

Fall 2014

# Instructional Technology Integration and Situational Interest in Math

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# INSTRUCTIONAL TECHNOLOGY INTEGRATION AND SITUATIONAL INTEREST IN MATH

by

JAMES A. THOMPSON IV

(Under the Direction of Teri Denlea Melton)

## ABSTRACT

Motivating students to be engaged in learning, especially in math, has been a perennial challenge for educators. Over the past 20 years, instructional technology has become an increasingly prevalent teaching tool that, according to many educational observers and researchers, can have a transformative effect on teaching and learning because of the way that it engages today's students. The purpose of this quantitative study was to determine the relationship between students' perceptions of technology integration and situational interest in middle school math so that educational planners will be better informed when making instructional decisions concerning the use of technology in the math classroom. In this study, the relationship between students' perceptions of teacher technology integration and situational interest in math was investigated using the Pearson product-moment correlation coefficient. A moderate, positive correlation was established and found to be significant [ $r=.461$ ,  $n=223$ ,  $p<.01$ ]. Results from this study showed middle school students who perceive a higher degree of teacher instructional technology integration show higher levels of situational interest in math. Results also indicated that there was a statistically significant difference in the relationship between perceptions of instructional technology integration and situational interest in math between sixth and eighth graders. No statistically significant differences in this

relationship were found between any other sub-groups. The findings of this study suggest that instructional technology can be a motivating factor for middle school students regardless of sex, grade, or race and that educators should pursue *student centered* paths to instructional technology integration.

**INDEX WORDS:** Instructional technology integration, Situational interest, Math, Student perceptions, Middle school

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INTEREST IN MATH

by

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A Dissertation Submitted to the Graduate Faculty of Georgia Southern University in  
Partial Fulfillment of the Requirements for the Degree

DOCTOR OF EDUCATION

STATESBORO, GEORGIA

2014

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December 2014

## DEDICATION

This dissertation is dedicated to my wife, Valerie, and our children, James, Hannah, Stephen, and Erin.

## ACKNOWLEDGMENTS

I would first like to thank my committee chair, Dr. Teri Melton, for her constant help, encouragement, and support through this entire process. You are a servant leader, a mentor, and a dear friend. Your words, “you are going to do this,” made the difference. As always, you went the extra mile to make it very special in the end.

I would also like to thank the other members of my committee, Dr. Jason LaFrance and Dr. Paul Brinson. Both of you have been a source of encouragement and guidance through my course work at Georgia Southern and this dissertation process.

It is always humbling to have someone help you along the way just because they can and because they choose to be interested in what other people are doing. Thank you to Dr. Helen Bland for her help with SPSS and data analysis. It is hard to believe that someone can get such a kick out of statistics.

We are all indebted to the teachers that make a positive difference in the classroom each day. I would like to say a special “thank you” to Ella McAfee, Brenda Griner, Erin Garvin, Kelly Chandler, Kathie Collins, Lesia English, and Carol Thomas for their help with data collection. Also, thanks to Allison Sturdivant for her help with the pilot study.

Finally, I would like to thank Dr. Gilda Rackley for her friendship, constant encouragement, and for always being willing to help. You probably helped me get through this as much as anyone and I doubt you ever realized it.



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## CHAPTER 1

### INTRODUCTION

Motivating students to be engaged in learning has long been recognized by educators as an integral component of academic success. Over 100 years ago, Dewey (1913) wrote, “compulsory education rises or falls with our ability to make school life an interesting and absorbing experience to the child” (p. ix). More recently, in his comprehensive review of modern motivational science research, Pintrich (2003) explained how Social Cognitive Theory researchers have identified motivational variables that can be controlled to some degree by educators to influence student motivation to be engaged in learning activities. Situational interest is a motivational construct of Social-Cognitive Theory that research has shown can be influenced by teachers to foster students’ individual interest in a particular subject that is enduring and can lead to more meaningful engagement in academic activities (Hidi & Renninger, 2006; Linnenbrink-Garcia et al., 2010; Linnenbrink-Garcia, Patall, & Messersmith, 2013).

Regardless of recent findings and the subsequent application of those findings to instruction, many of today’s schools still struggle to meaningfully engage students, and large numbers of students fail to make desired gains in achievement. While national graduation rate just recently reached 78% (Stillwell & Sable, 2013), significant achievement gaps exist between white and minority students (Hemphill & Vanneman, 2011). Coupled with the fact that math and science literacy in the United States ranks below the average of Organization for Economic Co-operation and Development

countries (OECD, 2014), there is a general perception that public education in the United States is failing.

Not surprisingly, students in many individual states in the United States are viewed as being far behind their peers in making significant educational advancements as well. Georgia students, in particular, perennially fail to produce academic achievement that meets national averages. In a comparison of the 50 states on the eighth grade National Assessment of Educational Progress (NAEP), Georgia ranked 40<sup>th</sup> in math, 35<sup>th</sup> in reading, and 31<sup>st</sup> in science (National Center for Education Statistics [NCES], 2013a).

This poor public perception, data evidencing lagging academic performance, numerous politically motivated reports, and state and national legislation have been the impetus and the sustaining force behind the school reform movement that has persisted in the United States for the past 30 years (Wenglinsky, 2005). Much effort is put forth by educators and other education stakeholders through school reform initiatives to produce outcomes such as higher standardized test scores, lower numbers of discipline infractions, and improved attendance that would be measurable evidence of school improvement. Instructional technology, a school reform movement in its own right, has long been viewed by educators and educational observers as an important tool that schools can use to motivate students to be engaged in learning activities (Wenglinsky, 2005).

The instructional technology movement has gained momentum in conjunction with the growth of technology in the larger society. Schools have looked to educational software and hardware to decrease teacher workload, to increase the efficiency of learning, and to engage students in ways that have not been possible with traditional teaching methods. Subsequently, the amount and type of instructional technology that is

available to students and teachers in the classroom has risen dramatically over the last 20 years. For example, the ratio of public school students to instructional computers with internet access dropped from 12.1 in 1998 to 4.4 in 2003 (NCES, 2005), and by 2008, it had dropped to 3.1 (NCES, 2013b) . Enormous amounts of time, money, and effort have been invested by local school districts, state governments, and to some extent, the federal government, with the hopes of achieving high levels of technology integration in classrooms. Nevertheless, survey data show that teacher use of technology in the classroom is somewhat limited (NCES, 2010c), and many educational observers and researchers have contended that the type of technology integration present in schools today, at best, does not engage students meaningfully (Ertmer & Ottenbreit-Leftwich, 2010; Prensky, 2008), or at the worst, is harmful to learning (Cuban, 2003; Oppenheimer, 2003).

Results of the research on the outcomes of instructional technology vary widely, but do generally support the idea that technology can be a motivating factor for students in the classroom (Bebell & Kay, 2010; Li, 2007; Mouza, 2008; Suhr, Hernandez, Grimes, & Warschauer, 2010; Swan, van 't Hooft, Kratcoski, & Unger, 2005). However, most of these findings have been ancillary to other research objectives and have measured the effect of instructional technology integration on motivation in a broad sense. Research that explores the relationship of technology integration on isolated constructs of motivation that can be influenced by teachers, such as situational interest, may aid educational stakeholders in planning technology integration programs that have the greatest motivational impact and foster higher degrees of student engagement.

## **Statement of the Problem**

Motivating students to be engaged in learning has been and continues to be a major challenge for many educators. An enormous amount of research has been conducted to try to pinpoint what factors affect student motivation and how those factors can be manipulated in the school setting so that students are more engaged in learning activities. Over the past 20 years, instructional technology has become an increasingly prevalent teaching tool that, according to many educational observers and researchers, can have a transformative effect on teaching and learning because of the way that it engages today's students.

In their quest to engage students, meet learning objectives, and keep pace with society at large, educators have invested large amounts of time, money, and human resources into bringing technology into the classroom. Nevertheless, many educational stakeholders question the cost effectiveness of this investment and the results of research measuring the effect of instructional technology on education outcomes are mixed.

While the results of research may vary concerning technology's effect on certain outcomes such as student achievement, much research supports the idea that technology is engaging to students and that they enjoy using it for learning. Such findings are generally focused on motivation in general and derived from qualitative research data, such as interviews and some survey data. However, there is little quantitative research that has determined the relationship between a teacher-influenced motivational variable, situational interest, and students' perceptions of technology integration.

The purpose of this correlational study was to investigate the social cognitive theory of motivation as it relates to technology integration, a situational and contextual



element of classroom instruction, to situational interest in middle school math by students in a rural school district in Georgia. The independent variable was generally defined as students' perceptions of technology integration as measured by the NETS-S Student Survey (International Society of Technology in Education [ISTE], 2007). The dependent variable was generally defined as situational interest as measured by the Situational Interest Survey (Linnenbrink-Garcia et al., 2010).

### **Research Questions**

The education community has made a huge investment of time and money in instructional technology. While there are many expected outcomes of this investment, instructional technology is widely recognized as a strategy or tool to increase student engagement. However, as Marzano (2007) pointed out, strategies should not be used randomly or simply based on their rank of effect; their effectiveness depends greatly upon what educational gaps they are designed to address and the context in which they are employed. In other words, only through an understanding of the research behind an instructional strategy and thoughtful application in the context of lesson design will any strategy have a chance of having a consistent positive impact on learning. This is especially true with the integration instructional technology as it becomes more prevalent in schools across the country. While low implementation is an obvious threat to the success of instructional technology integration, poorly planned implementation has the potential to be much more detrimental. In order to integrate effectively, teachers and administrators need a thorough understanding of how different applications of technology in the classroom affect student learning. Research has shown a relationship between instructional technology integration and an important aspect of student learning,

motivation. This study focused on the relationship between students' perceptions of technology integration and situational interest, a construct of motivation. The following research question guided this study: Is there a significant relationship between students' perceptions of teacher technology integration in math and students' level of situational interest in math? In addition, the following sub-questions helped further define the research question:

1. Is there a significant difference in the relationship between students' perceptions of technology integration in math and students' levels of situational interest in math between males and females?
2. Is there a significant difference in the relationship between students' perceptions of technology integration in math and students' levels of situational interest in math between grade levels?
3. Is there a significant difference in the relationship between students' perceptions of technology integration in math and students' levels of situational interest in math across racial groups?

### **Significance of the Study**

Technology integration is a major issue in education because it can impact all of the many parts of a very complicated system. Instructional technology integration at its highest level has the potential to fundamentally change the way that content is delivered and learned, and promises increased student engagement and academic achievement. Unfortunately, there are many barriers to such improvements because technology integration can make high demands on teachers and administrators. Furthermore, technology planning often does not include the viewpoints of all stakeholders and often

does not consider how the different parts of the educational system will be affected. Consequently, poor or low levels of integration result and enormous amounts of time, money, and energy can be seen as wasted because investments in technology did not bring about the desired educational outcomes.

Math instruction is an area of particular concern for educators. Poor performance in math has been linked to negative attitudes, math anxiety, and a lack of engagement. Middle school is a critical period in math instruction when many abstract concepts are introduced. Major drops in student achievement in math are often seen during this time. It is critical that educators employ variety of strategies to engage students in learning in general and especially in math. Utilizing strategies that increase students' situational interest has been shown to foster the development of personal interest, which in turn is an important factor in increasing overall motivation to be engaged in learning.

The significance of this study is that it sought to provide educational planners with valuable information about the effects of technology integration on a critical variable in the design of an effective learning environment for students, situational interest. Such information can help teachers and administrators plan and implement technology integration programs that better meet the motivational needs of students and can subsequently foster more meaningful engagement that leads to higher academic achievement.

### **Procedures**

This was a quantitative, non-experimental study using one administration of a two-part survey instrument to measure students' perceptions of teachers' technology integration and students' situational interest in math to determine the nature and extent of

the relationship between those two variables. The population consisted of students of a rural middle school in the southeastern United States and their participation was voluntary.

The Situational Interest Survey by Linnenbrink-Garcia et al. (2010) was used to measure middle school students' situational interest in math. In addition, the NETS-S Student Survey (ISTE, 2007) was administered to the same middle school students to measure their perceptions of teacher technology integration in math. Pearson's correlation coefficient was calculated between the results of the two surveys to discover the nature and extent of the relationship between students' perceptions of teachers' technology integration and students' level of situational interest in math for the entire sample. Furthermore, Pearson's correlation coefficient was calculated between the results of the two surveys for males, females, each grade level, and each demographic group to determine the nature of the relationship between students' perceptions of technology integration and students' level of situational interest for each sub-group of the sample.

### **Limitations, Delimitations, and Assumptions**

A limitation of this study was that all of the subjects came from one school in a rural, high poverty area. This limited the types of students who were surveyed. In this study, over 75% of the students came from poverty; therefore, this study may not be generalizable to urban, high income, or more culturally diverse populations.

