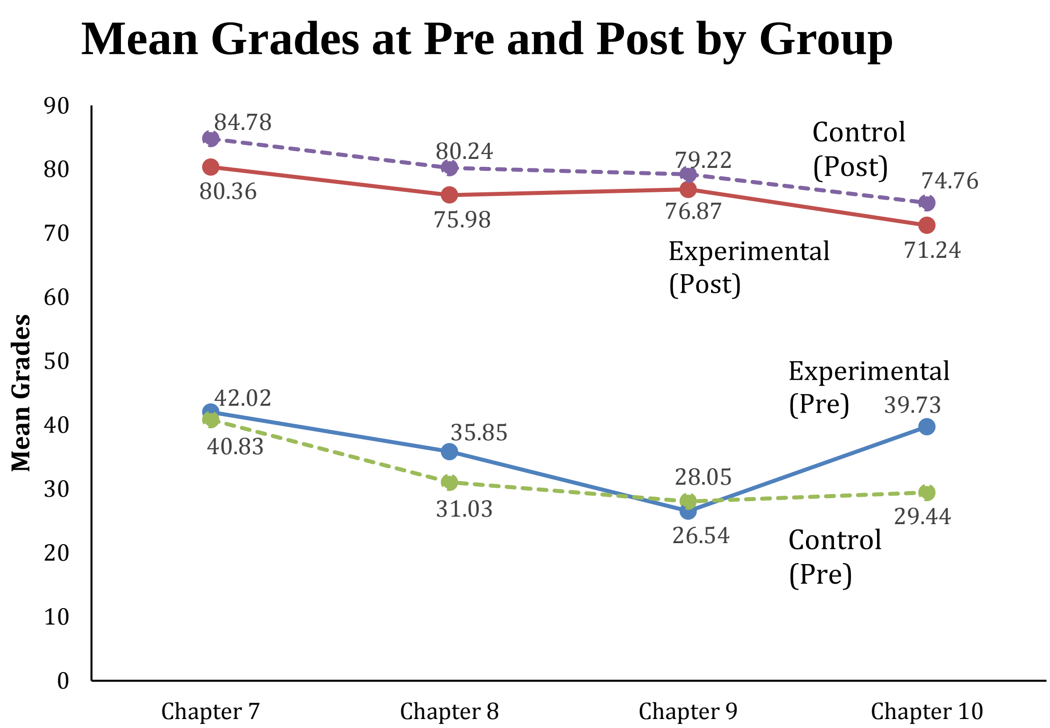


Note: $*p \le .05$; $**p < .01$; $***p < .001$

- Compared to the experimental group, students in the control group have significantly higher grades (larger average change from pre to post) in every chapter except for chapter 9, the chapter on probability.

The mean grades for the pre and post assessments for chapters seven through ten for both the control and experimental groups are shown in Figure 2.

Figure 2:



The mean differences from the pre and post achievement assessments for all of these unit chapter assessments were analyzed with paired *t*-tests. Students' mean change in their chapters seven, eight, and ten grade was significantly higher for the control group than it was in the experimental group; $t(116) = 2.00$, $p \leq .05$; $t(116) = 3.26$, $p < .01$; $t(116) = 4.91$, $p < .001$, respectively. The students' mean change in their chapter nine grade was not statistically significantly different for the control group and the experimental group. Therefore, I failed to reject the null hypothesis that there would be no change in the students' achievement levels for the experimental group and the control group. The results did reject my hypothesis that the students' achievement levels for the experimental group would increase greater than the achievement levels for the control group.

CHAPTER FIVE

REVIEW OF FINDINGS, IMPLICATIONS, FUTURE RESEARCH, AND CONCLUSIONS

PARENT AND STUDENT VIDEO USE

Review of Findings

Qualitative and quantitative data was collected and analyzed from surveys, interviews, field notes, and analytics from the video hosting website, SproutVideo, on how the students and parents in the experimental group used the teacher-made video tutorials that were provided to them for the unit on probability in this one mathematics classroom. A review of this data identified a plethora of highlights and important findings. Both the qualitative and quantitative research reached the same conclusion that students used the video tutorials more often and for a variety of more reasons than their parents.

Overwhelmingly, the data revealed a high use rate for the tutorials by the 55 students in the experimental group, whether it was for remediation, enrichment or missed instruction because of absence from the classroom. The data from SproutVideo showed the average number of times a video tutorial was played by students was 107 times, while the average number of plays per video by parents was 20 times. These results correlated with the theme that emerged from the interviews with the parents and students, as well as, the field notes and informal conversations. The video engagement was much greater for the students in this study than the parents. Although her sample size was too small for conclusive results, June Kronholz's (2012) initial research on Khan Academy, gave similar promising results that video tutorials increased students' engagement and their perceptions of math.

Another interesting finding was that parents wanted the video tutorials to support home involvement in their child's learning. The videos provided resources for the parents who wanted to help the student with their math learning. While parents stated extreme happiness that the videos were available for their child as an additional resource, some did not watch the videos for various reasons. These mainly included time as the deterrent. They stated they would use them more on lessons when their child struggled with the math concepts. On the other hand, all the students commented on watching the videos, many times more than once when studying for a test or reviewing a concept that they did not understand. A highlight mentioned by both the students and the parents was having the video tutorial to view for missed lessons from being absent from class. Students liked not getting behind because they were absent or homebound.

While the data and the statements from parents showed that less than half of the students' parents utilized the video tutorials, one train of thought emerged. There were parents who used the videos tutorials to re-learn the material themselves and to help their child with the math concepts and there were also parents who did not utilize the videos. The pattern that existed was that parents of the highly above average students or the average ability mathematics students used the video tutorial more than the parents of the students who actually struggled the most in mathematics. Ironically, one thought that emerged from all these parents, whether they actually viewed the videos or not, was an overwhelming appreciation for the resource being available to their child.

Parents responded so positively when they heard that teacher-made tutorials would be provided for their children in mathematics. Parents asked questions such as could both the father and the mother have passwords to the videos, or could an aunt or grandmother have a password. One father who was overseas even wanted a password to the videos. Parents wanted access to the tutorials and spoke of plans as to how they could use them to help their child. Yet, when it came time to actually view the tutorials with their child, the analytics showed that a small percentage of parents viewed them. This did not take into consideration if a parent watched a video with their child under their child's login password. Parents were requested to use their own logins when viewing the videos but the qualitative data did reveal that some parents watched with their child when the child was already logged in under their own login. This skewed the data.

A thrilling highlight was that the students were really excited about having the new resource and actually viewed the videos. The students commented that this excitement came from being vested in the production of the videos by having their input solicited about features in the production of the videos that they liked and did not like. The results reflected the parents' comments that they did like having the video tutorials as resources but for time constraint reasons they did not actually view the tutorials as much as they wanted. Since the lack of time was the biggest complaint for parents, the video tutorials being available as an additional resource for their child seemed to make them feel less guilty that they did not have the time to help their struggling child with their math skills and homework. The students having help from their own teacher on the online tutorials available to them at anytime comforted the parents.

Another highlight in the findings was that the use of the tutorial videos by the students was not due to the novelty of the videos since the use did not decline as more videos were introduced. The analytics provided by SproutVideo reported the most popular video, as determined by the number of plays, was the video for the students on the Fundamental Counting Principle, which was the third video introduced. Students mentioned that they used the videos to provide additional examples of how this concept worked. Since the third video was actually the most popular video, this suggests the students' use of the videos was needs based. Students commented that the Fundamental Counting Principle had been a difficult concept for them to grasp without watching the additional examples shown in the videos. Interestingly, the very first video, “Probability of simple events-parents”, that was provided for the parents to view was the most popular video played by the parents. There was more interest associated with the first video as parents wanted to see what this new resource looked like for their child. This aligns with the qualitative data that the parents did like having the video tutorials but just did not have the time to help their child with homework and view the videos. By the first and second videos being the top two videos by the number of views, this would indicate that the novelty of the videos being a new math resource might have played a part in some of the parent views since the number of parents viewing the videos dropped after the first two videos.

How often they watched the video tutorials varied, also. For some, it was daily; some had a time set aside each day to watch the videos, while others only watched it when they struggled. There were students who watched them to raise their grade and those who were trying to attain the highest average in the class. While the reasons may be different, the students did use the videos and they requested video tutorials for the other units in math. They even hoped that the school would begin to require the videos be provided as resources so they could have them for 8th grade, their next grade in school.

The rationale for Mayes’ (2011) research was much like the rationale for this study, an attempt to increase students' math success by the introduction of teacher-assisted video instruction into the instructional process. In both of the studies, students rated the use of the videos at an even higher approval rating than the parents. Much like the results of this study, Mayes found that not only did the videos help students when stuck on a homework problem, but also students used them to keep up with assignments when absent, and to gain a head start on learning.

Parents stated that they liked that the videos were available online at their home and that they were available on their phones. While some parents did not have desktops with Internet, they did have data on their phones. Home Internet availability was an issue that the researcher was concerned about when this research began. The researcher was not sure if the parents had the resources needed to watch the videos at their home. It turned out that most parents either had Internet or did not mind using the data on their phones. Over 81 percent of the views for the video tutorial were on a mobile device. It turned out that home Internet availability was definitely not as big of an issue as once was worried about since only a very small percentage of parents did not have Internet availability at home. Time was much more of the factor that kept parents from using the videos themselves. Some parents did state that by having the videos available, it actually relieved some of their time because the videos helped their child and saved them the time it would take to re-learn the math and help their child with math homework.

One of the more interesting findings was that the vast majority of tutorial views, 620 of the 761 total views, were on mobile devices while only 141 views were on desktop computers. When this study was in the planning stages, one of the biggest concerns of the researcher was if the households would have computers and how this should be addressed to give the students access to computers after school hours. Students were offered ipads and computers afterschool hours and the library was made available before and after school. The researcher did not realize that over 81 percent of the views would be made on mobile devices. The qualitiative data confirmed this finding as students and parents discussed how much they enjoyed the videos being available on their phones. The consenus was that the students and parents carried their phones everywhere and enjoyed being on their phones, so having the videos available on mobile devices was a top enhancement to the videos production mentioned in the surveys and interviews.

Implications

Technology is more readily available today to assist other educators who would like to make their own video tutorials for their subject areas. Computers have recording devices and websites to assist with the production of the videos. If an educator will take the time and effort to produce teacher-made video tutorials for their students, the videos will likely yield high usage and satisfaction by their students. The tutorials will fulfill critical needs that exist in our schools today.

The tutorials are time consuming for teachers to produce, but once they are made, they are ready to use. It is much more time consuming than one thinks. Preparing the PowerPoint, finding a quiet time to video, actually recording the video, retakes for mistakes, and then watching the finish product is just part of the time required. Aligning the examples to the Standards and what the students need to know, purchasing the software, learning how to work the equipment, downloading and uploading the videos, making a website for the videos are additional time-consuming tasks that may be overlooked when someone begins to contemplate making the tutorials. But, once they are produced, they are ready for use by all the students at anytime and are valuable resources to provide the students.