Another limitation is that since the NETS-S Student Survey is a self-report instrument that yields perception data, it is not reliable as a stand-alone measure of teachers' degree of technology integration. However, for the purposes of this study, the

researcher is more interested in student perceptions of technology integration and how they relate to situational interest rather than adult perception data derived from subjective measures such as observations.

Finally, the fact that some students chose not to participate in the survey is a limitation. Students who have adverse feelings about technology might have self-selected out of the sample and thus skewed the results. Nevertheless, precautions such as clear explanations to students, parents, teachers, and administrators concerning the purpose of the study and how results will be reported and used should have helped allay student concerns.

A delimitation of this study was that the researcher only investigated the relationship between students' perceptions of instructional technology integration and situational interest in the math classroom. The scope of this study has been narrowed in such a way because there has been a significantly higher level of technology integration in the math classrooms as compared to other subjects in the school in which this study will be conducted. Furthermore, the math teachers have received more professional development for instructional technology integration and the math classrooms have been better equipped for a longer period of time with laptops, interactive whiteboards, interactive slates, and student response systems than the other academic classrooms. Because this study only focused on math, it may not be generalizable to other subjects.

Another delimitation was that this study did not control for individual interest. Another survey could have been utilized or questions could have been added to the Situational Interest Survey to measure individual interest. The researcher chose not to do so in order to keep the survey instrument for this study as short as possible.

The assumptions of this study were that the sample understood the survey questions and answered them honestly. It was assumed that the Situational Interest Survey measured situational interest, and that the NETS-S Student Survey measured student perceptions of teacher technology integration. It was assumed that the researcher would have access to the sample population.

### **Definition of Terms**

The following terms are significant to this study and were used throughout. Definitions are based on relevant research and applicable in the context of this study. These definitions are provided to aid in understanding and provide uniformity; they will remain consistent as the researcher refers to the terms.

*Instructional Technology Integration:* Instructional technology integration is defined as the incorporation of technology resources and technology-based practices into the daily routines, work and management of schools. Technology resources are computers and specialized software, network-based communication systems, and other equipment and infrastructure. Practices include collaborative work and communication, Internet-based research, remote access instrumentation, network-based transmission and retrieval of data, and other methods...it is important that integration be routine, seamless and both efficient and effective in supporting school goals and purposes. (NCES, 2003, p.75). For the purposes of this study instructional technology integration will be measured by a score on the NETS-S Student Survey (ISTE, 2007).

*Interest:* Interest is defined as a “psychological state characterized by focused attention, increased cognitive and affective functioning, and persistent effort” (Ainley, Hidi, & Berndorff, 2002, p. 545).

*Motivation:* Motivation is defined as the energy that moves individuals toward particular activities or tasks (Pintrich, 2003).

*Personal Interest:* Personal Interest is defined as “an individual’s relatively enduring disposition to be attracted to, to enjoy, or to like to be engaged in a particular activity or topic” (Pintrich, 2003, p. 674)

*Situational Interest:* Situational Interest is defined as interest that is “elicited by certain aspects of the environment” (Ainley et al., 2002, p. 545). For the purposes of this study, situational interest will be measured as a score on the Situational Interest Survey (Linnenbrink-Garcia et al., 2010).

### **Chapter Summary**

Motivating students to be engaged in learning math presents unique challenges for many educators. Over the past 20 years, instructional technology has become an increasingly prevalent teaching tool that, according to many educational observers and researchers, can have a transformative effect on teaching and learning because of the way that it engages today’s students. However, there is little or no quantitative research that has determined the relationship between student perceptions of technology integration and situational interest in math. The purpose of this correlational study was to test the Social-Cognitive Theory of motivation as it relates technology integration, a situational and contextual element of classroom instruction, to situational interest in math. Students from a middle school in the rural, southeastern United States were selected by

convenience sampling. The students completed a survey that measured situational interest in math and a survey that measured their perceptions of instructional technology integration. This study examined the correlation between students' perceived level of teacher technology integration in the classroom and the degree of situational interest in math.

Results of this study will provide valuable information concerning the potential relationship between students' perceptions of technology integration and situational interest. Administrators and teacher who understand this relationship should be better prepared to design and implement instructional technology initiatives to foster increased levels of interest and enhance student learning in math.



## **CHAPTER 2**

### **REVIEW OF RELATED LITERATURE**

Educational observers such as Prensky (2008) have contended that one reason today's students are unmotivated is that they cannot relate to the outdated teaching methods that most schools still employ. Prensky's writing has suggested that schools must quickly move toward ubiquitous computing environments in order to re-engage students. Though the educational technology movement has widespread support, critics (e.g., Cuban, 2003; Oppenheimer, 2003) have attested that much instructional hardware and software is left unused or is often ill-used which negatively affects academic achievement. Nevertheless, research (e.g., Bebell & Kay, 2010; Li, 2007; Mouza, 2008; Suhr, Hernandez, Grimes, & Warschauer, 2010; Swan, van 't Hooft, Kratcoski, & Unger, 2005) has shown that instructional technology integration can be a motivating factor for students in the classroom. This motivation to become involved in learning activities can foster attitudes and actions that support higher academic achievement. By better understanding the relationship between student motivation and instructional technology and the factors affecting that relationship, educational stakeholders can more effectively plan technology integration programs in schools that will have a better chance of success.

This chapter will review the general findings concerning student motivation and, more specifically, motivation in math. The history of the study of motivation will be recounted briefly to show the progression from early theories of "fixed" motivation to modern Social-Cognitive Theory that contends that motivation changes in relation to a variety of factors. A construct of the Social-Cognitive Theory, situational interest, will

be examined closely in order to explain how students can be motivated by environmental factors that are under the control of the classroom teacher.

The school reform movement will be examined to provide the reader with a perspective of the time, energy, and resources school leaders have expended to try to meet public and political demands for accountability. A description of how technology integration has become a major component of federal and state educational policy will explain how instructional technology has evolved into a stand-alone school reform strategy.

An account of the technology that is physically present in schools and current statistics describing the degree and type of technology usage by teachers will provide a general overview of the state of technology integration in U. S. schools. A review of research exploring how teachers use technology as a pedagogical tool will explore how implementation affects outcomes in technology integration. Research examining outcomes of technology integration and student perceptions of technology will be examined to explain what is currently known about the relationship between instructional technology and student motivation and achievement. Finally, research concerning math motivation in general and research focused on the relationship between instructional technology integration and situational interest in math will be discussed.

### **Search Strategies**

The researcher employed academic search engines provided through the university online library system such as EBSCOhost, ProQuest, ERIC, and Google Scholar to obtain, peer-reviewed and scholarly journal articles, studies and dissertations. The key words used in the search included “student motivation,” “motivation in

education,” “situational interest,” “technology in schools,” “successful technology integration in schools,” “instructional technology and student achievement,” “student perceptions of instructional technology,” “instructional technology and student motivation,” “math motivation,” and “instructional technology, math, and situational interest.” A number of books were also used in the research process and were obtained through the university library.

### **Motivation**

Pintrich (2003) described motivation as the energy that moves individuals toward particular activities or tasks. Schunk, Pintrich, and Meece (2008) defined motivation as “the process whereby goal-directed activity is instigated and sustained” (p. 4). Nevertheless, they admitted that motivation is difficult to precisely define because it is conceptualized in so many different ways. They noted that inner forces, such as drive, response to stimuli, and individual beliefs, thoughts and emotions have all been linked to the source of the “energy” that is motivation.

The enormous body of research that exists concerning how motivational theory relates to educational practice is a testament to the importance and the complexity of this issue. Motivation is so important to education because it “bears a reciprocal relation to learning and performance” (Pintrich, 2003, p. 670). In other words, when students are motivated to learn and are successful in learning, they are subsequently motivated to learn more. This is the cycle that educators hope to initiate and sustain as they plan learning activities for their students.

Different paradigms exist concerning where motivation comes from and how it functions. Teachers’ beliefs about motivation may run parallel to their beliefs about

intelligence in the context of both factors being fixed or situational. Consequently, an educator who believes that motivation is more a fixed attribute is just as limited in his or her instructional choices as one who believes intelligence to be one-dimensional and fixed. Teacher beliefs about students' ability and motivation to learn give rise to the expectations that they have for those students in the classroom. Research (e.g., Schunk et al., 2008) has shown that when teachers' expectations are mismatched and not easily changed, student performance will suffer.

Just as the paradigm of intelligence being one dimensional and fixed stems from early research that produced intelligence testing and the intelligence quotient (IQ), such beliefs about motivation find their origin in the foundational research of early psychologists. Scientists of the late 19<sup>th</sup> Century, such as Wunt and James, sought to understand and describe concepts first proposed by Plato and Aristotle about how individual will, or desire, was translated into volition or action. Later, Ach, a researcher of the early 20<sup>th</sup> century, studied how what he termed "determining tendencies" shaped actions to attain goals (Schunk et al., 2008). Along the same lines, McDougall (1926) compared motivation to instincts that served as the "essential springs or motive powers of all thought and action" (p. 20). Schunk et al. described Freud's similar views that motivation to act came from drive, an inborn force similar to instinct. While these theories sought to explain where motivation comes from, they were based on the principle that motivation was driven by tendencies that are common to a species and they did not go very far to explain how motivation could be affected or shaped in individuals.

While strands of each of these foundational theories are still the subject of research, aspects of each have contributed to the development of the field of motivational

research that is seen as the most relevant modern educational practice, Social-Cognitive theory (Pintrich, 2003). In the following, four major theories of motivation will be discussed to demonstrate the evolution of motivational theory from isolated paradigms that explain human behavior from one viewpoint to multifaceted approaches that account for the interplay of internal and external variables.

Behavioral theorists of the early and mid-20<sup>th</sup> century, such as Pavlov and Skinner, framed motivation in the context of an individual organism's reactions to stimuli and how those reactions could be shaped due to changes in the environment. Their work initiated a line of research devoted to examining how the power of motivation could be harnessed to influence desired outcomes. Skinner (1953) described an operant as a naturally occurring behavior in an individual that becomes more or less frequent because of the consequences that follow it. With this observation, Skinner made a distinction between the instincts that ensure the survival of a species and the behaviors that meet individual needs. Nevertheless, behavioral theory in general was concerned mainly with how behavior is motivated by a series of external stimuli that can be manipulated completely through changes in the environment without much regard for the thoughts or feelings of the individual (Schunk et al., 2008).

In contrast to behavioral theory, research that took into account how an individual's thought and behavior interacted began in the mid-20 century with the development of Heider and Festinger's cognitive consistency theory. They believed that people are motivated to maintain a balance between how they think about things and how they behave. Their theories did little to explain how or why the balance was maintained

but they did open the door to future research that would look to explain how thoughts, feelings and beliefs influence motivation (Schunk et al., 2008).

Humanistic theories of motivation constituted a major departure from the tenets of behaviorism and expanded upon the work of early cognitivists. These theories, developed in the mid to late 20<sup>th</sup> century, focus on subjective awareness of individuals and their higher order needs such as creativity and self-actualization (Schunk et al., 2008).

Maslow (1943) explained motivation as “the desire to achieve or maintain the various conditions upon which ... basic satisfactions rest and by certain more intellectual desires” (p. 394). In other words, individuals will not pursue the fulfillment of psychological and intellectual needs before the basic physiological needs are met and maintained. Maslow’s “Hierarchy of Needs” emphasized the importance of the complex socially-dependent needs of belonging, esteem, and self-actualization as motivating factors.

Rogers (1969), another humanistic theorist, focused mainly on the “more intellectual desires” described by Maslow, specifically self-actualization, and the idea that humans are motivated primarily to seek autonomy and freedom. McGregor (1966) applied humanistic theory to the workplace in “Theory Y” and emphasized the importance of, self-actualization, autonomy, and social interactions in motivation. Application of humanistic theory in schools and in the workplace has shown the importance of leaders in both settings creating optimal conditions for learning or productivity by addressing the human needs of belonging, freedom, autonomy, and self-actualization.

The motivational theories cited thus far have represented a progression of study that has sought to identify and understand particular factors that influence motivation in isolation. As knowledge about motivation has grown from attributions to drives, traits, and needs to encompass the effects of environmental stimuli, cognitive functions, and social influences, motivational researchers have spent more time investigating how these factors work together to influence human action. According to Bandura (1991), social-cognitive theory contends that humans are motivated to take certain actions based on “interplay of self-generated and external sources of influence” (p. 249). This interaction between internal influences and the environment that results in certain human behaviors is made possible by the cognitive capabilities of the human brain that allow individuals not only to learn from direct experience, but to learn vicariously by observing others, represent situations and solve problems symbolically, and create self-regulative influences (Bandura, 1977). These processes, according to Bandura, “serve as important functions in causal sequences” (p. 3) of behavior, thus their study has strong implications for educational practice. Pintrich (2003) wrote that the most recent research that is useful in the educational context is focused on the social-cognitive theory of motivation because it deals with “constructs that offer the potential to be changed or more strongly influenced by the context” (p. 671). In other words, social-cognitive theory assumes that students can be motivated in many different ways and that motivation is affected by situational and contextual elements (Linnenbrink & Pintrich, 2002). These situational and contextual elements can be influenced by what teachers do in the classroom as they control external stimuli, foster vicarious and symbolic learning, and model and teach self-regulative practices.

### **Situational Interest**

Pintrich (2003) described five families of social-cognitive motivational constructs including adaptive self-efficacy, adaptive attributions, interest and intrinsic motivation, value, and goals. The effects of interest on motivation were recognized early in educational research by Dewey (1913). He placed great educational value on what he termed “genuine interest,” which would be described by researchers today as personal or individual interest. Dewey believed that personal interest was the key to students’ high quality, attentive participation in learning activities. More recently, personal interest was described by Marsh et al. (2005) as a long standing, stable preference toward certain activities that are associated with positive experiences that can have a powerful effect on student motivation. In their longitudinal study of over 5,000 German, seventh grade students, these researchers, not surprisingly, found that interest in a subject was positively correlated with higher grades and higher standardized test scores in that subject. Hidi (2006) defined interest as a “psychological state that occurs during interactions between persons and their objects of interest...characterized by increased attention, concentration and affect” (p. 70). Interest researchers (e.g., Ainley, Hidi, & Berndorff, 2002; Hidi, 2006; Hidi & Harackiewicz, 2000; Hidi & Renninger, 2006; Mitchell, 1993; Schraw, Flowerday, & Lehman, 2001; Schraw & Lehman, 2001) have concurred on the importance of interest in learning, its value as a motivational variable, and that it is content specific. Furthermore, they generally divide interest into two categories; personal, which has been shown to be somewhat fixed; or, situational, which is dependent upon the attributes of task at hand its surrounding environment. Therefore, since personal interest, which is described as a fixed characteristic or pre-existing disposition



of a student toward certain activities or topics, it will not be a part of this study. This study will focus on situational interest, which is described as a state that can be induced by factors that are under the control of the teacher, and its relationship to students' perceptions of instructional technology integration.

Constructs of situational interest and how they were related to individual interest were first studied empirically within the context of developing interesting instructional texts. Foundational research by Hidi and Baird (1988) demonstrated strategies could be employed to create "text based" interest in expository texts. In their study, 44 fourth grade students and 66 sixth grade students were randomly assigned one of three versions of an expository text. Each version contained the same basic information but was differentiated from the others with interest evoking strategies. All students were given 25 minutes to read the text and were asked to produce a written free recall immediately after the reading session and again one week later.

Results showed that novel texts with high activity level, character identification, and life themes increased factual recall levels. The strategy of inserting salient elaborations (i.e. details of importance that transcend the importance of the story) after the main points of the text increased immediate recall of important points in younger students and increased delayed recall of important points in older students. A resolution strategy, in which text was modified to create a need for a resolution by the reader, employed in the third text elicited no improvements in the recall of important information. The study also showed that texts employing salient elaborations and resolution strategies were more interesting to students; however, they did not necessarily evoke improved recall of important information. The implication of this research is that

teachers' choices about instructional material, especially expository texts, are an important part of instructional design and can play a role in triggering situational interest that may continue to develop into individual interest.

Mitchell's (1993) seminal work explored how situational interest and personal interest could be clearly differentiated in the broader context of a classroom setting rather than just in text. Furthermore, he theorized a model of situational interest where certain conditions "catch" interest and other conditions "hold" interest. Through the use of student surveys he found that group work, computers, and puzzles in the math classroom constituted catch facets of situational interest and meaningfulness of learning and involvement (i.e. active learning) constituted hold facets. He posited that hold facets of situational interest would have more impact on student achievement as they were more directly related to student empowerment. His research did not address the nature of the relationship between catch facets and hold facets.

Schraw et al. (2001) supported Hidi and Baird's (1988) and Mitchell's (1993) research as they examined empirical studies on increasing situational interest in the classroom. They noted findings that showed that selecting coherent, relevant, and vivid texts increased situational interest and recall. Additionally, providing meaningful choices to students and providing students with adequate background knowledge of the subject at hand were also presented as well supported strategies to increase situational interest.

Later research (e.g., Hidi, 2006; Hidi & Renninger, 2006) also supported the idea that teachers who understand the motivational component of interest can manipulate the learning environment to increase interest and learning in the classroom. Expanding on Mitchell's work, Hidi and Renninger (2006) posited that students' academic interests

develop in four phases beginning with triggered situational interest, which if sustained, may then develop into maintained situational interest, which can lead to emerging individual interest, and finally result in individual interest. Along the continuum of interest development, affect, knowledge, and value increase as the level of interest increases and becomes more stable.

In their review of the literature concerning interest development, Hidi and Renninger (2006) also noted the importance of selecting teaching materials that trigger situational interest as well as providing feedback to students, showing students their own interest in the subject they teach, and by showing positive emotions about their subject. They noted that maintaining situational interest and facilitating its development into emerging individual interest is dependent upon the environment. In other words, the way that classroom tasks and activities are crafted and how the subject is supported by interactions with others become an important part of helping students develop personal interest in a subject.

Linnenbrink-Garcia et al. (2010) conducted research to validate scores on a measure of situational interest across academic subjects. Their work supported Hidi and Renninger's (2006) studies that showed how situational interest, if maintained, progresses to individual interest in phases. In three studies, 858 undergraduate students were administered an initial version of the survey, and two groups (284 and 246) of secondary math students were administered a refined version of the instrument at two points during the school year. Results further supported the distinction between situational interest and individual interest as well as a three-factor situational interest model for secondary math

students. Furthermore, situational interest was shown to be a significant predictor of individual interest.

While researchers have generally agreed about the importance of interest as a motivational variable, results are mixed concerning the effects of triggering situational interest on academic achievement. A study by Rotgans and Schmidt (2011) of 69 polytechnic students in Singapore in an active learning classroom setting revealed that situational interest predicted achievement-related behaviors in students, which in turn was a strong predictor of academic achievement. This study seems to support the educational significance of Hidi's (2006) model of interest development as teachers can proactively support achievement-related behaviors in the design of their classroom environment.

Linnenbrink-Garcia, Patall, and Messersmith (2013) investigated the contextual antecedents of situational interest, the potential benefits of situational interest on academic outcomes, and how situational interest serves as a mediator between classroom practices and academic outcomes. Their aim was to build upon previous research on how situational interest is supported in academic classrooms and how it supports academic achievement. In their study of 126 adolescent students in a summer program, results from self-report measures and ratings by instructors showed that perceived choice, instructor approachability, and relevance were antecedents to situational interest. They also found that situational interest was positively related to personal interest, perceived competence, and teacher-rated engagement. Thus, they concluded that classroom practices that support and shape situational interest subsequently support student motivation and engagement.

The idea that increasing situational interest should be positively linked to academic achievement seems to be common sense; however, research has shown that in some instances that is not the case. Magner et al. (2014) investigated the effect of decorative illustrations in computer-based learning environments on triggered situational interest. In a pre-study of 87 German eighth graders, students were divided into 3 groups and evaluated screenshots from a computer-based geometry program. The students rated each screenshot on a 9-point Likert scale in a self-report survey that measured the feeling-related component, which is associated with triggered situational interest, as well as the value-related component that is associated with maintained situational interest. Results of the pre-study showed that the decorative illustrations increased feeling-related situational interest only. The illustrations that were rated as most interesting were used later in the researchers' main study.

In the main study, Magner et al. (2014) randomly assigned 52 German eighth graders to two experimental groups. All students were assigned ten geometry tasks to complete in the computer-based program. One group worked on the computer program with decorative illustrations selected as most interesting from the pre-study and the other group worked on the same program without the illustrations. All students were given a supplemental geometry booklet that could be used at home for voluntary study. The students were administered a pre-test, an immediate post-test, and a delayed post-test. They were given a survey after the completion of each task to measure the feeling-related component of triggered situational interest and value-related components of maintained situational interest. Results of the main study showed that, as in the pre-study, decorative illustrations increase situational interest but only in the feeling-related domain.

Moreover, decorative illustrations reduced immediate recall for students with low prior knowledge, yet increased recall in general for students with very high prior knowledge. This study supports the notion that the use of strategies to increase situational interest, especially computer-based multi-media strategies, can be distracting for some students with low prior knowledge of the subject at hand, and can impede learning for those students. Furthermore, the study shows the importance of a “student-centered” approach as teachers consider the incorporation of strategies to increase situational interest into learning activities.

### **Technology Integration in Schools**

Computer technology has evolved from a cumbersome, expensive problem-solving tool to which only a select few had access, to an agile, cheap, ubiquitous, personal item than can be found in nearly every purse or pocket. The significance of this evolution was pointed out by Friedman (2005) as he listed smartphones as one of the ten forces that flattened the world. In education, the “flat world” analogy is synonymous with the “level playing field.” Educators have long understood the role of technology as a means of access to information. However, Prensky (2013) argued that when adults focus on access, they reveal a misunderstanding of what technology has done to the world and what it can do for education. Prensky has written that “technology isn’t something we need *in addition* to mental activity; technology is now *part* of mental activity” (p. 23). Prensky’s conceptualization of technology addresses how personal it has become. Because of technology’s highly personal and customizable nature, it is inherently relevant, interesting, and absorbing to the user. If effectively employed, these qualities can make technology a powerful tool to motivate and engage students in school.

## **School Reform and the Technology Integration Movement**

While motivating students to be engaged in learning has always been a concern for educators, the school reform movement of the past 30 years has brought a heightened degree of importance to the field. The report, *A Nation at Risk*, published by the National Commission on Excellence in Education in 1983, warned that the United States was falling behind other industrialized nations because of an ineffective educational system. Subsequently, school reform became a major concern for education stakeholders and research backed programs that promised increases in student achievement abounded. As the burden of accountability has shifted more and more to the educator in the wake of this movement, teachers, administrators and educational policy makers have endeavored to identify and implement programs and practices that return measurable results. Beginning in the mid-1990s, closely following the technology revolution that brought increased productivity to nearly all sectors of the business world, instructional technology became a major component of the school reform movement and has continued as a sustained movement in its own right (Wenglinsky, 2005). This movement has been supported by educational stakeholders at the federal, state and local levels and has resulted in the introduction of a massive amount of instructional technology into the nation's classrooms.

The integration of instructional technology in schools occurred in tandem with the standards movement that saw its inceptions with the *Goals 2000* Act that was signed into law by President Bill Clinton in 1994 (Wenglinsky, 2005). This act, which established the first national standards in the United States, also included a section that provided funding initiatives to increase student exposure to technology. The idea behind this

initiative was that the added efficiency and opportunity that technology could create would speed up the process of school reform and make the attainment of the bill's education goals more likely within the given time frame. Also, language in the act echoed the sentiments of private sector proponents of education technology that its integration into teaching and learning is necessary to ensure that the United States' workforce will remain competitive in a global economy (U.S. Department of Education [US DOE], 2003). As the technology in schools movement gained momentum due to the passage of this act, subsequent federal authorizations by the Clinton administration and Congress, such as the Technology Literacy Challenge Fund, the Technology Innovation Challenge Grants, and the Telecommunications Act, pumped billions of dollars for educational technology initiatives and infrastructure to states, local school districts, educational consortia, and research organizations (Wenglinsky, 2005). Following the lead of the Clinton administration, the Bush administration and Congress passed the Enhancing Education Through Technology Act (EETT) of 2001. A part of the No Child Left Behind Act (NCLB), this legislation had the primary goal of improving academic achievement through the use of technology by providing federal funding through grants to school districts (US DOE, 2001). EETT, or Title II, D grants, were focused on utilizing research-based practices, providing technology professional development for teachers, and giving poor school districts greater access to instructional technology (Wenglinsky, 2005).

Title II, D grant funding continues at the present time, and while NCLB still awaits re-authorization, there is every indication that instructional technology will continue to be an important part of federal educational policy. The Obama



administration's Blueprint for Educational Reform (US DOE, 2010) lists technology as a "cross-cutting priority" that impacts many different areas of education and asserts that "technology, effectively and thoughtfully deployed, can improve how schools work, how teachers teach, and how students learn" (p. 41). Further evidence of the Obama administration's support of technology as a tool for reform is found in the National Education Technology Plan (NETP). Also entitled *Transforming American Education: Learning Powered by Technology*, the plan outlines a vision of technology fundamentally changing the American education system through five overarching goals. The NETP challenges education to mirror students' lives outside school where access to information, collaboration, and freedom reign. It calls for technology-based assessments to measure learning and drive school improvement, and it points to a gap in teacher technology proficiency that must be bridged in order to move toward a model of *connected teaching*. Far ranging technology infrastructure investments by the federal government are cited as necessary to providing access to "e-learning" for everyone, all the time. Finally, the plan envisions a personalized model of learning rather than one that is dependent upon seat-time constraints. This new model of learning will function with completely re-designed technology-driven processes that are more efficient and cost effective.