Schools need to provide the tools and software for their teachers to conduct research on the usage of these videos. Video capturing software and video hosting websites that provide analytics are expense with this type of research. Schools also need to provide the support and training that teachers need to carry out the video production since the tutorials meet the needs of the students.

Software and equipment need to be purchased to make the videos and there is a monthly fee for video hosting sites such as SproutVideo that was used in this research. Schools need to provide for these hosting services with analytics, since analytics are needed to research the video usage. Schools should consider a learning management system, LMS, to aid with the administration, documentation, tracking, reporting and delivery of electronic educational technology as the trend moves toward e-learning.

Internet access is not as much of a concern anymore. Free Internet exists at many public locations and smartphones have made Internet available in most all areas. Mobile devices are commonplace for students and parents. The video tutorials should be adapted and designed to work on these popular mobile devices.

Future Research

Video tutorials have not previously been available for any subject at the school in which this research was conducted. There was much excitement among the students about this new resource. Future research should include a study over a longer period of time to be sure the newness of the addition of video tutorials did not play a role in the results found. Studies should be conducted to see if students would continue to use the tutorials if they were available for all the Standards for the entire school year. Future research should be conducted over time to see how parents and students use these videos as they become more commonplace in learning and to track technical trends. Since very few studies have been conducted on teacher-made video tutorials, future studies should include other teachers from other subjects and schools conducting similar research.

Teacher-made video tutorials are labor intensive for the teacher to produce. There is a need for future studies to be conducted that compares the effectiveness of pre-made video tutorials, such as Khan Academy that are already available, and teacher-made video tutorials. Students could be given access to their lesson subject on both types of videos. If research findings showed that there is a demand for the teacher-made video tutorials, more teachers may be prompted to make their own video tutorials for their classes.

Use of video hosting services such as SproutVideo that provides analytics needs to be included in future research. While SproutVideo was used in this research, it should be noted that it collected analytics on the video tutorial usage not on individual student usage. For this study SproutVideo provided the total number of views by students for each video. An assumption would be that all students viewed the videos but SproutVideo did not provide this individual information. A more in-depth study is needed with another video hosting site to add the dimension of individual student use since this was not available with SproutVideo. Studies should be conducted on individual student usage and the effects that the teacher made video tutorials have on those individuals. The analytic feature adds invaluable data for and should be included in the research studies. An interesting study would be to compare how often an individual student used the tutorials and the impact that the tutorials had on that student's self-efficacy and achievement scores.

Future studies using the same methodology as used in this research study should be conducted with comparisons groups that have more similar academic abilities, such as both groups containing gifted students or both groups containing mixed ability levels. Curiosity led me to dwell deeper into my study at the completion of this research. I discovered that future deeper studies on this topic could be broken down by demographics, socioeconomic status, cultural, ethnic background, academic ability, and/or gender.

VIDEO DESIGN

Review of Findings

According to the parents, there were many factors that enabled these videos to be effective. The main feature parents liked about these tutorials was that it was presented by their child's very own teacher and in the same way that their child was taught in class. This correlates to Mayes' (2011) research that showed observed benefits from teacher tutorials included improved relationships with parents when the parents could use the videos to see how lessons were being taught, which created less anxiety between the parent and the student during homework sessions, both of which were the desired outcomes of creating the teacher-made videos for this research study. Overwhelmingly, parents reported the reason that they watched these videos over others was that their child's teacher produced the videos. Other factors that enabled the videos to be effective included that the content was exactly paired to what their child needed to know for 7th grade; it gave the parent a chance to watch the videos with their child; the videos were available at their home and on their phones.

A few of the parents did say that possibly the videos were too long. This matched the findings of Ruth Clark and Richard Mayer (2003) in their empirical testing of online learning and their research of the production of teacher-made video tutorials. Their findings on what makes an effective online tutorial video include the use of shorter video lessons rather than longer versions designed to educate and not to entertain.

Students stated the largest factor that impeded the effectiveness of the video tutorials was that they were too long. The students' suggested that shorter videos would be more effective. The students also had long conversations among themselves on how they thought the videos needed to be shorten. They debated back and forth that while they wish the videos were shorter, they did not know what they would have left out of the videos. After careful consideration, the students settled with the suggestion to divide the videos into two parts, one for instruction and one for examples. Their thoughts were that if the videos were divided into two separate videos, it would allow the individual student the chance to decide what they needed to watch.

A few students added that they would have liked the videos to be interactive. Some missed being able to send the teacher questions, either on chat or a thread. A suggestion from the students was to offer some sort of reward for watching the videos. They thought that if a few problems were added at the end of the videos, students could bring those in the next day for homework. During no part of this study did any student receive any rewards. But, remembering the age of these students and how much they love rewards, so it is not surprising that they thought it would be a good idea in the future.

The number one factor the students thought made the videos so effective was that it sounded like the teacher was talking just to them in the videos, just like they were having a conversation. The students liked the way the teacher on the videos asked them questions throughout the videos. This was a big feature they stated as being effective. A few of the students said things like, “How did you know that I got the right answer?” when the teacher would ask a question during the video and then say, “Good job, that’s right”. A few even said they found themselves answering the teacher’s questions and talking back to the video screen. This goes along with Clark and Mayer’s (2003) findings that the dialogue of the instructor in the tutorial videos should be more like a conversation and less like a lecture.

Other factors that students’ thought enabled the videos to be effective included the videos being available on their phones so they could watch them anywhere, anytime. They liked the videos being taught by their own teacher and in the same manner in which their classes are taught. They liked them being available if they were absent from class, so they would not get behind in their work. A feature that enhances the videos for them was the way the teacher worked the problems out right onto the SmartBoard during the videos. The students liked the way the videos could be re-played or could be paused so they could take notes. They liked any parts of the videos that were humorous. They felt like more riddles or jokes would add to the effectiveness of the videos. They had suggestions that I dressed up and acted out word problems. They liked any word problems that contained references to items that were relevant in their lives, such as the American Eagle clothing word problems or how many different outfits can one wear to school with four tops and 3 bottoms, that I included in the videos. This parallels the findings of Gürbüz, Çatlioglu, Birgin, and Toprak, (2009) in their study on a similar premise to this research, in which they believed traditional instructional methods fail to overcome difficulties when teaching the subject of probability. They studied the use of information and communication technology as a useful approach to overcome these obstacles. The results of their study on the 8th grade students in a school in Turkey revealed positive opinions of the computer assisted instruction by making the subject of probability more concrete and associated with real world examples.

Implications

Instructional video tutorials should be made by the students' teacher to maintain the teacher's voice that has been found to be an effective design feature of the tutorials for both the students and the parents. The videos need to retain the conversational style of delivery. All positive comments centered on how the tutorials sounded like the teacher was talking directly to the student in conversational style. If teachers are comfortable with humor, that is an additional element that could be used.

Implications from this study show that shorter videos are more effective and retain the viewer's interest. Therefore, breaking a longer video into chucks to make it shorter is definitely a better design than having longer videos that viewers lose interest in watching, therefore losing their effectiveness. Also, chunking videos into different sub-topics allows for more differentiation as students are offered videos on just the sections of the lessons that they need remediation or enrichment.

An issue that was raised during this research was the length of the videos. Students and even a few parents reported length as a factor that impeded the effectiveness of the video tutorials. In producing the math video tutorials, it was attempted to include everything the student needed to know about that particular lesson in one video. This included an explanation of the topic, a few simple examples explaining how the topic works, and then more complex word problems. Research from Ruth Clark and Richard Mayer (2003) in their empirical testing of online learning tutorials found shorter video tutorials more effective. The suggested length of a video is between five to seven minutes to keep a student's attention. Even with this knowledge, most of my videos were around ten minutes. As a math teacher, I teach chapters, such as probability, which are divided into lessons in most textbooks. My attempt was to include one complete lesson in one video.

An extreme example would be my video tutorial on "Independent and Dependent Probability". I had to re-take this video three times just to reduce the size down to thirteen minutes. I started with the definition of independent probability, an example with a pair of dice and a spinner and then I included tricks and mnemonics to remember how to determine if it is independent. I included a formula and proceeded to work examples of independent events word problems, beginning with simpler and moving to complex problems. I, then, did the same procedure for dependent events, definition, examples, tricks, and word problems. I finished the video by taking a few word problems on probability and talking the students through how to determine if it is dependent or independent and how to solve the problem. This is a good example with a simple practical solution. The video should have been divided into two sections, if not three. One would have been on independent, one on dependent, and possibly, one on examples of how to tell if a word problem is independent or dependent.

In practice there is an easy fix to this problem for anyone who produces video tutorials. If possible, try to keep the videos between five and seven minutes long. My students did not mention the videos being too long until they watched this thirteen-minute video. The rest of the videos were around ten minutes long. Another implication for practice is to title all videos. Parents and students commented on the ease of being able to select the tutorial that they needed to watch. With complete titles, dividing longer videos into separate smaller videos would help. Videos titles could even include the wording part one and part two in the title, as an attempt to keep the length of each video between five and seven minutes long.

During the interviews and informal conversations, students suggested dividing the videos into two separate videos. Their plan was to have one video for instruction and one video for examples. This would enable them to select what they needed help with, instruction or more examples. This could be a practical solution to the videos being too long, also.

Students responded highly in favor that the tutorials sounded more like a conversation than a lecture. Ruth Clark and Richard Mayer (2003) had similar findings that tutorials were more effective when conducted more like a conversation and less like a lecture. The students voiced a desire for the videos to be even more like a conversation by adding a dimension where they could reply back to the video or ask a question. A thread or blog could be added for students to provide feedback to the teacher. In selecting the website to host the video tutorials, one could be selected that has a comment section at the bottom of each video. I would suggest a hosting site that allows for the teacher to approve the comments before becoming available for everyone to read. Comments sections have the opportunity to provide addition learning and feedback if used correctly. Without the teacher maintaining control, the comments could get off subject or become more of a social medium, which is not the intention. Another opinion from the students was to add questions at the end of the videos. This would be a good way for the teacher and student to check for understanding. The students could bring the answers to the questions back to class the next day as possibly the bell ringer or homework.

Another implication from this study is accessibility. While this sample in this study did not contain students who had trouble with accessibility, it needs to be addressed. Teacher-made video tutorials need to be accessible to hearing and vision-impaired students, as well. The preparation and design process of producing the videos need to address this concern and all other concerns that would limit any student from having the videos accessible to them.

Future Research

Future research is needed to explore the wide variety of different types of approaches to producing and offering teacher made video tutorials to students. The possibilities are endless. Little to no research exists for any of these. Additional studies need to be conducted similar to this study but with individual student usage analytics collected by a website that allows for that, not SproutVideo that collected video analytics.