Obviously with such an emphasis on instructional technology in federal educational policy, it is no surprise that the individual state-level policy followed suit. The State of Georgia's technology plan's first goal is to "increase community support for Georgia's vision to infuse 21<sup>st</sup> century technology skills into the Georgia curriculum" (Georgia Department of Education, 2007, p. 3). This goal implies that not only is there a need to increase technology integration in schools, but also a need for a paradigm shift

regarding technology if it is to be implemented effectively. The remaining goals of this plan include increasing educators' technology proficiency, increasing effective instructional and administrative uses of technology, increasing the quality of support for technology, maintaining equitable access to technology programs, and increasing broad-based-access to technology resources.

### **Teacher Use of Technology**

Considering the prominence of technology in national and state educational policy, it is not surprising that local school systems have made it a priority as well. The increase in instructional technology infrastructure in classrooms over the past 20 years plots an impressive trajectory. In 1994, only 3% of public school classrooms had a computer with Internet access; by 2003 that percentage had risen to 93% (NCES, 2005). The ratio of public school students to instructional computers has dropped from 12.1 in 1998 to 4.4 in 2003 (NCES, 2005), and, in the most recent national statistics available, was 3.1 in 2008 (NCES, 2010b). Not only has the amount of instructional technology increased, the variety has as well. The latest national survey of teacher technology use in public schools (NCES, 2010b) documented the use of liquid crystal display (LCD) projectors, video conference units, interactive whiteboards, classroom response systems, digital cameras, MP3 players and iPods, and document cameras.

While the amount and variety of instructional technology that is available to teachers has increased rapidly over the past 20 years, teacher and student use has not kept pace. With 97% of teachers reporting that they had computers in their classroom every day, only 40% reported that they used a computer often in the classroom (NCES, 2010c). This discrepancy between availability and use underscores another issue that has been

identified by many as one of the reasons that technology has not had the impact on student achievement that it could or should have. A number of educational policy makers, researchers, and observers have contended that teachers simply do not use the instructional technology that is available to them in an effective manner. Some (e.g., Cuban, 2003; Oppenheimer, 2003) have argued that they do more harm than good when they try to use it incorrectly.

In his seminal work on the failures of computers in education, Oppenheimer (2003) cautioned against the belief that technology in itself is a vehicle for school reform. He has contended that such a viewpoint leads to poor technology planning and ill-conceived instructional uses of technology that hurt students academically. Further, he has reported examples of schools that invested heavily in many different types of instructional technology yet saw no improvement and sometimes decreases in academic achievement.

Failures of instructional technology were also observed in a landmark study by Cuban (2003). He upheld that the value of instructional technology depends explicitly upon how teachers use it in the classroom. This is an important point with regard to the issue of the effectiveness of instructional technology because, as Cuban has pointed out, there is a strong tendency for teachers to make the technology fit into traditional teaching practices, or simply ignore it altogether. He has argued that the power of instructional technology lies in its transformative qualities that are achieved through effective integration. In other words, technology allows teachers to plan, create, and deliver instruction in new ways that have not been possible in the past, such as a real time

collaborative project with students in another country. According to Cuban, if this type of potential is not tapped, instructional technology has little positive effect or value.

The concerns raised by researchers like Oppenheimer (2003) and Cuban (2003) have given rise to a great deal of study concerning the question of why teachers do not often embrace instructional technology and use it to its fullest potential. Wenglinsky (2005) has proposed that ineffective technology use is mostly a factor of teachers' core pedagogical beliefs. His view is that technology integration is ineffective or even harmful when used as an extension of didactic, or traditional, teaching methods. He stated that the "effectiveness of educational technology is enmeshed in the kind of pedagogy employed. Constructivist uses of technology help students learn better than they would otherwise, whereas didactic uses of technology make the technology useless or even damaging" (p. 11). He asserted that technology integration is most effective when it is a part of a constructivist classroom where teachers are "viewed as facilitating the construction of student knowledge" (p. 6) by promoting higher order thinking, collaboration, and creativity. To him, technology is an effective tool in the hands of teachers and students in the constructivist classroom, and it is the utilization of that tool in that context that brings about a higher quality of learning and student achievement.

Recent research by Ertmer and Ottenbreit-Leftwich (2010) supported Wenglinsky's argument that teachers utilize low-level integration of technology simply to support traditional instruction rather than high level implementation that leads to *new* methods of instruction and assessment that yield meaningful, portable learning. Teachers, they argued, for the most part are still not expected to utilize the latest technology to perform their jobs like other professionals are, and they do not use

instructional technology in ways that have the most impact on student learning. They propose new conceptualizations of teacher knowledge and skill that are described as *pedagogical technology integration content knowledge*. This concept links technology, content, and pedagogy at a foundational level where understanding and application of one is dependent upon the others. In other words, this viewpoint makes instructional technology a fundamental, necessary component of instruction.

Kozma (2003) also found that technology was most successful when teachers integrated it into the curriculum and used as an extension of constructivist teaching. His study revealed that this success was linked to how technology changed the role of teacher from primary provider of information to a provider of structure, feedback, and advice. Later, similar research by Means (2010) also showed that successful instructional technology integration involved teachers viewing technology as an essential part of curriculum planning and instructional design, not just a supplementary activity. In other words, this research supports the seamless integration of instructional technology into the day-to-day instruction to the extent that it is an essential part of the curriculum.

### **Instructional Technology Standards**

In the wake of the new demands that technology integration has brought upon students and teachers, the International Society for Technology in Education (ISTE) has sought to give guidance on specific instructional technology practices and activities that will bridge the gap between teacher use and integration. Using instructional technology research and input from educators, ISTE first created the National Education Technology Standards for Students (NETS-S) in 1998. Later revised in 2007, these standards have

provided the specific benchmarks of knowledge, skills, and dispositions that should be developed in students in the following areas:

1. Creativity and Innovation
2. Communication and Collaboration
3. Research and Information Fluency
4. Critical Thinking, Problem Solving, and Decision Making
5. Digital Citizenship
6. Technology Operations and Concepts (ISTE, 2007a)

The NETS-S provides descriptive examples of what technology integration should “look like” and subsequently, what it should be able to produce in learning outcomes.

Three of the NETS-S in particular set expectations for technology integration in areas of classroom practice that research has shown are associated with higher levels of interest. Standard 1, Creativity and Innovation, and Standard 2, Communication and Collaboration, call for students to use technology to “create original works as a means of original expression” and “interact, collaborate, and publish with peers, experts or others” (ISTE, 2007). Standard 4, Critical Thinking, Problem Solving, and Decision Making, sets expectations that students utilize technology to “identify and define authentic problems,” “plan and manage activities to develop solutions or complete a project.” Research identified social involvement or collaboration, and active involvement in learning (Dohn, Madsen, & Malte, 2009; Mitchell, 1993; Renninger & Hidi, 2002) as well as connections to real life, or relevance (Durik & Harackiewicz, 2007; Hulleman & Harackiewicz, 2009; Hulleman et al., 2010) as instructional factors that are strongly associated with the development and support of situational interest.

## **Outcomes of Technology Integration**

There has been an enormous investment of time and money into technology integration in education; hence, it is no surprise that there has been a great deal of research investigating its effectiveness. Educational stakeholders have varying ideas about what are the most important educational outcomes. Obviously, there is broad interest in technology's effect on student achievement. Other outcomes, such as frequency, degree, and type of student and teacher use are studied as many advocates believe that in today's society, effective use of technology in a variety of contexts is an essential skill. Studies also often include measures of how technology effects student interest, engagement, and motivation with the purpose of supporting the use of technology as a motivational tool that has the potential to, at least indirectly, lead to higher student achievement through increased engagement at school.

**Student achievement and technology integration.** In 1998, as the technology education movement was becoming fully established, Wenglinsky undertook an extensive national study of the effects and outcomes of technology integration. At that time, there was not a large amount of empirical evidence showing that instructional technology was related to an increase in academic achievement; instead, the success of technology integration was measured by the number of computers and educational software programs that were being used or were available for use in schools. Wenglinsky's aim was to find out if the degree and method of technology use affected student achievement in math. He used data from the NAEP, in particular, student achievement across core subject areas in Grades 4, 8, and 12, as well as measures of other factors related to school effectiveness such as teacher professional development and

teaching experience through questionnaires given to administrators and teachers.

Wenglinsky examined the correlations between data sets derived from the NAEP including math achievement, social environment of the school, student characteristics, and organization of technology use. From these correlations, he concluded that, in general, technology can make a positive difference in educational outcomes depending on how it is used. Specifically, for eighth graders he found that technology integration, when combined with professional development and teaching higher order thinking skills, was positively related to math achievement and a positive social environment in the school. Also, in support of his views about using technology in a didactic teaching environment, Wenglinsky found that using computers to teach lower order thinking skills was negatively related to achievement and the social environment of the school. Interestingly, his work showed that while frequency of home computer use was positively related to academic achievement and a positive school social environment, frequency of computer use in school was unrelated to school social environment and negatively correlated to academic achievement.

While Wenglinsky's (1998) research focused on instructional technology in a general sense, technology advocates and planners often design integration strategies around an initiative concept. One of the most popular of these is the one-to-one computing initiative. One-to-one computing is designed to create a ubiquitous computing environment in a school giving personal access to each student through some type of small mobile computing device such as a laptop. The popularity of these programs is driven by the belief that complete access to computers will drastically improve teaching and learning (Bebell & O'Dwyer, 2010). A growing body of recent research (e.g.,



Bebell & Kay, 2010; Mouza, 2008; Suhr, Hernandez, Grimes, & Warschauer, 2010; Swan, van 't Hooft, Kratcoski, & Unger, 2005) does support that under certain circumstances, initiatives like one-to-one computing can positively affect student achievement as well as other educational outcomes.

In a quasi-experimental study that utilized qualitative and quantitative data from classroom observations, teacher and student interviews, student questionnaires and focus groups, Mouza (2008) found that the use of laptop computers in a poor, urban school produced academic gains in writing and math. Students were also more motivated to complete schoolwork and indicated that the laptops empowered them and gave them more confidence in their academic work. Notably, no test data was included in this study.

A similar study by Swan et al. (2005) investigated the effects of a one-to-one computing initiative that incorporated various other instructional technology tools such as document cameras, digital cameras, digital microscopes and a variety of learning software. They used qualitative data from lesson plans, student work samples, student and teacher interviews, as well as classroom observations to inform how students used the laptop devices and how this ubiquitous computing environment affected student motivation and supported learning processes. Results revealed an increase in student motivation and support for learning processes evidenced in higher quality student work.

Suhr et al. (2010) conducted research to discover the effects of a one-to-one laptop initiative in fourth grade Language Arts classes on the “fourth grade slump,” a widely recognized drop in the pace of reading development progress. Using a quasi-experimental design, the researchers compared reading achievement scores of 54 fourth

graders who participated in the laptop program with the scores of a control group of 54 fourth grade students in non-laptop classes. Other variables including English Language Learner status, parent education, ethnicity, and sex were considered to ensure a statistical match between groups. Data were analyzed using analysis of variance to determine their effect on Language Arts achievement. Qualitative data from interviews, observations, surveys, and document analysis were also collected.

The study did find that students in the laptop program had higher Language Arts achievement scores than the non-laptop group. Furthermore, the strongest correlation between laptop use and increased achievement was in the sub-categories of writing strategies and literary response and analysis. Not surprisingly, qualitative data from student and teacher interviews and surveys showed that laptops were mostly used for the writing and revising process.

Bebel and Kay's (2010) study of a one-to-one laptop initiative involving middle school students in western Massachusetts used a variety of both quantitative and qualitative data to determine the effect of the program on student achievement, student engagement, changes in teaching methods, and student research and collaboration capabilities. Again, a quasi-experimental design was used to compare the achievement data in all academic subjects of students from five schools that participated in the one-to-one laptop program to achievement data of students from two schools that did not participate in the program. Qualitative data were derived from student and teacher surveys, teacher and principal interviews and student work.

While the study did find that a small increase in student achievement was associated with participation in the program, there was strong evidence that the initiative

had a major effect on teaching practices. Student and teacher surveys, principal interviews, and student work data showed that teachers used the technology to adopt new teaching practices and that it fundamentally changed the way that they taught. Teacher survey data also indicated that teachers believed that this new access and exposure to technology had dramatically increased student motivation and engagement.

**Student motivation and technology integration.** Given the importance of understanding how and to what degree instructional programs affect student motivation, it is no surprise that most of the previously cited studies included a component to measure student motivation through student and teacher perceptions. Such research supports claims by educational observers like Prensky (2005) who contended that one outcome of growing up in the digital age is the increased importance of technology in students' lives; they do not just see technology as a tool, but rather as an extension of themselves. According to Prensky (2008), one of the main reasons that students are unmotivated at school is because they feel separated from the technology that connects them to the rest of the world when they are not at school. While Prensky did not provide empirical evidence for his claims, research has revealed that students do have strong feelings regarding technology in schools.

Li's (2007) study on student and teacher views about technology gives merit to Prensky's stance. Using a mixed methods study that collected survey and interview data from 15 secondary math and science teachers and 450 secondary school students in Canada, she found that most students liked to use technology in school and thought that it could be effective in learning because it increased learning efficiency. Student interview data showed the recurring themes of technology making learning exciting or fun.

Teachers, however, responded in a negative manner toward technology due to the fear that they might one day be replaced by computers. Li pointed out that this discrepancy between teacher and student perceptions of technology indicates a need for further research that can inform better practice in technology integration.

In another, yet much larger, study of the perspectives of 4,000 middle school students in North Carolina, Spires, Lee, Turner, and Johnson (2008) found that “students see a clear link between the use of technologies in school and their academic engagement” (p. 511). These researchers recorded responses from student focus group interviews that, like in Li’s study, indicated that students believe learning is more fun when technology is used.

Research has generally shown that students have positive perceptions of instructional technology regardless of sex or race. In their study of the influence of sex on technology perceptions in sixth grade students, Bain and Rice (2006) found that males and females show similar positive attitudes toward technology in school. Research by Spires et al. (2008) mentioned earlier, also found positive attitudes toward technology use in school with no significant differences across sex or race.

The fact that research has found that students generally have positive attitudes toward technology combined with the fact that technology can be integrated into teaching in a variety of meaningful ways supports its use as a tool to engage students in learning, especially in subjects such as math that are often seen as difficult and present achievement challenges for many students.

### **Motivation in Math, Instructional Technology, and Situational Interest**

Math is a subject that is of particular concern for educational stakeholders. Math achievement is generally seen as a critical factor in the global competition for high paying jobs, yet the United States ranks below the average of other economically developed countries in international math assessments and has made no gains in comparisons since 2003 (OECD, 2014). Because of the importance of math achievement in the competitive world job market, a large amount of research is devoted to why math presents such a problem for so many students. Ongoing research across economically developed countries found that students' math anxiety is strongly associated with poor math performance (OECD, 2013). Math anxiety, negative attitudes toward math, and lack of motivation in math are seen as key elements in students' low math achievement, especially in grades 7-12 (Hannula, 2002; Ma & Kishor, 1997; Ma & Xu, 2004). Analysis of middle school student survey data from the National Center for Educational Statistics by Singh, Granville, and Dika (2002) demonstrated that attitude towards math and time spent engaged in math activities were strongly correlated with higher math achievement.

Cleary and Chen (2009) examined the self-regulation and motivation of different achievement groups in 880, suburban middle school math students. They utilized analysis of variance to determine differences between groups in self-regulation strategies and motivation beliefs across grade levels and math courses to determine the extent to which self-regulation and motivation varied in importance as related to achievement across grade levels and courses, and to determine what variables most strongly predicted students' use of self-regulatory strategies. Bandura (1991) explained self-regulation as

“very basis of purposeful action” where individuals “motivate themselves and guide their actions in an anticipatory proactive way” (p. 248). Cleary and Chen found task interest to be a strong predictor of the use of self-regulatory strategies that help students increase performance. This study emphasizes the importance of teachers leveraging the power of task interest in subjects such as math that are generally associated with poor performance due to mal-adaptive self-regulatory processes, such as anxiety and learned helplessness.

Since research (e.g., Bebell & Kay, 2010; Li, 2007; Mouza, 2008; Suhr, Hernandez, Grimes, & Warschauer, 2010; Swan, van ‘t Hooft, Kratcoski, & Unger, 2005) has shown the positive relationship between instructional technology integration and student motivation, and math motivation is such a prevalent concern, it is not surprising that technology programs have been integrated into math classrooms with the hopes of increasing student engagement. Recent research measuring the effects of instructional technology on math motivation has generally been focused on the use of computer games or simulations as instructional tools and has provided varied results.

Kebritchi, Hirumi, and Bai (2010) performed a mixed methods study to examine the effects of computer games on math achievement and motivation. In their study, 193 algebra and pre-algebra students from an urban high school in the southeastern United States were randomly assigned to treatment and control groups where the treatment groups used modern math and reading instructional game software as a part of instruction. Student motivation was measured using a survey and interviews, and academic achievement was measured using district-wide benchmark exams. While the study found that the math games significantly increased student achievement on the exams, there was no difference in math motivation between groups.

A similar study (Bai, Pan, Hirumi, & Kebritchi, 2012) measured the effect of a modern math video game on the math achievement and motivation of 437 eighth graders. Using a quasi-experimental design, students were randomly assigned to treatment and control groups where the treatment group used the math video game in instruction and the control group did not. A benchmark test and motivational survey were used to measure achievement and motivation respectively. In results similar to the earlier study with high school students, the researchers found that the use of the math video game increased student achievement, however in this study, results suggested that the game sustained motivation to learn math.

The research reviewed previously has established a link between instructional technology and student engagement, motivation, and interest. With regard to math specifically, Mitchell's (1993) early study identified use of computers in the math classroom as a "catch" facet of situational interest; however, he did not explore the contextual elements associated with the instructional use of the computers. Magner et al. (2014) concentrated their situational interest research on the "decorative illustration" component of computer based learning and how that one component affected learning outcomes in geometry. However, this researcher has found little or no recent research that has investigated the relationship between general instructional technology integration in the math classroom and situational interest. As instructional technology integration becomes more a factor of the effective use of a variety of digital tools for teaching, more research is needed on how these tools can best be used to capture and develop students' interest and subsequently foster higher academic achievement.

## Chapter Summary

The lack of student motivation to be engaged in learning is a major problem in schools today. This disconnection between students and academics leaves schools struggling with numerous problems that result in poor school performance. Research has identified motivational variables that can be influenced by teachers through instructional planning to increase student motivation. Situational interest is a construct of motivation that can be increased by environmental factors that are under the control of the teacher, and, if maintained, could possibly lead to the development of individual interest.

Research has also shown that instructional technology can be a motivating factor for students and, in turn, schools have invested greatly to bring technology into the classroom. However, questions remain about how this technology can most effectively be employed to increase motivation and ultimately improve academic achievement. Unfortunately, there is little research that investigates the relationship between the degree of teacher instructional technology integration and students' situational interest. Therefore, the purpose of this study is to determine the relationship between students' perceptions of instructional technology integration and situational interest in middle school math so that educational planners will be better informed when making instructional decisions concerning the use of technology in the math classroom.



## **CHAPTER 3**

### **METHODS**

There has been much research regarding the relationship between instructional technology and motivation in general, yet few studies have investigated the relationship between instructional technology integration and situational interest in math. Therefore, the purpose of this quantitative, non-experimental study was to determine the extent of the relationship, if any, between instructional technology integration and situational interest in middle school math in southeast Georgia. The independent variable was generally defined as students' perceptions of technology integration as measured by the NETS-S Student Survey (ISTE, 2007), which had been modified by the researcher. The dependent variable was generally defined as situational interest as measured by the Situational Interest Survey (Linnenbrink-Garcia et al., 2010).

This chapter will present the structure and organization of the research that was performed to determine the nature and extent of the relationship between instructional technology integration and situational interest in math. The chapter describes the following: (a) the research questions, (b) the research design, (c) selection of the sample for the study, (d) the instruments that will be used, and (e) the data collection and data analysis procedures.

#### **Research Questions**

In this study the researcher sought to answer the following question: Is there a significant relationship between students' perceptions of teacher technology integration and students' level of situational interest in math? In addition, the following sub-

questions, which were focused on specific sub-groups of the middle school population, helped further define the research question:

1. Is there a significant difference in the relationship between students' perceptions of technology integration in math and students' levels of situational interest in math between males and females?
2. Is there a significant difference in the relationship between students' perceptions of technology integration in math and students' levels of situational interest in math between grade levels?
3. Is there a significant difference in the relationship between students' perceptions of technology integration in math and students' levels of situational interest in math across racial groups?

### **Research Design**

This was a quantitative non-experimental study using a three-part survey instrument to gather students' demographic information, measure students' perceptions of instructional technology integration, and measure students' level of situational interest in math. According to Creswell (2009), "quantitative research is a means of testing objective theories by examining the relationship among variables" (p. 4). Furthermore, he has stated that survey design is an appropriate method to make generalizations or claims about a population based on the quantitative description of trends, attitudes, or opinions garnered from survey results of a sample.

The correlational research method was used in this study to learn if a relationship existed between student motivation and instructional technology integration for the entire sample as well as the following sub-groups within the sample: males, females, each grade

level, and each demographic group. Pearson's correlation coefficient was calculated between the results of the two parts of the survey for the entire sample and each subgroup to discover the nature and extent of the relationship between students' perceptions of teachers' technology integration and students' level of situational interest in math. Sprinthall (2003) explains the value of the Pearson correlation coefficient in representing the linear relationship between two variables in a single value, and how that value is useful to researchers in displaying the type and extent of association between those two variables.

The Z test was utilized to determine the significance of the difference of the Pearson coefficients between sub-groups. According to Sprinthall (2003), applying the Z test to the Pearson correlation coefficients of two samples will determine if the difference between the correlations for the two groups is significant where the independent variable explains significantly more of the variance of the dependent variable in one group as opposed to another (Pallant, 2005).

### **Context**

This study took place in Martin County (pseudonym) located in the Southeastern region of the United States. Martin is geographically large, rural, and sparsely populated with about 14,000 residents. Only 75% of adults in the county have a high school diploma and only 11.9% have earned a post-secondary degree. The median household income is \$31,963 and 25.4% of the population lives below the poverty level. The county is largely rural with very little industry, and agriculture accounts for a large portion of the local economy.

Martin County Middle School (MCMS), in which this study was performed, is the only middle school in the county and serves grades 6-8. There are nearly 50 certified employees and a classified staff of about 20. In the 2013-2014 school year, each academic teacher taught in his or her field of certification and all teachers met the Highly Qualified Status as required by NCLB. Over 80% of the staff is white and female, and over 35% have more than 20 years of teaching experience.

With 530 total students, MCMS's population is divided into two main sub-groups with 49% being African American and 47% White. Only 1.7% of the students are categorized as Hispanic, 1.7% multi-racial, and less than 1% Asian. By sex, the population is comprised of 49% male and 51% female. Because nearly 80% of the students in the school come from homes of low socioeconomic status, all students receive Title I services, and all students receive a free lunch through the state's Free and Reduced Lunch Program.

Students in the school receive academic instruction in four 70-minute classes including Math, Language Arts, Science, and Social Studies. Connections, or enrichment classes, are taught in two 40-minute sections each day and consist of Band, Music, Agriculture, Keyboarding, Physical Education, and Health. Most students have Physical Education and Health for one connections class the entire year and rotate through the other connections classes each nine weeks.

There are numerous extracurricular activities available for students at the school including many athletic teams such as football, softball, basketball, tennis, baseball, soccer, and track. Students may also choose to be involved in a middle school chapter of

the Future Farmers of America club, 4-H club, Y-club and/or Fellowship of Christian Athletes.

All academic classrooms in the school are equipped with digital whiteboards, digital LCD projectors, and at least one computer that is connected to the internet. Each grade has access to a computer lab with at least 24 internet connected desktop computers and each grade has access to two laptop carts containing 28 Wi-Fi enabled laptops each. The entire school has wireless internet access. All teachers have wireless digital slates, each academic team has access to a digital camera and all math teachers have a classroom set of student response devices.

At the time of this study, MCMS was implementing a one-to-one Chromebook initiative. A Chromebook is a personal computing device similar to a laptop that utilizes the Google Chrome internet browser as its operating system. Chromebooks are wireless devices and use web-based applications to complete computing tasks. All students were assigned a Chromebook to use during the school day. Teachers underwent extensive training during the summer before the beginning of the school year on how to utilize Google Apps for Education as instructional tools.