All future research would be accentuated by utilizing a mixed methods approach. The inclusion of interviews and surveys adds a more rich and intricate view of the construction, implementation and use of the teacher-made video tutorials. Resources and tools to collect the qualitative and quantitative analytics are needed to supplement the perceptions data.

INFLUENCE OF VIDEOS ON STUDENT EFFICACY AND ACHIEVEMENT

Review of Findings

The mean of the pre survey results for the self-efficacy of the control group was higher than the pre survey mean of the experimental group. This could be a factor of the control group consisting of all the "average ability" students, while the experimental group consisted of the gifted students and all the below average students. The experimental group reported a much higher mean difference from the pre and the post surveys results. The experimental group was the only group that received the video tutorials as the additional resource to use during the probability unit. The highlighted finding was that the students' self-efficacy improved after having the video tutorials as an additional resource. The study from Denler, Wolters, and Benzon found that students with greater self-efficacy are more confident in their abilities to be successful when compared to their peers with lower self-efficacy (2014).

While the results may not have been what I expected, extremely interesting results were found in the comparisons of the control and experimental groups' mean differences in the pre and post assessment grades for the different chapters. The control group had higher mean differences than the experimental group in the pre and post assessment grades for chapters seven, eight, and ten by 5.6, 9.08, and 13.81 points, respectively. Yet, the difference in chapter nine was only a 0.84 increase for the control group over the experimental group. Chapter nine was the unit that the experimental group received the video tutorials as the added resource. An extremely interesting finding is that the gap between the control and experimental group almost disappeared for chapter nine, highlighting that although the achievement gains were not significant, the gap did close. Research had suggested that the application of Vygotsky's theory of the Zone of Proximal Development (ZPD) could improve mathematical achievement (Christmas, Kudzai, & Josiah, 2013). While the results of the experimental groups' achievement assessments were not higher than the control groups' scores, I do feel that Vygotsky (1978) theory held true and my students were able to move to the "next level" of potential development when given the benefit of adult guidance with the videos which was demonstrated by the gap between these two groups almost closing during the probability unit.

This research does match the results found by Tienken and Maher (2008) who used the computer to assist in the students' math instruction without a significance increase being seen in the students' achievement levels. This research does not align with the study of Lloyd and Robertson (2012) whose results found that the students taught with the screencast tutorials scored significantly better than the students taught with the traditional instructional techniques. A fitting point to add at this point in my research is that I have reached the same main opinion reached by Lloyd and Robertson (2012) after their study, which is, while the use of computer-assisted instruction has drastically increased over the last few years, there is little empirical research evaluating those computer programs. More research is needed in the use of video tutorials.

Implications

For anyone considering duplicating this research with their own teacher-made video tutorials, my suggestion is to use a video housing website such as SproutVideo during the data collection period. The website provides deep and informative analytics that the researcher would otherwise not have available. I intentionally included and labeled some of the graphs provided by SproutVideo in this study so others who may be considering making their own tutorials could see exactly how much aggregate and individual video data is available if they use a website comparative to SproutVideo to house their tutorial videos. It is a wealth of data that will assist the teacher in seeing how the videos are being viewed. The analytics collected from the participants by the website is password protected and makes the results more reliable. The richness and depth of data collected on each video allowed me to see exactly who and how the videos were used, providing me valuable research data.

One warning though is to carefully select the video-hosting site that will be used to collect the analytics. SproutVideo, for example, collected the analytics for the video usage and was a good resource to discover that the videos were actually watched and to see the engagement students had throughout their viewing of the videos. Yet, if a researcher is trying to access video usage per student and the effect that the tutorials have on individual student, then a different hosting site should be used that collects individual student analytics verses video analytics.

Future Research

Since the use of teacher-made video tutorials for learning probably really does help the students as this research showed, future research is needed with other subject areas, presenters, and grade levels. This is such a wonderful avenue to explore that opens the world of learning up to the students in a realm that the students are comfortable using, technology.

While the individual student's stories of achievement improvement in this study may not have moved the statistics enough to show an overall improvement in the achievement scores, the individual stories of success existed and were fascinating, therefore worth future studies. Future research needs to be conducted on individual students either on the effect that the teacher-made video tutorials had on the student's self-efficacy and/or their academic achievement.

More research is needed similar to this study but with a better matched control group. The control group for this study consisted of all the "average ability" students, while the experimental group consisted of the gifted students and all the below average students. Although the mean achievement scores for the two groups matched in this study, it did not provide the best match for a control group. The two groups should contain the same ability level students and the same corresponding mean achievement scores for a more informative study since the groups would be better matched.

While the use of technology in education has grown exponentially over the last decade, limited research exists, much of which, has conflicting results. Schools have added more technological instruction in the classroom. Yet, this research study and previous research literature does not find that technological instruction consistently results in increased academic achievement. Today's students were born in the digital age and very comfortable using technology. With the increased use of technology in the classroom, there is a need for future research on what specific technology applications and instructions have a positive effect on the students' academic achievement levels.

CONCLUSION

Since today's students are accustomed to turning to the web for information and social interaction, a few new innovated technological teaching ideas have evolved, such as the addition of online video tutorials as a resource. According to Goodwin and Miller (2013), there is a lack of hard scientific evidence that these new ideas impact student learning, but if teachers only implemented strategies supported by decades of research, they would never try anything new. Until proven evidence is available, the best strategy for a teacher, such as this researcher who is trying something new, is to be sure the video tutorials reflect research-based principles of effective teaching and learning.

Khan Academy, an online library of instructional videos, is currently changing the way many students learn in the flipped and blended classrooms. Bill Tucker (2012) noted that one of the nation's leading thinkers on educational technology and the director of the UCEA Center for the Advanced Study of Technology Leadership in Education saw the reason that Sal Khan is so visible right now is that Khan is doing video tutorials nobody else is doing. While Khan Academy is free for the users, many of the other video tutorials that are available for students, such as those provided by textbook companies, come with a cost. Very little research is available on video tutorials that are produced by the classroom teacher for their subject.

As a middle school mathematics teacher, I produced video tutorials and made them available to my fifty-five students and their parents online for free. This mixed methods research study explored the construction, implementation, and effectiveness of these video tutorials. Both qualitative and quantitative methods were used to answer the research question, "How are students and parents using the video tutorials?" The video hosting website used to house the videos collected analytics on the video usage by the students and parents per video.

Both the qualitative and quantitative research reached the same conclusion that students used the video tutorials more often and for a variety of more reasons than their parents. The survey results showed the parents' mean rating of the uses for the video tutorials, on a scale from one to five, was 3.45, while the students mean score was 3.57. The analytics revealed that the average number of plays per video for the probability unit by students was 107 times, while the average number of plays per video by parents was 20 times. These results correlate with the themes that emerged from the interviews with the parents and students, as well as, the field notes and informal conversations. While parents stated extreme happiness that the videos were available for their child as an additional resource, they gave various reasons for not watching the videos themselves. These mainly included time as the deterrent. They stated they would use them more on lessons that child struggled with the math concepts.

When this study was first started, a huge concern was whether the students and parents would have availability to the Internet after school hours to view the videos. This did not prove to be a problem, since the majority of participants chose to use their mobile devices. The videos were viewed only 141 times on a desktop and 620 times on a mobile device.

On the other hand, all the students commented on watching the videos, many times more than once when studying for a test or reviewing a concept that they did not understand. Students used the videos to study for tests, help with their homework, and to enable them to stay caught up in class when they were absent. Multiple themes resulted since students discussed multiple reasons they used the tutorials. While the reasons may be different, the students did use the videos and they requested video tutorials for the other units in math.

Students had positive opinions about using the video tutorials on the probability unit. Gürbüz, Çatlioglu, Birgin, and Toprak, (2009) based their study on a similar premise to this research, in which they believed traditional instructional methods fail to overcome difficulties when teaching the subject of probability. The results of their study on the 8th grade students in a school in Turkey revealed similar positive opinions from the students on the computer assisted instruction by making the subject of probability more concrete.

Concluding thought about how parents and students used the video tutorials would be mixed but positive. Even though research did not reveal parents using the tutorials as much, they still wanted the resource to be available to their child. Students did use the video tutorials for remediation and learning. It did prove to be a valued asset when a student was absent from class. There was a deep appreciation from both the students and the parents for receiving the video tutorials as an additional resource. Parents and students viewed the offering of these tutorials as a genuine caring by the teacher about that child's learning.

Both qualitative and quantitative methods were used to answer the second research question, "What factors enable/impede the effectiveness of the video tutorials?" While the students were much more vocal than the parents, both had the same response that when video tutorials were too long that would impede the effectiveness of the videos. I tried to include everything a student needed to know about one lesson in one video, which was usually around a ten-minute video. I would not do this again. I would divide the videos into two sections, if needed, to keep the videos between five and seven minutes long. These findings match the findings of Ruth Clark and Richard Mayer (2003) in their empirical testing of online learning tutorials that shorter videos are more effective. My students suggested dividing the videos into two parts, one for instruction and one for examples. Their thoughts were that if the videos were divided into two separate videos, it would allow the individual student the chance to decide what they needed to watch.

The number one factor the students thought made the videos so effective was that it sounded like I was talking just to them in the videos, just like we were having a conversation. The students liked the way I asked them questions throughout the videos. This was a big feature they stated as being effective. A few of the students said things like, "How did you know that I got the right answer?" when I would ask a question during the video and then say, "Good job, that's right". A few even said they found themselves answering my questions and talking back to the video screen. This goes along with Clark and Mayer's (2003) findings that the dialogue of the instructor in the tutorial videos should be more like a conversation and less like a lecture.

Parents stated a factor that enhance the effectiveness of the video tutorials was that they were taught by their child's own teacher. As a teacher, I sit through many parent-teacher conferences and hear the same thoughts from many parents that they do not know how to do "this new math" or that their child says that the parent does not work out the problems the same of the teacher. These tutorials enabled parents to know exactly how the math problems are being solved. Students watched these video tutorials because their own teacher presented them in the same way they were taught in the classroom.

Other characteristics found to enhance the video tutorials were their availability on cell phones or mobile devices, working the problems out step-by-step during the videos, and just talking to the viewer during the video. Students would like for the videos to contain more humor and be interactive, to a degree where they could comment or ask questions, as in a thread or blog. I believe the teacher who makes his or her own video tutorials should always consider the age of the viewer. Since my viewers were middle graders, they liked humor and story telling, not lectures.