### **Sample and Sampling**

This study used convenience sampling as the researcher had direct access to the population and the researcher was familiar with the level of technology integration present in the school that made it well suited to the study. According to Gall, Gall, and Borg (2007), while the validity of nonprobability sampling, such as convenience sampling, is harder to establish, it is the most prevalent technique used in social science research. They point out that generalizations made from convenience samples are more

valid if the sample is “carefully conceptualized to represent a particular population” (p. 176). The sample size was adequate to accurately represent the population of this study as it well exceeded the minimum of 158 that was required to detect a low, definite but small correlation of .30 with an alpha error rate of .01 and a power level of .90 (Faul, Erdfelder, Buchner, & Lang, 2009)

The population of this study included 513 students who received minor assent and parental consent forms. The subjects in this study included 301 students who returned a signed minor assent form, a signed parent consent form, and completed the survey. The sample included 137 African-Americans, 3 Asian Americans, 5 Hispanics, 131 Caucasians, 13 multi-racial students, 5 Native Americans, and 7 categorized as “other.” By grade, the sample was comprised of 79 sixth graders, 132 seventh graders, and 90 eighth graders. One hundred and thirteen of the subjects were boys and 188 were girls.

### **Instrumentation**

The Situational Interest Survey by Linnenbrink-Garcia et al. (2010) was administered to middle school math students to measure situational interest (SI). There are 12 items which are rated on a 5-point Likert scale ranging from 1 (not at all true) to 5 (very true), and all questions were worded with a focus on math. This instrument was designed by the authors to test a three-factor model of situational interest, yielding separate measures for triggered SI, maintained-feeling SI, and maintained-value SI. However, for the purposes of this study, the researcher utilized a composite score to represent total SI.

This instrument is appropriate to measure situational interest in this study because the items focus on characteristics of the specific course rather than the general

subject or domain. Furthermore, the authors reported good internal consistency, with Cronbach alpha coefficients ranging from .83 to .94. In the current study, the Cronbach alpha coefficient was .94.

The NETS-S Student Survey (ISTE, 2007), which had been modified by the researcher, was administered to middle school math students to measure their perceptions of technology integration. Modifications included the removal of questions that were linked to NETS-S standards that were not found in the literature to be associated with situational interest. Furthermore, based on the results of a pilot study, some questions were re-worded to make them easier for middle school students to understand. There are 15 items that focus on the three NETS-S Standards that support instructional contexts that research (e.g., Dohn, Madsen, & Malte, 2009; Durik & Harackiewicz, 2007; Hulleman & Harackiewicz, 2009; Hulleman et al., 2010; Mitchell, 1993; Renninger & Hidi, 2002) has found to be associated with increased situational interest. Furthermore, all items were rated on a 5- point Likert scale ranging from 1 (never) to 5 (very often).

The NETS-S student survey was piloted by two middle school administrators and, a middle school counselor, and reviewed by 30 middle school teachers. Furthermore, both the Situational Interest Survey and the NETS-S Student Survey were piloted by 5<sup>th</sup> grade students at an elementary school in the same district who were not a part of the study to ensure that it can be read and understood by middle school students. Minor adjustments relative to wording were made based on feedback from these groups. Reliability analysis from this study showed good internal consistency with a Cronbach alpha coefficient of .88.

## **Data Collection and Processing**

The researcher gained permission to conduct the study through Georgia Southern University's Institutional Review Board (IRB), the superintendent of the school system, and the principal of the school before proceeding with the study. To perform the study, the researcher developed a version of the survey in *SurveyMonkey*<sup>TM</sup> that included three sections. The purpose of section one was to collect basic demographic data; section two contained the NETS-S Student Survey, and section three contained the Situational Interest Survey. All survey data were downloaded from *SurveyMonkey*<sup>TM</sup> into SPSS.

The data collection procedure was that the researcher asked for the aid of certified teachers from each grade to assist in handing out and collecting minor assent and parental informed consent forms. These same teachers also agreed to allow students with appropriate permission to complete the survey on a Chromebook during class time.

The Chromebook and Google Apps for education initiatives in place at MCMS during the time of the study greatly facilitated the administration of the survey. Because all students have a school Google account, it is possible to limit access to Google websites created in the school's domain to certain students. For the purposes of administering the survey during class time, all students were given access through Google Apps to a website, "Mr. Thompson's Project Site", created by the researcher. This site contained one link to an online learning activity to which all students had access and another link to a Google website, "Mr. Thompson's Interest Survey" to which only students who returned the signed minor assent and parental consent forms were given access. Directions on "Mr. Thompson's Project Site" explained that only students that returned the signed minor assent form and parental consent form would have access to



the survey link and that they could click on the link, complete the survey, and then begin working on the online learning activity. Furthermore, the directions assured students who had access to the survey that they could exit the survey at any time without any type of penalty and begin working on the online activity. Students who did not return both a signed minor assent and parental informed consent form and thus did not have access to the survey were directed to begin working on the online learning activity.

Since all students at MCMS have a Chromebook that they carry with them to each class, the administration of the survey was a seamless part of class activity. Students completed the survey or worked on the online activity independently and then moved on to other parts of the day's lesson as directed by the teacher. Students were not aware of which of their peers had access to the survey or not, or who completed the survey or not unless that information was shared by that individual.

Survey administration was anonymous; only non-identifiable, basic demographic data were requested at the beginning of the survey and the researcher was not present during administration. All students completed the survey and transitioned to other classroom activities in less than 30 minutes. As an added precaution, students were given the opportunity to confirm assent on the opening page of the online survey before gaining access to the questions. Students who did not confirm assent at that time were provided a link to the computer-based learning activity.

### **Data Analysis**

All demographic data, as well as data from the NETS-S Student Survey and Situational Interest Survey, were downloaded from *SurveyMonkey*<sup>TM</sup> and entered into SPSS by the researcher. Total scores for each section of each individual survey were

determined by summing the responses to the items in each section. Total scores were summed to yield a sum of scores for each section. The mean and standard deviation of all total scores for each section were also calculated. The Pearson correlation coefficient was calculated to find the relationship between the results of the NETS-S Student Survey and the Situational Interest Survey for the entire sample. The Pearson correlation coefficient was also calculated between the NETS-S Student Survey and the Situational Interest Survey for sub-groups of the sample including males, females, each grade level, and three race groups. For the purposes of this study, students who represented race groups other than African-American and Caucasian, because their numbers were so few, were placed in one group classified as “Other Races” so that their responses could be represented in a statistically significant manner.

The Z test was applied to the Pearson coefficients between sub-groups to determine the significance of the difference of the correlation of student perceptions of technology integration to student situational interest between groups. The Z test was performed to compare males to females, to compare each grade level, and to compare each race group.

### **Presentation of Findings**

In Chapter 4, data are reported using tables to display the frequency of responses for each question from each section of the survey. Tables are also used to display the mean and standard deviation for the total score for each section. A narrative format is used to explain data tables. Pearson r correlation coefficients and related Z test results are presented and explained in a narrative format.

### **Chapter Summary**

The purpose of this quantitative study was to determine the relationship between students' perceptions of technology integration and situational interest in middle school math. Information about how instructional technology integration is related to student interest is valuable to teachers and other school leaders as they plan the purchase and use of digital tools in the classroom.

By administering the combined survey instrument to a convenience sample of middle school students in the rural southeastern United States, and through the subsequent collection and interpretation of the results, the researcher was able to determine to what degree students' perceptions of technology integration in math are associated with situational interest in math.

## **CHAPTER 4**

### **REPORT OF DATA AND DATA ANALYSIS**

This study was intended to inform educational stakeholders of the degree to which instructional technology integration is related to a construct of student motivation, situational interest, in the middle school math classroom. The NETS-S Student Survey, which was used to measure student perceptions of instructional technology integration, is focused on standards of technology integration practice (NETS-S) that may be implemented in a variety of instructional technology initiatives. Situational interest, which was measured by the Situational Interest Survey, is an important construct of student motivation that can be influenced by teachers and the instructional practices and strategies that they employ (Hidi, 2006; Hidi & Baird, 1988; Hidi & Renninger, 2006; Mitchell, 1993; Schraw et al., 2001). By better understanding the nature of the relationship between instructional technology integration and situational interest, especially in high stakes subjects like math, educational practitioners may be more adequately equipped to more effectively implement technology integration initiatives that are in place in schools across the country.

This chapter presents an overview of the research questions and the design of the study. The demographic data collected from the respondents is presented and explained. The findings, including descriptive statistics, Pearson correlation coefficients, and Z test results are organized by research questions and presented in tables with narrative explanations. The chapter describes the following: (a) the research questions, (b) the research design, (c) a description of the respondents, and (d) the findings.

## **Research Questions**

In order to add to the existing research concerning the relationship of instructional technology integration with student motivation in specific educational contexts the researcher sought to answer the overarching question: Is there a significant relationship between students' perceptions of teacher technology integration and students' level of situational interest in math? The following sub-questions helped further define the research question:

1. Is there a significant difference in the relationship between students' perceptions of technology integration in math and students' levels of situational interest in math between males and females?
2. Is there a significant difference in the relationship between students' perceptions of technology integration in math and students' levels of situational interest in math between grade levels?
3. Is there a significant difference in the relationship between students' perceptions of technology integration in math and students' levels of situational interest in math across racial groups?

## **Research Design**

This was a quantitative non-experimental study using a three-part survey instrument to record student demographic information, measure students' perceptions of instructional technology integration, and measure their level of situational interest in math. The Situational Interest Survey by Linnenbrink-Garcia et al. (2010) was used to measure middle school students' situational interest in math. In addition, the NETS-S

Student Survey (ISTE, 2007) was administered to the same middle school students to measure their perceptions of teacher technology integration in math.

The correlational research method was used in this study to learn if a relationship existed between student motivation and instructional technology integration for the entire sample as well as the following sub-groups within the sample: males, females, each grade level, and each racial group. Pearson's correlation coefficient was calculated between the results of the two parts of the survey for the entire sample and each sub-group to discover the nature and extent of the relationship between students' perceptions of teachers' technology integration and students' level of situational interest in math. The Z test was utilized to determine the significance of the difference of the Pearson coefficients between sub-groups.

### **Description of the Participants**

The population of this study included 513 students in Martin County Middle School (pseudonym) who received minor's assent and parental informed consent forms and were given the opportunity to participate in the survey. The sample included 301 (n=301) students who returned both a signed minor's assent form and signed parental informed consent form and participated in the survey yielding a 58.6% response rate. To provide the demographic information needed to inform the sub-questions of this study, respondents were asked to answer three questions at the beginning of the survey to identify sex, grade level, and race. Table 1 shows the size of the population, the actual number of respondents, and the percentage of total responses.

Table 1

*Survey Participation*

Group	Potential Respondents (N)	Respondents (n)	Respondents (%)
Students	513	301	58.6

Table 2 shows the number and percentage of respondents that were males and females respectively. Females were the largest subgroup to participate in the survey.

Table 2

*Survey Response by Sex*

Subgroup	Responses (n)	Responses (%)
Males	113	38
Females	188	62
Total	301	100

The number and percentage of respondents from each grade level is shown in Table 3. As this table shows, the seventh graders had the highest participation rate of all grade levels surveyed.

Table 3

*Survey Response by Grade*

Subgroup	Responses (n)	Responses (%)
Sixth Graders	79	26
Seventh Graders	132	44
Eighth Graders	90	30
Total	301	100

Table 4 displays that responses by race were generally evenly distributed between African-Americans and Caucasians, with a small percentage of other race groups represented. Because of the low percentages of response by groups other than African-American and Caucasian, the researcher grouped Asian-American, Hispanic, Multi-Racial, Native-American, and Other sub-groups into one category entitled “Other Races.” Table 5 shows the response rates with the composite sub-group “Other Races” included.



Table 4

*Survey Response by Race*

Subgroup	Responses (n)	Responses (%)
African-American	137	45.5
Asian-American	3	1.0
Hispanic	5	1.7
Caucasian	131	43.5
Multi-Racial	13	4.3
Native-American	5	1.7
Other	7	2.3
Total	301	100.0

Table 5

*Survey Response by 3 Race Groups*

Subgroup	Responses (n)	Responses (%)
African-American	137	45.5
Caucasian	131	43.5
Other Races	33	11.0
Total	301	100.0

## Findings

The following section presents and explains the findings they relate to each sub-question and to the overarching research question of the study. Data are presented in tables and explained in a narrative format. Sub-questions are discussed first followed by the over-arching research question.

### Sex Comparison

The first sub-question of this study addressed whether or not there was a significant difference in the relationship between students' perceptions of instructional technology integration (ITI) and situational interest (SI) between males and females. Table 6 shows the means and standard deviations for the total scores both the NETS-S Student Survey and the Situational Interest Survey. The highest possible total score for the NETS-S Student Survey was 65 and the highest possible total score for the Situational Interest Survey was 60. Only slight differences in descriptive statistics between males and females on the two instruments are noted.

Table 6

*Descriptive Statistics for Total Scores for NETS-S and SI Surveys by Sex*

Instrument	Sub-Group	Mean	SD
NETS-S	Males	29.70	10.13
	Females	30.25	9.23
Situational Interest	Males	43.75	11.48
	Females	42.25	12.21

Table 7 shows the Pearson product moment correlation coefficient ( $r$ ) for the relationship between students' perceptions of ITI and SI for males and females.