Vygotsky (1978) viewed assisted instruction and scaffolding whereby the teacher models the desired learning strategy as ways that the responsibility for learning would gradually shift to the students. My desire in providing the tutorials included shifting the responsibility for learning to the students and away from the parents by giving the students the additional resource of the tutorials at home. Being a parent myself, I recognize that time it becoming a bigger issue for parents. While studies such as the one by Christmas, Kudzai, & Josiah (2013) found that it was quite common for teachers to give students a lot of mathematical tasks as homework, without considering the sort of assistance that is available to the learner, I have worked very hard to go in the other direction. Instead of giving my students more work without assistance, the videos were aimed to provide my students the assistance needed to promote learning and higher self-efficacy.

A quantitative, quasi-experimental design was used to investigate the research question, "Is there a significance increase in students' self-efficacy levels after the use of the video tutorials as an instructional resource as measured by increased scores on the Likert scale survey and the video survey?" This research found the confidence questions scored the highest responses of any of the questions on the survey given to the students and the parents after having the video tutorials as additional resources. This matches the qualitative and quantitative data that identified higher confidence levels for both parents and students after the use of the tutorials. While my hypothesis was that the self-efficacy levels of the students and parents would increase from before and after the participants used the video tutorials as an instructional resource, the overwhelming increase even surprised me. On a scale from one to five with five being the highest self-efficacy, the mean average from the pre to the post self-efficacy survey went from 3.68 to 4.31, while the control class had a mean that went from 3.90 to a mean of 3.91.

After all the interviews and conversations with parents and students, I knew the videos were providing increase self-efficacy. My concern was that this was the first time any teacher had provided teacher-made video tutorials to the students at this school. There is much excitement when something is new. While I do think the self-efficacy increased, I would want to conduct this study for a longer period of time and see what the results are when the newness of the videos being available wears off.

The study from Denler, Wolters, and Benzon found that students with greater self-efficacy are more confident in their abilities to be successful when compared to their peers with lower self-efficacy (2014). This was the main basis for this research to see if the video tutorials could provide greater self-efficacy and give the students more confidence in their abilities to be successful in mathematics, thereby, giving the students the “I think I can, I think I can” perspective about mathematics.

The quantitative, quasi-experimental design was used to investigate the research question, “Is there a significance increase in students' achievement levels for the experimental group after the use of the video tutorials as an instructional resource as measured by increased scores on the pre-post assessment?” There have been inconsistences in the literature as to whether online tutorials affect achievement scores. Tienken and Maher (2008) used the computer to assist in the students’ math instruction and did not find a significance increase in their students’ achievement levels. Whereas, Lloyd and Robertson (2012) found that the students in their study taught with screencast tutorials scored significantly better than the students taught with the traditional instructional techniques. I had to fail to reject the null hypothesis in this research that there would be no change in the students’ achievement levels for the experimental group and the control group. Yet, it is interesting that the gap between the control and experimental group almost disappeared just for the unit on probability. While I was unable to accept my hypothesis, the experimental group did show improvement for the probability unit.

Technology plays a key role in our everyday lives, so of course it has become a key aspect in education as teachers prepare students for the real world and their future careers. Technology in the classroom is changing education and giving the teachers more opportunities to try different instruction methods. More research is needed as teachers experiment with these new methods in their quest to meet the needs of today’s digital learner and improve their instruction. Whether teacher-made video tutorials are the answer to this quest will be up to each teacher to decide for himself or herself. For my students, they provided excitement for learning and increased self-efficacy, which helped my students have the “I think I can, I think I can” perspective about mathematics.

References

Anderman, E., Urdan, T., & Roeser, R. (2003). The patterns of adaptive learning survey: History, development, and psychometric properties. Washington, D.C.

Balfanz, R. & Byrnes, V. 2006. Closing the mathematics achievement gaps in high poverty middle schools: Enablers and constraints. *Journal for Educating Students Placed at Risk*, *11*(2), 143-157.

Balfanz, R. & Byrnes, V. (2012). *The importance of being in school: A report on absenteeism in the nation's public schools.* Baltimore: Johns Hopkins University Center for Social organization of Schools.

Bandura, A. (1977). *Social learning theory*. Englewood Cliffs, NJ: Prentice Hall.

Bandura, A. (1986). *Social foundations of thought and action: A social cognitive theory*. Englewood Cliffs, NJ: Prentice Hall.

Bandura, A. (1997). *Self-efficacy: The exercise of control*. New York: W. H. Freeman.

Bender, W.N. (2012). *Differentiating instruction for students with learning disabilities: New best practices for general and special educators.* Thousand Oaks. CA: Crowin.

Boston University of Public Health. (2013). The social cognitive theory. Retrieved from http://sphweb.bumc.bu.edu/otlt/MPH-Modules/SB/SB721-Models/SB721-Models5.html

Bottge, B., Rueda, E., & Skivington, M. (2006). Situating math instruction in rich problem-solving contexts: Effects on adolescents with challenging behaviors. *Behavioral Disorders*, *31*(4), 394–407.

Brown, J. S., Collins, A., & Duguid, S. (1989). Situated cognition and the culture of learning. *Educational Researcher, 18*(1), 32-42.

Burns, M. K., Kanive, R., & DeGrande, M. (2012). Effect of a computer-delivered math fact intervention as a supplemental intervention for math in third and fourth grades. *Remedial and Special Education*, *33*(3), 184-191.

Carlson, A. (2015, January 12). Study: Georgia home to one of the country's poorest counties. *The Atlanta Journal-Constitution*. Retrieved from http://www.ajc.com/news/news/study-georgia-home-one-countrys-poorest-counties/njmNX/

Carr, J. M. (2012). Does math achievement h'app'en when iPads and game-based learning are incorporated into fifth-grade mathematics instruction? *Journal of Information Technology Education*, *11,* 269-286.

Cavalluzzo, L., Lowther, D. L., Mokher, C., & Fan, X. (2012). Effects of the Kentucky virtual schools' hybrid program for algebra I on grade 9 student math achievement. Final Report. NCEE 2012-4020. *National Center for Education Evaluation and Regional Assistance*.

Christmas, D., Kudzai, C., & Josiah, M. (2013, August 13). Vygotsky's Zone of Proximal Development theory: What are its implications for mathematical teaching? *Greener Journal of Social Sciences, 3*(7), 371-377.

Clark, R. C., & Mayer, R. E. (2003). *E-Learning and the science of instruction: Proven guidelines for consumers and designers of multimedia learning*. San Francisco, CA: Jossey-Bass/Pfeiffer.

Creswell, J. & Plano Clark, V. (2007). *Designing and conducting mixed methods research.* Thousand Oaks, CA: Sage.

Darling-Hammond, L., Zielezinski, M. & Goldman, S. (2014, September). *Using technology to support at-risk students' learning*. Retrieved from https://edpolicy.stanford.edu/sites/default/files/scope-pub-using-technology- report.pdf

Denler, H., Wolters, C., & Benzon, M. (2014, January 28). Social cognitive theory. *Education.com.* Retrieved from http://www.education.com/reference/article/social-cognitive-theory/

Dick, W., Carey, L., & Carey, J. O. (2009). *The systematic design of instruction*. Upper Saddle River, N.J.: Merrill/Pearson.

Fede, J. L., Pierce, M. E., Matthews, W. J., & Wells, C. S. (2013). The effects of a computer-assisted, schema-based instruction intervention on word problem-solving skills of low-performing fifth grade students. *Journal of Special Education Technology*, *28*(1), 9.

Georgia Department of Education. (2015). Georgia Standards of excellence framework. Retrieved from https://www.georgiastandards.org/Georgia-Standards/Frameworks/seventh-Math-Unit-6.pdf

Georgia Department of Education. (2015). Statewide Longitudinal Data System. Retrieved from https://slds.gadoe.org/sldsweb/Dashboard.aspx

Gillispie, L., Martin, F., & Parker, M. A. (2010). Effects of a 3-D video game on middle school student achievement and attitude in mathematics. *Electronic Journal of Mathematics & Technology*, *4*(1), 68-80.

Goodwin, B., & Miller, K. (2013). Evidence on Flipped Classrooms Is Still Coming In. *Educational Leadership*, *70*(6), 78.

Governor's Office of Student Achievement. (2013,August 30). *A snapshot of K-8 academic achievement in Georgia*. Retrieved from https://gosa.georgia.gov/snapshot-k-8-academic-achievement-georgia.

Gürbüz, R., Çatlioglu, H., Birgin, O., & Toprak, M. (2009). Students' and their teachers' views of computer-assisted instruction: The case of the probability subject. *Educational Sciences / Odgojne Znanosti, 11*(1), 155-169.

Hackett, G. & Betz, N. (1989). An exploration of the mathematics self-efficacy/mathematics performance calibration. *Journal for Research in Mathematics Education, 20,* 261-273.

Hanushek, E., Peterson, P., & Woessmann, L. (2010). *U.S. math performance in global perspective: How well does each state do at producing high- achieving students?* Harvard's Program on Education Policy and Governance, Report No.: 10–19.

Hanushek, E., Peterson, P., & Woessmann, L. (2012). *Achievement growth: International and US state trends in student performance*. Cambridge, MA: Harvard University Press.

Hillier, E. (2011). Demystifying differentiation for the elementary music classroom. *Music Educators Journal, 97*(4), 49-54.

Hough, D. L. (2009). Middle grades research: Exemplary studies linking theory to practice. Charlotte, NC: IAP.

Hudson, S., Kadan, S., Lavin, K., & Vasquez, T. (2010, December 1). *Improving basic math skills using technology*. Retrieved from ProQuest Digital Dissertations.

Imenda, S. (2014). Is there a conceptual difference between theoretical and conceptual frameworks? *Journal Of Social Science*, *38*(2), 185-195.

Independent Task Force on U.S. Education Reform and National Security, Council on Foreign Relations. (2012): *U.S. Education Reform and National Security*, Report No. 68 (March).

Khan, S., & Slavitt, E. (2013). A bold new math class. *Educational Leadership, 70*(6), 28-31.

Kersaint, G., Dogbey, J., Barber, J., & Kephart, D. (2011). The effect of access to an online tutorial service on college algebra student outcomes. *Mentoring & Tutoring: Partnership* *in Learning*, *19*(1), 25.

Kronholz, J. (2012). Can Khan move the bell curve to the right? Math instruction goes viral. *Education Digest*, 78(2), 23-30.

Lave, J. (1988). *Cognition in practice: Mind, mathematics and culture in everyday life.* Cambridge: Cambridge University Press.

Lloyd, S. A., & Robertson, C. L. (2012). Screencast tutorials enhance student learning of statistics. *Teaching Of Psychology*, *39*(1), 67-71.

Maloy, R. W., Edwards, S. A., & Anderson, G. (2010). Teaching math problem solving using a web-based tutoring system, learning games, and students' writing. *Journal of STEM Education: Innovations & Research*, *11*(1), 82-90.

Marshall, C., & Rossman, G. B. (2010). *Designing qualitative research* (5th ed.). Thousand Oaks, CA: Sage.