According to Sprinthall (2003),  $r$  values of .20 to .40 represent low correlations;  $r$  values of .40 to .70 denote moderate correlations, while  $r$  values of .70 to .90 show a high correlation. A significant, moderate, positive degree of correlation exists between these two variables in males and a significant, low, positive degree of correlation exists in females.

Table 7

*Pearson Product-Moment Correlations Between Students' Perceptions of ITI and SI in Math for Males and Females*

Sub-Group	$r$	Degree of Correlation	$n$
Males	.578*	Moderate	88
Females	.384*	Low	134

*Note.*  $n$  represents total number of individuals with complete sets of data for both instruments. \* $p < .01$

Although significant relationships between students' perceptions of ITI and SI in math exist in both males and females, Table 8 shows that Z test results indicate that the difference between the correlations in males and females is not statistically significant. Sprinthall (2003) explains that a statistically significant difference between correlations of two separate samples exists only if a Z test results in a Z value that is  $\pm 1.96$  at the .05 level of significance.

Table 8

*Sex Comparison of Differences in Correlations between Students' Perceived Technology Integration and Situational Interest, Z test results, and Significance of Difference*

Comparison	r Difference	Z <sub>obs</sub>	Significance
Males vs. Females	.194	1.83	Not Significant

### **Grade Comparison**

Sub-question two of this study sought to determine if there was a significant difference in the relationship between students' perceptions of instructional technology integration (ITI) and situational interest (SI) among grade groups. Descriptive statistics from Table 9 show that among grade groups, eighth graders yielded the highest mean total score for the NETS-S Student Survey and that sixth graders had the highest mean total score for the Situational Interest Survey. Notably, seventh graders had the lowest score on the NET-S Student Survey of any grade group.

Table 9

*Descriptive Statistics for Total Scores for NETS-S and SI Surveys by Grade*

Instrument	Sub-Group	Mean	SD
NETS-S	Sixth Graders	31.42	8.94
	Seventh Graders	25.77	8.52
	Eighth Graders	34.86	8.95
Situational Interest	Sixth Graders	46.13	12.49
	Seventh Graders	41.73	11.96
	Eighth Graders	41.63	10.98

Table 10 displays the Pearson product moment correlation values for the relationship between students' perceptions of ITI and SI for each grade level. A significant, moderate, positive correlation between these variables existed for sixth and seventh graders and a significant, low, positive correlation was seen in eighth graders.

Table 10

*Pearson Product-Moment Correlations Between Students' Perceptions of ITI and SI by Grade*

Sub-Group	r	Degree of Correlation	n
Sixth Graders	.680*	Moderate	52
Seventh Graders	.507*	Moderate	101
Eighth Graders	.386*	Low	69

*Note.* n represents total number of individuals with complete sets of data for both instruments. \*p< .01

As seen in Table 11, the only significant difference in correlations between students' perceptions of ITI and SI among grade groups exists between sixth and eighth graders. No significant difference was found between correlation coefficients of sixth and seventh graders or between correlation coefficients of seventh and eighth graders.

Table 11

*Grade Comparisons of Differences in Correlations between Students' Perceptions of ITI and SI, Z test results, and Significance of Difference*

Comparison	r Difference	Z <sub>obs</sub>	Significance
Sixth Graders vs. Seventh Graders	.173	1.55	Not Significant
Sixth Graders vs. Eighth Graders	.294	2.24	Significant
Seventh Graders vs. Eighth Graders	.121	0.95	Not Significant

### **Race Comparison**

The final sub-question addressed in this study addressed the difference in the relationship between students' perceptions of ITI and SI among race groups. Table 12 indicates that African-American students had the highest mean of total scores on both the NETS-S Student survey and the Situational Interest Survey. The composite group "Other Races" had the lowest mean total scores on both surveys, while differences between Caucasian students' and "Other Races" mean total scores on both surveys were slight.

Table 12

*Descriptive Statistics for Total Scores for NETS-S and SI Surveys by Race*

Instrument	Sub-Group	Mean	SD
NETS-S	African-American	32.00	9.44
	Caucasian	28.81	9.8
	Other Races	27.68	8.03
Situational Interest	African-American	45.07	10.82
	Caucasian	41.21	12.59
	Other Races	40.37	12.19

In Table 13, variation is seen in the degree of correlation for the relationship between students' perceptions of ITI and SI between each grade level. The "Other Races" group of students showed a significant, moderate to high, positive correlation while Caucasian students exhibited a significant, moderate, positive correlation between the two variables. African-American students had the lowest correlation coefficient for the relationship of all race groups.

Table 13

*Pearson Product-Moment Correlations Between Students' Perceptions of ITI and Situational Interest by Race*

Sub-Group	r	Degree of Correlation	n
African-American	.362*	Low	93
Caucasian	.463*	Moderate	106
Other Races	.670*	Moderate	24

*Note.* n represents total number of individuals with complete sets of data for both instruments. \*p< .01

A significant relationship between students' perceptions of ITI and SI was seen in each race group. Table 14 shows that there was no statistically significant difference between any of the correlation coefficients among races.

Table 14

*Race Comparisons of Differences in Correlations between Students' Perceptions of ITI and SI, Z test results, and Significance of Difference*

Comparison	r Difference	Z <sub>obs</sub>	Significance
African- American vs. Caucasian	-.101	-0.85	Not Significant
African-American vs. Other Races	-.308	-1.78	Not Significant
Caucasian vs. Other Races	-.207	-1.29	Not Significant



## **Instructional Technology Integration and Situational Interest**

The overarching research question for this study asked: Is there a significant relationship between students' perceptions of teacher technology integration in math and students' level of situational interest in math? The relationship between students' perceptions of teacher ITI (as measured by the NETS-S Student Survey) and SI (as measured by the Situational Interest Survey) in math was investigated using the Pearson product-moment correlation coefficient. A moderate, positive correlation was established and found to be significant [ $r=.461, n=223, p<.01$ ].

The moderate, positive correlation that was found indicates that when students' perceptions of teacher ITI in math are higher, students' SI in math is also higher. While this correlational research does not establish causation, it does establish that in this study, teacher ITI is a factor of classroom design that is moderately associated with higher levels of student situational interest in math.

### **Chapter Summary**

This study sought to investigate the relationship between students' perceptions of instructional technology integration (ITI) and situational interest (SI) in the middle school math classroom. The sample consisted of 301 students in a rural, southeastern United States middle school who participated in a three-part survey that recorded demographic data, measured perceptions of ITI and measured SI in math. The Pearson product-moment correlation coefficient was utilized to determine the extent of the relationship between student perceptions of ITI and SI in math. That relationship was also examined in the contexts of different sub-groups of the middle school population. In general, a significant, positive relationship was found to exist between students' perceptions of ITI

and SI in math in all sub-groups considered in this study. That relationship was found to be strongest in middle school males, sixth graders, and the “Other Races,” which was a composite group consisting of Asian-American, Hispanic, Multi-Racial, Native American, and other ethnicities. While variation among correlation coefficients was seen, a statistically significant difference between the relationship between students’ perceptions of ITI and SI in math existed only between sixth and eighth graders. Overall, results of the study showed a significant, moderate, correlation existed between student perceptions of ITI and SI in math.

## CHAPTER 5

### SUMMARY, CONCLUSIONS, AND IMPLICATIONS

#### Summary

Teachers today are faced with fierce competition for the attention of their students. To complicate this situation, some critical subjects, such as math, present particular challenges for many (Hannula, 2002; Ma & Kishor, 1997; Ma & Xu, 2004) thus making engagement in learning and high academic achievement difficult goals to attain.

Motivational science has long been looked to by educators for guidance on how to spark students' interest in learning activities and increase their academic achievement. Social-Cognitive Theory researchers have identified motivational variables that can be controlled to some degree by educators to influence student motivation to be engaged in learning activities (Pintrich, 2003). Situational interest is a motivational construct of Social-Cognitive Theory that research has shown can be influenced by teachers to foster students' individual interest in a particular subject that is enduring and can lead to more meaningful engagement in academic activities (Hidi & Renninger, 2006; Linnenbrink-Garcia et al., 2010; Linnenbrink-Garcia, Patall, & Messersmith, 2013).

Instructional technology integration is seen by many educational stakeholders as a key to student engagement and high academic achievement. Indeed, research (e.g., Bebell & Kay, 2010; Li, 2007; Mouza, 2008; Suhr, Hernandez, Grimes, & Warschauer, 2010; Swan, van 't Hooft, Kratcoski, & Unger, 2005) has shown that instructional technology integration can positively affect student motivation. Some educational observers believe that it is the crucial element in engaging today's students (Prensky, 2005; 2008). Schools

have invested vast resources into instructional technology initiatives yet survey data (e.g. NCES, 2010c) indicate low level technology use by teachers. Not surprisingly, research regarding instructional technology's effect on educational outcomes is mixed and has shown that when teachers do use technology in the classroom, they often employ it in a way that is not engaging for students (e.g. Ertmer & Ottenbreit-Leftwich, 2010; Prensky, 2008) or is harmful to learning (Cuban, 2003; Oppenheimer, 2003).

As research on how instructional technology integration is related to specific motivational constructs, such as situational interest, is limited, more information is needed on how teachers can best implement technology in the classroom to foster student engagement that could lead to higher academic achievement. The purpose of this correlational study was to investigate the social cognitive theory of motivation as it relates technology integration, a situational and contextual element of classroom instruction, to situational interest in middle school math by students in rural school districts in Georgia. The independent variable was generally defined as students' perceptions of technology integration as measured by the NETS-S Student Survey (International Society of Technology in Education [ISTE], 2007). The dependent variable was generally defined as situational interest as measured by the Situational Interest Survey (Linnenbrink-Garcia et al., 2010).

The following research question guided this study: Is there a significant relationship between students' perceptions of teacher technology integration in math and students' level of situational interest in math? In addition, the following sub-questions helped further define the research question:

1. Is there a significant difference in the relationship between students' perceptions of technology integration in math and students' levels of situational interest in math between males and females?
2. Is there a significant difference in the relationship between students' perceptions of technology integration in math and students' levels of situational interest in math between grade levels?
3. Is there a significant difference in the relationship between students' perceptions of technology integration in math and students' levels of situational interest in math across racial groups?

### **Analysis of Findings**

In response to the first sub-question of this study, analysis of survey data showed that males in this study did exhibit a stronger relationship between perceptions of instructional technology integration (ITI) and situational interest (SI) in math. However, the difference in this relationship between males and females was not statistically significant. Furthermore, descriptive statistics indicated that males and females as a whole perceived very similar levels of teacher ITI and reported similar levels of SI. In general, this study showed that in male and female middle school students, perceptions of higher degrees of teacher ITI are associated with higher levels of SI in math.

The second sub-question of the study investigated the difference in the relationship between ITI and SI in math between grade levels. The widest variation among correlations was found in this comparison. In fact, the difference in the relationship between sixth and eighth graders was the only one in the study found to be statistically significant with sixth graders showing the strongest correlation and eighth

graders the weakest. Nevertheless, this study showed that though the association weakens as grade level increases, perceptions of higher degrees of ITI are related to higher levels of SI in all grades. Broader research is needed to determine if this decline is due to school-site specific factors or is linked to general declines in school engagement that have been noted as students progress through school.

This study's third sub-question examined the difference in the relationship between students' perceptions of ITI and SI in math among race groups. While Z test outcomes did not indicate a statistically significant difference in correlations between races, African-American students showed the weakest correlation between perceptions of ITI integration and SI of any sub-group in the study. It is interesting to note that the composite group, "Other Races" displayed the strongest correlation between perceptions of ITI and SI in math among races.

This study found that, in answer to the overarching research question, there is a relationship between students' perceptions of teachers' ITI and SI in math. This relationship is moderate in strength and shows that the middle school students in this study who perceived a higher degree of teacher ITI showed higher levels of SI in math regardless of sex, grade, or race.

It is important to note that this study measured student perceptions of ITI that is linked to specific NETS-S standards. The NETS-S are centered on how technology is used by *students* to engage in learning activities and they support a student centered approach to ITI. Therefore, the findings of this study indicate that student centered ITI can be an important part of an engaging classroom design at the middle school level that is associated with higher levels of SI.

## Discussion of Findings

Because no previous research was found that specifically examined the relationship between students' perceptions of ITI and SI, it must be noted that the findings of this study will generally be compared with research that measured perceptions of ITI rather than the relationship between ITI and SI. This led the researcher to draw certain conclusions that are based on the fact that SI is related to positive feelings about the activities at hand (Hidi, 2006; Hidi & Renninger, 2006).