Mayer, R. E. (2003). The promise of multimedia learning: Using the same instructional design methods across different media. *Learning And Instruction*, *13*(External and Internal Representations in Multimedia Learning), 125-139. doi:10.1016/S0959-4752(02)00016-6

Mayes, D. R. (2011). *Effect of video assisted instruction on parent, teacher and student perceptions of a quality 5th grade math program*. (2011-99190-368).

McCutchen, K. (2015, July 23). Where does Georgia rank in K12 education? Retrieved from http://www.georgiapolicy.org/.

Meyer, D. (2015). Missing the promise of mathematical modeling. *Mathematics Teacher*, *108*(8), 578–583.

Midgley, C., Maehr, M. L., Hruda, L. Z., Anderman, E., Anderman, L., Freeman, K., . . . Urdan, T. (2000). Manual for the Patterns of Adaptive Learning Scales. Retrieved from http://www.umich.edu/~pals/PALS%202000_V12Word97.pdf

Miles, M. & Huberman, A. (1994). *Qualitative data analysis.* Thousand Oaks, CA: Sage Publications.

Miser, W., (2005). Educational Research-to IRB, or not to IRB? *Family Medicine, 37*(3), 168-173.

Mistretta, R. M. (2013). “We do care,” say parents. *Teaching Children Mathematics, 19*(9), 572-580.

National Council of Teachers of Mathematics. (2011). *Strategic use of technology in teaching and learning of mathematics.* Retrieved from http://www.nctm.org.

Peterson, P., Woessmann, L., Hanushek, E., & Lastra- Anadón, C. (2011): *Globally challenged: Are U.S. students ready to compete?* Harvard’s Program on Education Policy and Governance, Report No.: 11–03.

Robson, C. (2002). *Real word research: A resources for social scientists and practioner-researchers.* Oxford: Blackwell Publishers.

Sargent, C. S., Borthick, A. F., & Lederberg, A. R. (2011). Improving retention for principles of accounting students: Ultra-short online tutorials for motivating effort and improving performance. *Issues in Accounting Education, 26*(4), 657-679. doi:10.2308/iace-50001

Schaffhauser, D. (2013). The math of Khan. *T.H.E. Journal*, *40*(1), 19-25.

Shadish, W., Cook, T., & Campbell, D. (2002). *Experimental and quasi-experimental designs for generalized causal inference.* Boston: Houghton Mifflin Company.

Sherman, T. & Kurshan, B. (2005). Constructing learning: Using technology to support teaching for understanding. *Learning & Leading with Technology*, *32*(5), 10-39.

Sofaer, S. (1999). Qualitative methods: what are they and why use them? *Health Services Research*, *34*(5 Pt 2), 1101–1118.

Spector, J. (2012). *Foundations of educational technology: Integrative approaches and interdisciplinary perspectives*. New York: Routledge.

Spradlin, K., & Ackerman, B. (2010). The effectiveness of computer-assisted instruction in developmental mathematics. *Journal of Developmental Education*, *34*(2), 12-42.

SproutVideo. (n.d.). Retrieved June 25, 2016, from https://sproutvideo.com/features#feature-analytics.

Tienken, C. H., & Maher, J. A. (2008). The influence of computer-assisted instruction on eighth grade mathematics achievement. *Research in Middle Level Education Online*, *32*(3), 1-13.

Tucker, B. (2012). The flipped classroom: Online instruction at home frees class time for learning. *Education Next*, (1), 82.

Vygotsky, L.S. (1978). Mind in society: The development of higher psychological processes. Cambridge, MA: Harvard University Press.

What Works Clearinghouse. (2007). Middle school math. What works clearinghouse topic report. *Institute of Education Sciences*.

Willis, J. (2010). *Learning to love math: Teaching strategies that change student attitudes and get results*. Alexandria, Va: Assoc. for Supervision and Curriculum Development.

Woody, A.L. (2013). *The effects of a web-based mathematics program on student achievement*. Retrieved from ProQuest Digital Dissertations.

Yoon, C., Jamie. (2011). Student perceptions of effective use of tablet PC recorded lectures in undergraduate mathematics courses. *International Journal of Mathematical Education in Science & Technology, 42*(4), 425-445. doi:10.1080/0020739X.2010.543165

Zhang, M., Trussell, R., Gallegos, B., & Asam, R. (2015). Using math apps for improving student learning: An exploratory study in an inclusive fourth grade classroom. *Techtrends: Linking Research & Practice to Improve Learning*, *59*(2), 32-39. doi:10.1007/s11528-015-0837-y

Appendix A
Pre and Post Assessments – Probability – Chapter 9

NAME ______________________ DATE ______________ PERIOD ________

Pre-Assessment - Probability

SCORE ________

Write the letter for the correct answer in the blank at the right of each question.

For Exercises 1-3, use the spinner at the right. What is each probability written as a fraction in simplest form?

1. *P* (D)
   A. $\frac{1}{6}$ B. $\frac{4}{5}$
   C. about 50% D. 6

2. *P* (consonant)
   A. $\frac{1}{6}$ B. $\frac{2}{3}$ C. 0.75 D. 2

3. *P* (*not* A)
   A. 0.2 B. $\frac{1}{6}$ C. $\frac{5}{8}$ D. $\frac{5}{6}$

1. ________
2. ________
3. ________

For Exercises 4-6, what is the total number of outcomes in each sample space?

4. tossing a coin and spinning a spinner with five equal sections, 1-5
   A. 2 C. 10
   B. 7 D. 15

5. rolling two number cubes
   A. 8 C. 18
   B. 12 D. 36

6. choosing water, iced tea, or lemonade; with lemon or lime twist; served in a small or large glass
   A. 7 C. 8
   B. 10 D. 12

7. There are seven clarinet players in the concert band. In how many ways can they be seated in seven chairs at a concert? Use the Fundamental Counting Principle.
   A. 5,040 C. 840
   B. 2,520 D. 210

8. A store is handing out coupons worth 30%, 35%, or 40% off. Each coupon is equally likely to be handed out. Which of the following models could be used to simulate this situation?
   A. flipping a coin
   B. rolling a number cube labeled one through six three times
   C. spinning a spinner with four equal sections
   D. spinning a spinner with three equal sections

4. ________
5. ________
6. ________
7. ________
8. ________

NAME ______________ DATE ______________ PERIOD ______

Pre Assessment - Probability

SCORE ________

For Exercises 9 and 10, Vernon tossed a coin 20 times. The results were 8 heads and 12 tails.

9. What is the experimental probability of tossing heads? **9.** ________

A. $\frac{1}{8}$ **B.** $\frac{2}{5}$ **C.** $\frac{1}{2}$ **D.** $\frac{3}{5}$

10. What is the best comparison between the theoretical and experimental probability of tossing heads?

A. The theoretical probability is greater than the experimental probability.

B. The theoretical probability is less than the experimental probability.

C. The theoretical probability is equal to the experimental probability.

D. The theoretical probability is not related to the experimental probability. **10.** ________

11. A bag contains 2 red checkers and 6 black checkers. A checker is selected, kept out of the bag, and then another checker is selected. What is *P*(black, then red)?

A. $\frac{1}{9}$ **B.** $\frac{3}{16}$ **C.** $\frac{3}{14}$ **D.** $\frac{9}{16}$ **11.** ________

Find each value.

12. *P* (7, 2)

A. 14 **B.** 42 **C.** 49 **D.** 56 **12.** ________

13. *P* (9, 3)

A. 12 **B.** 27 **C.** 72 **D.** 504 **13.** ________

14. *P* (5, 4)

A. 9 **B.** 20 **C.** 120 **D.** 625 **14.** ________

A number cube is rolled and a letter is selected from the word GIRAFFE. Find each probability.

15. *P* (4 and F)

A. $\frac{1}{21}$ **B.** $\frac{1}{6}$ **C.** $\frac{2}{7}$ **D.** $\frac{1}{42}$ **15.** ________

16. *P* (even number and vowel)

A. $\frac{1}{2}$ **B.** $\frac{3}{7}$ **C.** $\frac{3}{14}$ **D.** $\frac{1}{14}$ **16.** ________

17. A jar contains 5 blue marbles, 7 yellow marbles, and 8 green marbles. What is the probability of randomly choosing a blue marble, not replacing it, and then choosing a green marble?

A. $\frac{1}{4}$ **B.** $\frac{2}{19}$ **C.** $\frac{8}{19}$ **D.** $\frac{1}{10}$ **17.** ________

IAME ______________________________ DATE ____________________ PERIOD ________

Post-Assessment - Probability

SCORE ______

Vrite the letter for the correct answer in the blank at the right of each question.

'or Exercises 1-3, use the spinner at the right. What is each probability vritten as a fraction in simplest form?

1. *P* (D)
A. $\frac{1}{6}$ **B.** $\frac{4}{5}$
C. about 50% **D.** 6

1. ____________

2. *P* (consonant)
A. $\frac{1}{6}$ **B.** $\frac{2}{3}$ **C.** 0.75 **D.** 2

2. ____________

3. *P* (*not* A)
A. 0.2 **B.** $\frac{1}{6}$ **C.** $\frac{5}{8}$ **D.** $\frac{5}{6}$

3. ____________

'or Exercises 4-6, what is the total number of outcomes in each sample pace?

4. tossing a coin and spinning a spinner with five equal sections, 1-5
A. 2 **C.** 10
B. 7 **D.** 15

4. ____________

5. rolling two number cubes
A. 8 **C.** 18
B. 12 **D.** 36

5. ____________

6. choosing water, iced tea, or lemonade; with lemon or lime twist; served in a small or large glass
A. 7 **C.** 8
B. 10 **D.** 12

6. ____________

7. There are seven clarinet players in the concert band. In how many ways can they be seated in seven chairs at a concert? Use the Fundamental Counting Principle.
A. 5,040 **C.** 840
B. 2,520 **D.** 210

7. ____________

8. A store is handing out coupons worth 30%, 35%, or 40% off. Each coupon is equally likely to be handed out. Which of the following models could be used to simulate this situation?
A. flipping a coin
B. rolling a number cube labeled one through six three times
C. spinning a spinner with four equal sections
D. spinning a spinner with three equal sections

8. ____________

AME ______________________ DATE ____________________ PERIOD __________

Post Assessment - Probability

SCORE __________

or Exercises 9 and 10, Vernon tossed a coin 20 times. The results were 8 eads and 12 tails.

9. What is the experimental probability of tossing heads?

A. $\frac{1}{8}$ **B.** $\frac{2}{5}$ **C.** $\frac{1}{2}$ **D.** $\frac{3}{5}$

9. ____________

10. What is the best comparison between the theoretical and experimental probability of tossing heads?

A. The theoretical probability is greater than the experimental probability.

B. The theoretical probability is less than the experimental probability.

C. The theoretical probability is equal to the experimental probability.

D. The theoretical probability is not related to the experimental probability.

10. ____________

11. A bag contains 2 red checkers and 6 black checkers. A checker is selected, kept out of the bag, and then another checker is selected. What is *P*(black, then red)?

A. $\frac{1}{9}$ **B.** $\frac{3}{16}$ **C.** $\frac{3}{14}$ **D.** $\frac{9}{16}$

11. ____________

ind each value.

12. *P* (7, 2)

A. 14 **B.** 42 **C.** 49 **D.** 56

12. ____________

13. *P* (9, 3)

A. 12 **B.** 27 **C.** 72 **D.** 504

13. ____________

14. *P* (5, 4)

A. 9 **B.** 20 **C.** 120 **D.** 625

14. ____________

number cube is rolled and a letter is selected from the word GIRAFFE. ind each probability.

15. *P* (4 and F)

A. $\frac{1}{21}$ **B.** $\frac{1}{6}$ **C.** $\frac{2}{7}$ **D.** $\frac{1}{42}$

15. ____________

16. *P* (even number and vowel)

A. $\frac{1}{2}$ **B.** $\frac{3}{7}$ **C.** $\frac{3}{14}$ **D.** $\frac{1}{14}$

16. ____________

17. A jar contains 5 blue marbles, 7 yellow marbles, and 8 green marbles. What is the probability of randomly choosing a blue marble, not replacing it, and then choosing a green marble?

A. $\frac{1}{4}$ **B.** $\frac{2}{19}$ **C.** $\frac{8}{19}$ **D.** $\frac{1}{10}$

17. ____________

Appendix B
Interview Questions

Interview questions

I plan to conduct some open-ended interview questions to clarify and complete the perceptions that the students and parents have about the teacher-made video tutorials. I would like to have permission to ask some probing questions about how the videos were used. The questions would be such as these that follow:

What would you say was the main purpose you watched the tutorials?
What features of the tutorials did you like best?
How often did you watch the tutorials?
Was Internet availability a problem?
Were there features about the videos that you liked? If so, what were they?
Were there features about the videos that you did not like? If so, what were they?
Would you use the tutorials if they were available for all of the units in math?

Appendix C
Video Survey for Students

Teacher-made Video Tutorial Survey for STUDENTS

This survey asks questions about the teacher-made video tutorials. Please answer the questions as honestly as possible. Participation is voluntary, and all responses will be kept anonymous. Thanks for your time!

1. Please indicate on a scale of 1 to 5 your level of agreement with the following statements. (1 being **strongly disagree** and 5 being **strongly agree**). Place a check in one box for each question.

	1 Strongly disagree	2 Disagree	3 Neither disagree or agree	4 Agree	5 Strongly Agree
Issue 1: Use of videos					
I watch the videos daily					
I watch the videos to help me learn					
I watched the videos for enrichment and to learn more					
I watched the videos because I missed the lesson in class					
I watched the videos before the teacher taught the lesson					
I watched the videos after the teacher taught the lesson					
I used the videos to help with homework					
I used the videos to help me prepare for a test					

	1 Strongly disagree	2 Disagree	3 Neither disagree or agree	4 Agree	5 Strongly Agree
Issue 2: Characteristics of the videos					
I was able to learn more from the video since I was able view at my own pace and to rewind and review portions I did not understand the first time.					
I found the videos that were more like lectures helpful					
I found the videos that solved math problems (step-by-step) helpful					
I liked seeing my teacher in the videos					
I liked just seeing the blackboard and writing in the videos					
I missed being able to ask questions during the videos.					
I found it hard to watch the					

videos because Internet access is a problem					
Issue 3: Confidence					
The videos helped me learn					
	1 Strongly disagree	2 Disagree	3 Neither disagree or agree	4 Agree	5 Strongly Agree
I have more confidence in my math ability now that I have the videos					
I understand the math concepts better by watching the videos					
I like having the videos as a math resource when I need it					

Please write any additional comments or important points you feel were missed in the survey.

Thank you for your time and participation!

Appendix D
Video Survey for Parents

Teacher-made Video Tutorial Survey for PARENTS

This survey asks questions about the teacher-made video tutorials. Please answer the questions as honestly as possible. Participation is voluntary, and all responses will be kept anonymous. Thanks for your time!

1. Please indicate on a scale of 1 to 5 your level of agreement with the following statements. (1 being **strongly disagree** and 5 being **strongly agree**). Place a check in one box for each question.

	1 Strongly disagree	2 Disagree	3 Neither disagree or agree	4 Agree	5 Strongly Agree
Issue 1: Use of videos					
I watch the videos daily					
I watch the videos to help me learn					
I watched the videos as enrichment to help my child					
I watched the videos because my child missed the lesson in class					
I watched the videos before the teacher taught the lesson					
I watched the videos after the teacher taught the lesson					
I used the videos to help my child with homework					
I used the videos to help my child prepare for a test					

	1 Strongly disagree	2 Disagree	3 Neither disagree or agree	4 Agree	5 Strongly Agree
Issue 2: Characteristics of the videos					
I was able to learn more from the video since I was able view at my own pace and to rewind and review portions I did not understand the first time.					
I found the videos that were more like lectures helpful					
I found the videos that solved math problems (step-by-step) helpful					
I liked seeing my child's teacher in the videos					
I liked just seeing the blackboard and writing in the videos					
I missed being able to ask questions during the videos.					
I found it hard to watch the videos because Internet access is a problem					

Issue 3: Confidence					
The videos helped me learn					
	1 Strongly disagree	2 Disagree	3 Neither disagree or agree	4 Agree	5 Strongly Agree
I have more confidence in my math ability now that I have the videos					
I understand the math concepts better by watching the videos					
The videos helped my child with math					

Please write any additional comments or important points you feel were missed in the survey.

Thank you for your time and participation!

Appendix E
Pre and Post Efficacy Survey for Students

(Pre – Post Likert Scale Confidence)

Students, please place a check mark in the box that matches your confidence levels for mathematics this year.

	Not true at all 1	2	Somewhat true 3	4	Very true 5
1. I'm certain I can master the skills taught in class this year.					
2. I'm certain I can figure out how to do the most difficult class work.					
3. I can do almost all the work in class if I don't give up.					
4. Even if the work is hard, I can learn it.					
5. I can do even the hardest work in this class if I try.					

Academic Efficacy subscale from Patterns of Adaptive Learning Scales (PALS)

Midgley et al., (2000)

This is the measurement of your cognitive process to acquire knowledge and understanding in mathematics. It describes your beliefs and attitudes toward mathematics and the level of "I think I can" that you possess to successfully complete homework assignments and review mathematical skills needed for the new Georgia Milestone Assessment.

Appendix F
Parental Consent Form With Child Assent (Control Group)

PARENTAL CONSENT FORM WITH CHILD ASSENT STATEMENT (Control Group)

Title of Research Study: Efficacy of Math Video Tutorials on Student Perception and Achievement

Researcher's Contact Information: Name: Carol Kahrmann
Telephone: [redacted]
Email: ckahrmann@[redacted]schools.org

Your child is being invited to take part in a research study conducted by Carol Kahrmann of Kennesaw State University. Before you decide to allow your child to participate in this study, you should read this form and ask questions if you do not understand.

Description of Project

The purpose of this study is to explore student achievement in the probability unit in 7th grade math. The study will also explore students' self-efficacy in math during the probability unit. Self-efficacy is one's belief in their ability to succeed.

Explanation of Procedures

All students presently take a pre- and post- assessment in the probability unit. The researcher is asking for permission to use these scores in her research. No individual scores will be reported. Student individual scores will not be identifiable in the research. Participating in this part of the research will not add time or additional tasks to the students. The pre-and post-assessments are already part of students' regular classroom activities.

The researcher would also like to administer a pre- and post-survey related to students' perceptions about their own abilities to do math (self-efficacy). Students' responses to this survey will be confidential. No identifiable responses will be used in the research report. The pre- and post-survey are very brief, consisting of nineteen questions and will be completed in their math class.

Time Required

The pre-and post-assessments will not add time to the students' schedules since they are already a part of the class. The surveys will require less than 10 minutes to complete.

Risks or Discomforts

There are no known risks or anticipated discomforts for the students during this study. Participation or non-participation in this study will not affect the student's grade.

Benefits

The research may learn what helps students increase their math achievement and their math self-efficacy. Students may also benefit from reflecting on their feelings about math.

Compensation (if applicable)

There is no compensation to anyone involved in this study.

Confidentiality

The results of this participation will confidential. Surveys will be conducted without any names attached. If a name is listed the identifier will be removed the day the survey is returned to the researcher. Interviews will coded with no identifiable information collected. The researcher will be the only person with access to any of the data that is collected. The data will be stored in a secured locked location and discarded at the end of this research.

Inclusion Criteria for Participation

The 7th grade students are between 12-14 years old. These students will attain parental content to participate in this study.

Parental Consent to Participate

I give my consent for my child, ____, to participate in the research project described above. I understand that this participation is voluntary and that I may withdraw my consent at any time without penalty. I also understand that my child may withdraw his/her assent at any time without penalty.

____
Signature of Parent or Authorized Representative, Date

____
Signature of Investigator, Date

____

PLEASE SIGN BOTH COPIES OF THIS FORM, KEEP ONE AND RETURN THE OTHER TO THE INVESTIGATOR

Research at Kennesaw State University that involves human participants is carried out under the oversight of an Institutional Review Board. Address questions or problems regarding these activities to the Institutional Review Board, Kennesaw State University, 585 Cobb Avenue, KH3403, Kennesaw, GA 30144-5591, (470) 578-2268.

Child Assent to Participate

My name is Carol Kahrmann. I am inviting you to be in a research study about why students have difficulty with the probability unit in 7th grade. I will compare the achievement scores from the 7th grade probability unit of those students who did and did not utilize the teacher made video tutorial resources and explore how you feel about your confidence in math this year. Your parent has given permission for you to be in this study, but you get to make the final choice. It is up to you whether you participate.

If you decide to be in the study, I will ask you to complete a survey about how you feel about math. There are no risks to you for being involved in this study. Whether you participate in this study or not, it will not affect your grade. The benefits include helping the researcher produce effective video tutorials.

You do not have to answer any question you do not want to answer or do anything that you do not want to do. When I tell other people what I learned in the study, I will not tell them your name or the name of anyone else who took part in the research study.

If anything in the study worries you or makes you uncomfortable, let me know and you can stop. No one will be upset with you if you change your mind and decide not to participate. You are free to ask questions at any time and you can talk to your parent any time you want. If you want to be in the study, sign or print your name on the line below:

____
Child's Name and Signature, Date

Check which of the following applies *(completed by person administering the assent.)*

- ☐ Child is capable of reading and understanding the assent form and has signed above as documentation of assent to take part in this study.

- ☐ Child is not capable of reading the assent form, but the information was verbally explained to him/her. The child signed above as documentation of assent to take part in this study.

____
Signature of Person Obtaining Assent, Date

Appendix G
Parental Consent Form With Child Assent (Experimental Group)

PARENTAL CONSENT FORM WITH CHILD ASSENT STATEMENT (Experimental Group)

Title of Research Study: Efficacy of Math Video Tutorials on Student Perception and Achievement

Researcher's Contact Information: Name: Carol Kahrmann
Telephone: [redacted]
Email: ckahrmann@[redacted]schools.org

You and your child are being invited to take part in a research study conducted by Carol Kahrmann of Kennesaw State University. Before you decide on participation in this study, you should read this form and ask questions if you do not understand.

Description of Project

The purpose of the study is to address why students have difficulty with the probability unit in 7th grade math. Mrs. Kahrmann wants to see if providing students and parents with teacher-made instructional video tutorials, that target the students' problem areas, will help the students. Mrs. Kahrmann also wants to explore if providing the students with video tutorials changes their confidence levels about being successful in math this year. An additional purpose of this research is to learn how to make and implement more effective video tutorials.

Explanation of Procedures

1) All students currently take a pre- and post-test in the probability unit in Carol Kahrmann's math class. These two assessments are used to determine student progress toward learning goals. This test is part of normal classroom activities. Taking the pre- and post-test will not add any time to the students' schedule. Students will take this test whether or not they participate in the research study. The researcher is seeking parental consent to use students' scores in the study. Students' individual scores will not be identified in the report. If students do not participate in the research, their scores will not be analyzed and used in the research report. Parents are always allowed to view the results of their child's tests scores.
2) All students will take a pre- and post-survey related to students' perceptions about their own abilities to do math (self-efficacy). The pre- and post-survey are very brief, consisting of nineteen questions and will be completed in their math class. This test is part of normal classroom activities. Taking the pre- and post-survey will not add any time to the students' schedule. Students will take this survey whether or not they participate in the research study. Results of the survey will help the teacher improve instruction. The researcher is seeking parental consent to use students' scores in the study.

Students' responses to this survey will be confidential. No identifiable responses will be used in the research report. If students do not participate in the research, their scores will not be analyzed and used in the research report. Parents will be allowed to results of their child's self-efficacy survey upon request.

3) All students and parents in Carol Kahrmann's class will be provided access to online teacher-made video tutorials as a resource to aid in remediation and enrichment for the probability unit. Each student and parent will receive his or her own individual passwords. The video hosting website will collect data on the usage of each video such as how many individuals are watching the videos, whether they are being played on a mobile or desktop device, how many plays each video receives, which videos are getting the most plays, and whether the parents or students are viewing the videos more. All parents and students will be provided access to these videos whether or not they choose to participate in the research study. The researcher is seeking permission to include parents' and students' usage information gathered from the video hosting site in the research. No identifiable, individual information on use will be included in the report. User information will be strictly confidential. Parents will be allowed to view usage information on their child upon request.
4) After the unit on probability is complete, parents and students participating in the research will be asked to complete a brief, anonymous survey on how they used the videos and what they liked/disliked about the videos. The results of the survey will be strictly confidential. No identifiable, individual data will be included in the study.
5) After the unit on probability, a few selected students and parents may be asked to participate in a one-on-one interview or in a small group to discuss how the videos were used; the effectiveness of the videos; and how they might be improved. Responses from the interviews and small group discussions will be confidential. No names will be connected to responses gathered from interviews or focus groups will be included in the final research report.
6) During the probability unit, the parents and students may engage in informal face-to-face or e-mail conversations about the videos. The researcher seeks permission to include these individual comments, questions, and suggestions in the research report. No names will be connected to responses gathered from these conversations will be included in the final research report.

Participating or not participating in the research project will not affect the students' grades. At the end of this consent form, parents and students will be given the opportunity to participate in all, some, or none of these research activities.

Time Required

The students would be given one hour to complete the pre and post assessments. The surveys will require less than 15 minutes to complete and the interviews will also last under 15 minutes.

Risks or Discomforts

There are no known risks or anticipated discomforts for the students during this study. Participation or non-participation in this study will not affect the student's grade.

Benefits

The researcher will learn more about producing effective tutorials videos. The researcher will give all parents and students access to these video tutorials online to use for remediation or enrichment. The videos can be instructional resources for the students. Benefits include helping me be a better digital-age teacher, utilizing technology, and identifying new resources for my students for the rest of the school year. If the video tutorials are successful, I will implement more videos later for the other math units for my students. This research will give my students and their parents a say as to what they think makes effective instructional videos. Students may also benefit from talking about their experiences and reflecting on their feelings about math.

Compensation (if applicable)

There is no compensation to anyone involved in this study.

Confidentiality

The results of this participation will be confidential. Surveys will be conducted without any names attached. If a name is listed the identifier will be removed the day the survey is returned to the researcher. Interviews will be coded with no identifiable information collected. The researcher will be the only person with access to any of the data that is collected. The data will be stored in a secured locked location and discarded at the end of this research.

Inclusion Criteria for Participation

7th grade students enrolled in Carol Kahrmann's math class during Spring 2016 and their parents are eligible to participate in this research study. The 7th grade students are between 12-14 years old. These students will attain parental content to participate in this study. The participants will have levels of participation.

Consent to Participate

I. I give my consent for my child, (child's name) ______________________________ to participate in the following research activities. I understand that all research data will be confidential and that my child's individual responses/scores will not be identified in the research reports. By checking the boxes below, I authorize the researcher to analyze and include the following data to be used in this research study. If you do not consent to the research activity, do not check the box.

☐ Yes, you may include my child's scores on pre-and post-test on probability test in the research
☐ Yes, you may include my child's responses from the pre- and post-survey on math ability (self-efficacy) in the research
☐ Yes, you may include my child's usage information from the video hosting site in the research
☐ Yes, you may include my child's responses from an anonymous survey on video use, effectiveness, and improvements in the research
☐ Yes, you may include my child's responses to interview and small group discussions about the videos in the research.
☐ Yes, you may include my child's informal conversations about the videos in the research

X Parent's Signature/Date

II. As parents or guardians, our signatures below indicate that we agree to participate in the research project. We understand that this participation is voluntary and that either of us may withdraw his/her consent at any time without penalty. Up to two parents/guardians/family members involved in the child's educational process can participate in this study. If only one person wishes to participate, leave the second field blank. If no one wishes to participate, skip this section.

(1)

Family Member's Printed Name Signature Date

(2)

Family Member's Printed Name Signature Date

Please indicate your level of participation by checking the boxes below. By checking the boxes below, you authorize the researcher to analyze and include the following data to be used in this research study. If you do not consent to the research activity, do not check the box. We understand that all research data will be confidential and that our individual responses will not be identified in the research reports.

Parent #1	Parent #2	Research Activities:
☐	☐	I allow my usage information from the video hosting site to be included in the research
☐	☐	I am willing to take a short survey about the video use, effectiveness, and improvements and to have my responses included in the research
☐	☐	If asked, I am willing to participate in one-on-one interviews with Ms. Kahrmann and have my responses included in the research.
		If asked, I am willing to participate small group discussions about the videos with Mrs. Kahrmann and other parents and have my responses included in the research.
☐	☐	If I engage in informal conversations about the videos with Mrs. Kahrmann, I am willing to have my comments, questions, and suggestions included in the research unless I specifically ask her to exclude them.

PLEASE SIGN BOTH COPIES OF THIS FORM, KEEP ONE AND RETURN THE OTHER TO THE INVESTIGATOR

Research at Kennesaw State University that involves human participants is carried out under the oversight of an Institutional Review Board. Address questions or problems regarding these activities to the Institutional Review Board, Kennesaw State University, 585 Cobb Avenue, KH3403, Kennesaw, GA 30144-5591, (470) 578-2268.

Child Assent to Participate

My name is Carol Kahrmann. I am inviting you to be in a research study about why students have difficulty with the probability unit in 7th grade and see if providing teacher-made instructional video tutorials, for these problem areas, could help you. I will compare the achievement scores from the 7th grade probability unit of those students who did and did not utilize the teacher made video tutorial resources and explore how these videos may have changed your thoughts about math, as well as, how these videos may have changed your parents thoughts about math. Your parent has given permission for you to be in this study, but you get to make the final choice. It is up to you whether you participate.

If you decide to be in the study, I will ask you to complete a survey about how you feel about the video tutorials and if they helped you. There are no risks to you for being involved in this study. Whether you participate in this study or not, it will not affect your grade. The benefits include having the video tutorials as resources to refer to during the probability unit and giving me feedback as to what features you like in video tutorials.

You do not have to answer any question you do not want to answer or do anything that you do not want to do. When I tell other people what I learned in the study, I will not tell them your name or the name of anyone else who took part in the research study. Your parents will have the right to know your data usage of the videos.

If anything in the study worries you or makes you uncomfortable, let me know and you can stop. No one will be upset with you if you change your mind and decide not to participate. You are free to ask questions at any time and you can talk to your parent any time you want. If you want to be in the study, sign or print your name on the line below:

____

Child’s Name and Signature, Date

Check which of the following applies *(completed by person administering the assent.)*

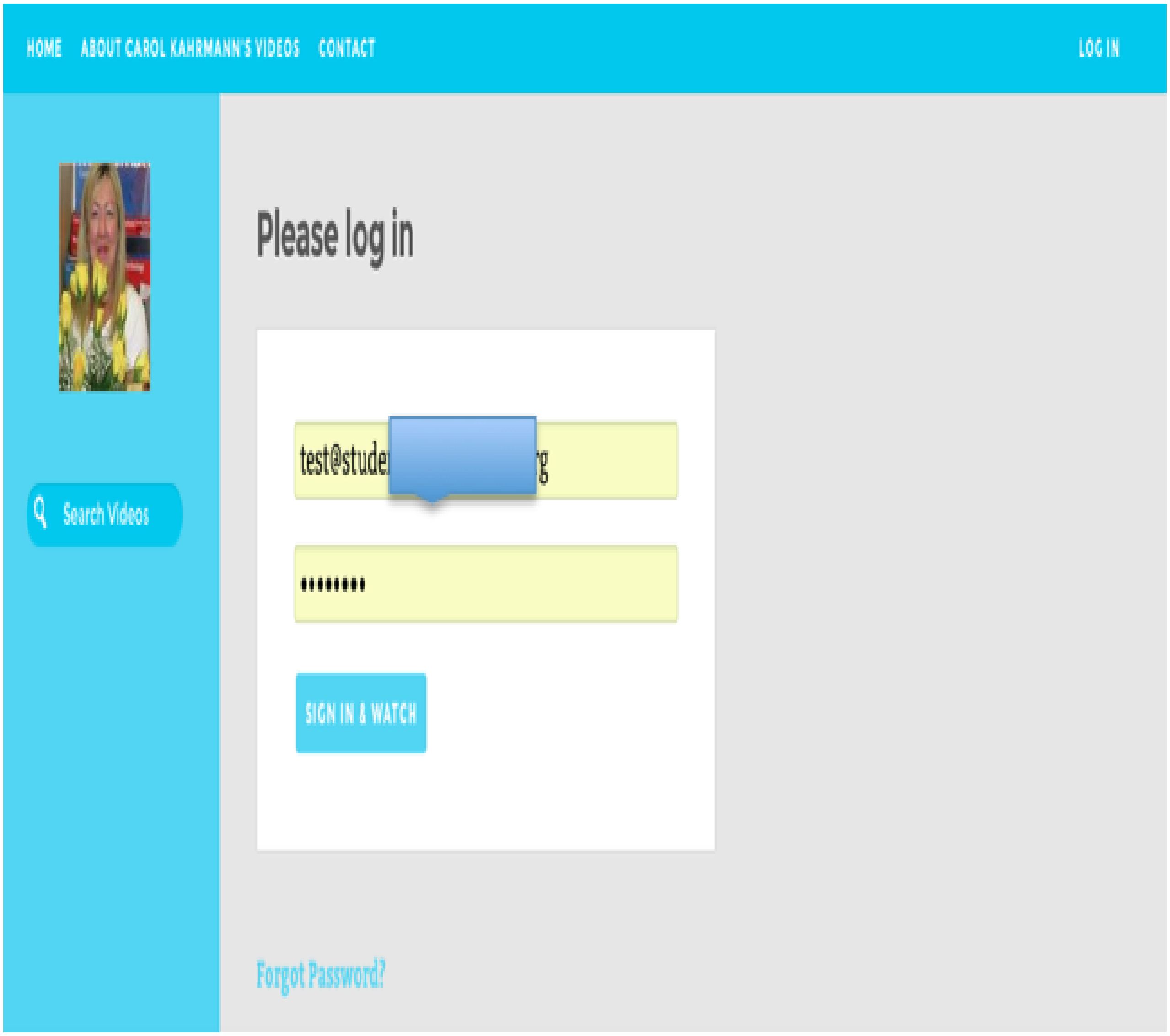
☐ Child is capable of reading and understanding the assent form and has signed above as documentation of assent to take part in this study.

☐ Child is not capable of reading the assent form, but the information was verbally explained to him/her. The child signed above as documentation of assent to take part in this study.

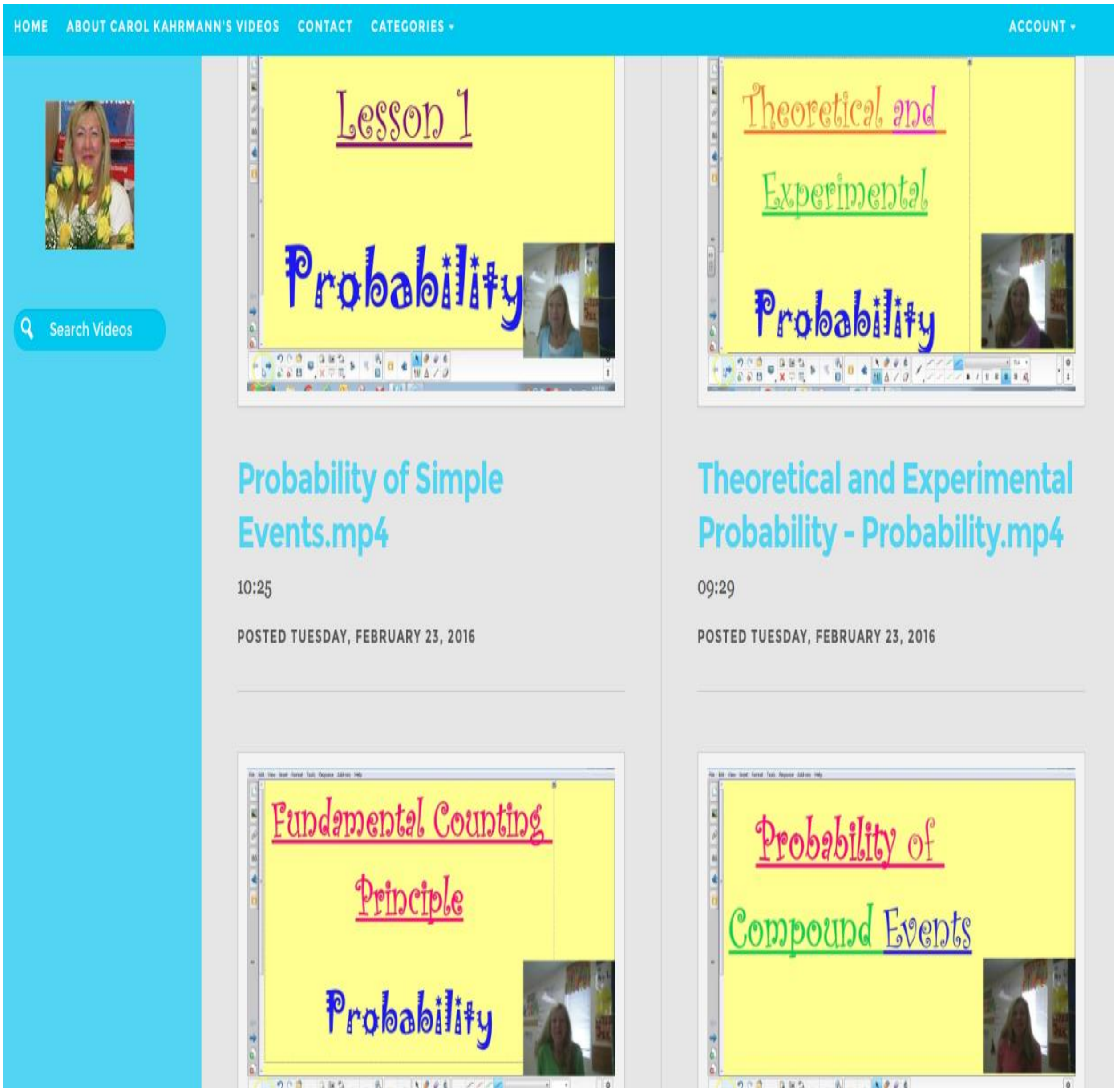
____

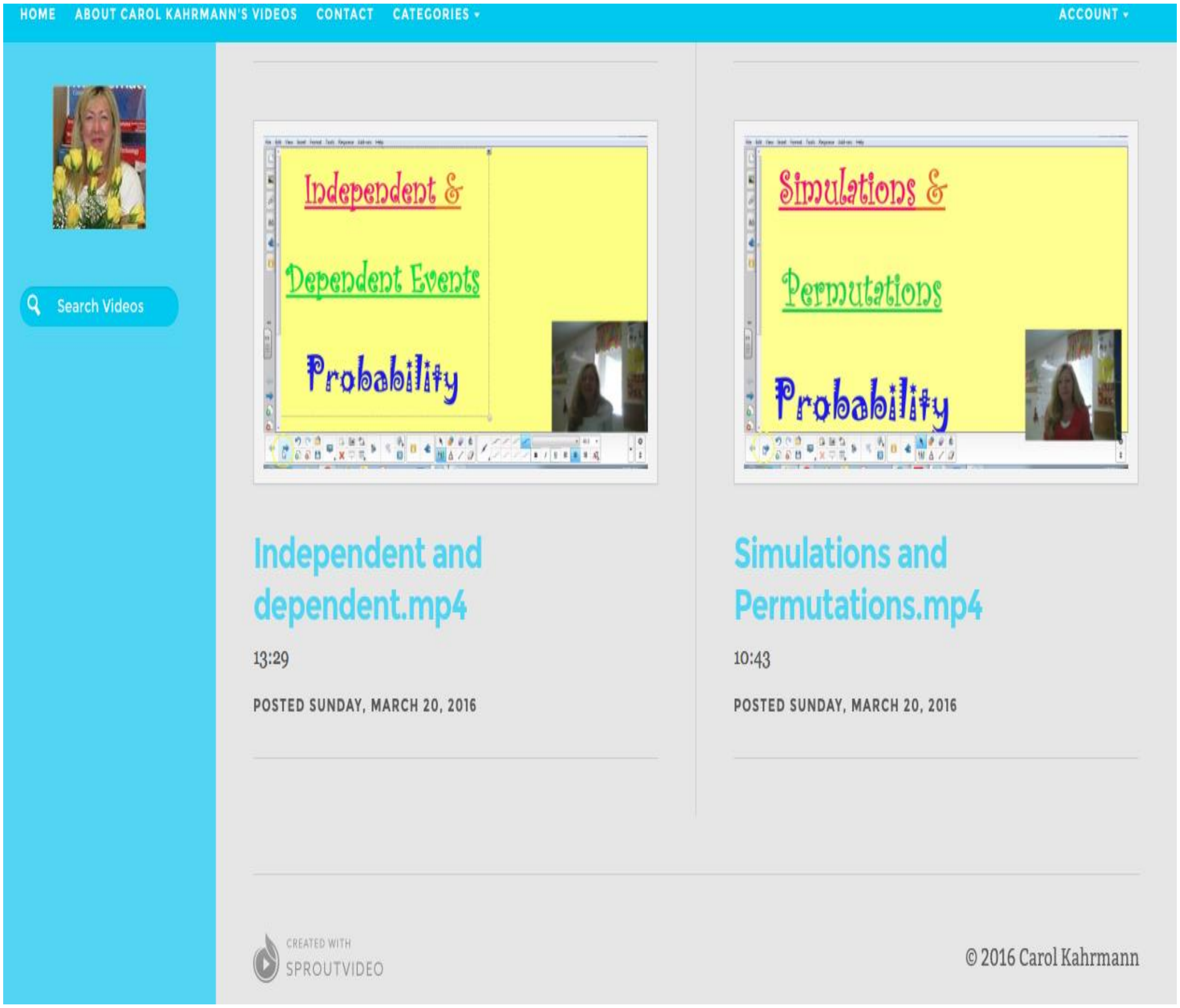
Signature of Person Obtaining Assent, Date

Appendix H
Log-in Page for Videos



Appendix I
Page after Login of Videos




HOME
ABOUT CAROL KAHRMANN'S VIDEOS
CONTACT
CATEGORIES
ACCOUNT
Search Videos
Independent &
Dependent Events
Probability
Simulations &
Permutations
Probability
Independent and dependent.mp4
13:29
POSTED SUNDAY, MARCH 20, 2016
Simulations and Permutations.mp4
10:43
POSTED SUNDAY, MARCH 20, 2016
CREATED WITH
SPROUTVIDEO
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Appendix J
Website with Videos After Study

Videos tutorials are available for everyone after the study at the website that follows:

http://carolkahrmann.weebly.com/videos.html