Research (e.g. Bain & Rice, 2006; Spires et al., 2008) has shown that while some differences in perceptions concerning instructional technology and technology use in general between male and female students exist, positive attitudes toward instructional technology integration are found in both sexes. While this research found the difference in correlations between perceptions of ITI and SI in math between males and females was not statistically significant, which supports previous research (e.g., Bain & Rice, 2006), it is noteworthy that the correlation for males was categorized as moderate while the correlation for females fell into the weak range.

This researcher found little research that specifically compared the attitudes of students toward instructional technology of students in different grade levels. However, research that examined these perceptions across a wide range of grade levels, including sixth, seventh, and eighth grades consistently reported positive student attitudes toward instructional technology (Li, 2007; Spires et al., 2008) as well as increased motivation to learn using instructional technology (Bai et al., 2012; Bebel & Kay, 2010; Mouza, 2008; Suhr et al., 2010; Swan et al., 2005) at all levels. Thus, it is surprising that this study found significant differences between grade levels in the relationship between

perceptions of ITI and SI in math, especially between sixth and eighth grade. One possible explanation may be perceived difficulty and extremely high stakes nature of eighth grade math. According to state school promotion rules, students in eighth grade must pass the math portion of a state standardized test to be promoted to ninth grade. This pressure is undoubtedly felt by students and exacerbates math-related problems such as math anxiety and negative attitudes toward math noted in research (Hannula, 2002; Ma & Kishor, 1997; Ma & Xu, 2004). However, teachers are subject to extreme pressure as well because of state education accountability rules that link teacher evaluation to student performance. In such circumstances eighth grade teachers may have chosen to employ fewer “new” teaching practices with instructional technology and opted for “traditional methods” described by Ertmer and Ottenbreit-Leftwich (2010) with which they are more comfortable.

As noted earlier, this study found no statistically significant difference in the relationship between perceptions of ITI and SI in math between races. African-American students however, displayed the weakest correlation between these two variables. This runs contrary to previous research (Spires et al. 2008) that found negligible differences in attitudes toward instructional technology between races. This apparent inconsistency in findings may be due to two factors. First, as previously stated, the fact that this was a correlational study placed the focus on the nature of the relationship between perceptions of ITI and SI rather than the nature of the perceptions of ITI. Second, African-American students in Martin Middle School and across the country are suspended from school at a higher rate than any other group. Obviously, these students that are suspended miss out on all “first hand” classroom experiences that take place during the time of the



suspension. This situation would plausibly result in students perceiving less instructional technology integration whether their attitude toward it was positive or negative. If this were the case it would logically follow that SI levels would be lower as well.

Overall, this study supports previous research (e.g., Bai et al., 2012; Bebel & Kay, 2010; Li, 2007; Mouza, 2008; Spires et al., 2008; Suhr et al., 2010; Swan et al., 2005) that found instructional technology to be a motivating factor for students. Findings of a moderate correlation between perceptions of ITI and SI in math are congruent with Mitchell's (1991) foundational study that linked classroom computer use to increased SI.

While moderate in strength, it is surprising, considering the potential level of technology integration in a school implementing a one-to-one Chromebook initiative like Martin County Middle, that the correlation was not stronger. This may be due to that fact that this study took place relatively early in the school year, during the first year of implementation of the Chromebook initiative.

### **Conclusions**

This study found, consistent with previous research, that instructional technology integration can be a motivating factor for middle school students regardless of sex, grade, or race. Students generally have positive feelings about using instructional technology for learning and teachers can capitalize on those feelings by incorporating technology into learning activities.

This study also supported the utilization of the National Education Technology Standards for Students (NETS-S) (ISTE, 2007) as a guide for instructional technology implementation. The NETS-S serve as guidelines for instructional practice in the

utilization of technology. They are focused on what *students* do with technology to learn. This study supports this “student centered” approach.

In the limited context of this study, differences in the relationship between perceptions of ITI and SI in math across sex, grade level, and race, though in most cases not statistically significant, were evident. These differences lead the researcher to conclude that inconsistent practice, especially between sixth and eighth grade, may be a factor affecting student outcomes in this technology initiative in this school.

### **Implications**

As Prensky (2005) has pointed out, today’s students are *digital natives*. They are comfortable in the digital realm and generally willing to take risks with technology. Today’s teachers, while often reluctant to embrace technology (Li, 2007), are nevertheless faced with the task of implementing some type of instructional technology initiative in most schools. This reluctance coupled with a tendency to revert back to a “comfort zone” of traditional teaching methods can cripple instructional technology initiatives. This study, along with other research, supports the idea that administrators and teachers must embrace and implement new conceptualizations of teacher knowledge and skill described by Ertmer and Ottenbreit-Leftwich (2010) that link technology, content, and pedagogy at a foundational level. Otherwise, public schools will continue to look the same way that they have for the last century and more and more students will choose to follow other, more engaging routes to education, or they will choose to not be engaged in education at all.

## **Recommendations**

Based on the finding of this study and considering the vast array of instructional technology initiatives and broad range of ways that technology can be incorporated into teaching and learning, the researcher makes the following recommendations for educational practice:

1. Educational planners should utilize the NETS-S (ISTE, 2007) as benchmarks for educational outcomes for instructional technology integration initiatives.
2. School systems should engage in robust professional development that places instructional technology knowledge and skill at the forefront of instructional practice along with pedagogy and content knowledge.
3. Teacher preparation programs should place the same importance on instructional technology knowledge and skill as they do pedagogy and content knowledge.

The researcher makes the following recommendations for future research in this field:

1. It is possible that individual interest in math may have accounted for some degree of situational interest reported by students. Adding another survey to measure individual interest so that it could be isolated and controlled would make the results of the study more reliable.
2. It was not in the scope of this study to investigate how individual aspects of instructional technology integration are related to the different phases of Situational Interest described by Linnenbrink-Garcia et al. (2010). Correlations between clusters of questions on the NETS-S Student Survey and sections of the Situational Interest Survey could be calculated to define these relationships.

3. This study relied on a self-report survey of students to measure teachers' levels of technology integration. Adding additional measures of technology integration, including teacher observations, would add reliability to the results of the study.
4. This study was intentionally limited to the math classroom. The NETS-S Student Survey and the Situational Interest Survey could be used to measure the relationship of students' perceptions of ITI and SI in all subjects.
5. This study was limited in scope as the population included students from one school. This study could be broadened to include schools in other parts of the country and world so that the results could be generalized to larger, more diverse populations.

### **Dissemination**

The results of this study would be of interest to administrators and teachers in school systems that are considering the implementation of or are in various stages of implementing instructional technology initiatives. Also, this study could serve as a resource to educational researchers investigating the effects and outcomes of instructional technology integration.

A bound copy of this study will be placed in the Georgia Southern University Library and a digital copy will be available in the online databases in Galileo. It will be shared with administrators and teachers in the researcher's school district and RESA district.

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## Appendix A

### IRB APPROVAL

Georgia Southern University Office of Research Services & Sponsored Programs		
<b>Institutional Review Board (IRB)</b>		
Phone: 912-478-0843		Veazey Hall 2021
		P.O. Box 8005
Fax: 912-478-0719	IRB@GeorgiaSouthern.edu	Statesboro, GA 30460

**To:** James A. Thompson  
Dr. Teri Melton

**CC:** Charles E. Patterson  
Vice President for Research and Dean of the Graduate College

**From:** Office of Research Services and Sponsored Programs  
Administrative Support Office for Research Oversight Committees  
(IACUC/IBC/IRB)

**Initial Approval Date:** 7/16/14

**Expiration Date:** 6/30/15


**Subject:** Status of Application for Approval to Utilize Human Subjects in Research –  
**Expedited Process**

After a review of your proposed research project numbered **H15003** and titled **“Instructional Technology Integration and Situational Interest in Math”** it appears that (1) the research subjects are at minimal risk, (2) appropriate safeguards are planned, and (3) the research activities involve only procedures which are allowable. You are authorized to enroll up to a maximum of **530** subjects.

*Therefore, as authorized in the Federal Policy for the Protection of Human Subjects, I am pleased to notify you that the Institutional Review Board has approved your proposed research. – The purpose of this study is to determine, via a survey of middle school students, if there is a correlation between students’ perceptions of instructional technology integration and students’ level of situational interest in math.*

If at the end of this approval period there have been no changes to the research protocol; you may request an extension of the approval period. Total project approval on this application may not exceed 36 months. If additional time is required, a new application may be submitted for continuing work. In the interim, please provide the IRB with any information concerning any significant adverse event, **whether or not it is believed to be related to the study**, within five working days of the event. In addition, if a change or modification of the approved methodology becomes necessary, you must notify the IRB Coordinator **prior** to initiating any such changes or modifications. At that time, an amended application for IRB approval may be submitted. Upon completion of your data collection, you are required to complete a *Research Study Termination* form to notify the IRB Coordinator, so your file may be closed.

Sincerely,

  
Eleanor Haynes  
Compliance Officer

## Appendix B

### SITUATIONAL INTEREST SURVEY (SIS) PERMISSION

**From:** Lisa Linnenbrink-Garcia  
**To:** Jim Thompson  
**Subject:** Re: Situational Interest Survey  
**Date:** Tuesday, June 10, 2014 3:13:38 PM

Dear Jim,  
Thanks for your email. You are welcome to use the SIS. Best of luck with your dissertation research.  
Lisa

Lisa Linnenbrink-Garcia, Ph.D.  
Associate Professor  
Educational Psychology & Educational Technology  
Michigan State University  
620 Farm Lane  
Room 513E Erickson Hall  
East Lansing, MI 48824-1034  
517-432-1817  
llgarcia@msu.edu

On Jun 10, 2014, at 3:11 PM, Jim Thompson <jimthomp@screven.k12.ga.us> wrote:

Dear Dr. Linnenbrink-Garcia,  
I am a doctoral student at Georgia Southern University and hope to be performing research for my dissertation project this fall. My committee chair is Dr. Teri Ann Melton and my study will examine the correlation between the degree of instructional technology integration perceived by students and situational interest in middle school math. I am seeking your permission to use the Situational Interest Survey (Linnenbrink-Garcia et al., 2010). The participants in this study will be about 500 middle school students in rural southeast Georgia. The background research on student motivation relies heavily on the social cognitive theory of motivation. Student perceptions of instructional technology integration will be measured using a researcher developed survey. I hope that you will consider this request. I was very excited when I came across your survey in my research as it measures the social-cognitive constructs that I have included in my background. If you need any further information from me concerning my study I will provide it as quickly as I can. I appreciate your time.  
Sincerely,  
Jim Thompson



## Appendix C

### MINOR'S ASSENT

Hello,

I am Jim Thompson, a graduate student at Georgia Southern University and I am conducting a study on Instructional Technology Integration and Situational Interest in Math.

You are being asked to participate in a project that will be used to learn about technology integration in math class. If you agree to be part of the study, you will complete a computerized survey. There will be 28 questions on the survey; 3 are about you, 13 are about how you use technology in math and the other 12 are about how interested you are in math. You will take this survey in your classroom and it will take about 15 minutes to complete.

You do not have to do this project. You can stop taking the survey whenever you want. If you do not want to complete the survey, it is ok, and you can do another activity on the computer, and nothing bad will happen. You can refuse to do the project even if your parents have said you can take the survey.

Your name will not be on the survey. No one, not even me, will ever know how you answered the survey.

If you or your parent/guardian has any questions about this form or the project, tell your teacher, or have your parent/guardian call me at 912-451-2000 or my advisor, Dr. Teri Denlea Melton at 912-478-0510. Thank you!

If you understand the information above and want to do the project, please sign your name on the line below:

\_\_\_\_\_ **Yes, I will participate in this project**

Child's Name (Printed):

\_\_\_\_\_

(Signature): \_\_\_\_\_

Investigator's Signature: \_\_\_\_\_

Date: \_\_\_\_\_

## Appendix D

### PARENTAL INFORMED CONSENT

Dear Parent or Guardian:

A study, *Instructional Technology Integration and Situational Interest in Math*, will be conducted at SCMS in the next few weeks. This study is part of my work as a graduate student at Georgia Southern University. Its purpose is to determine the relationship between students' feelings about technology integration in math and their level of interest in math. In particular, each student will be asked questions about how instructional technology is used in the math class room and questions about how he or she feels about math.

If you give permission, your child will have the opportunity to participate in a 28-question survey that will be administered via a computer at the school during the school day. The survey should take no more than 20 minutes to complete.

Your child's participation in this study is completely voluntary. The risks from participating in this study are no more than would be encountered in everyday life; however, your child will be told that he or she may stop participating at any time without any penalty. Your child may choose to not answer any question(s) he/she does not wish to for any reason. Your child may refuse to participate even if you agree to her/his participation.

In order that your child's answers remain anonymous, this is a blind survey. No identifying information will be recorded by the survey, and no identifying information will associated with any data collected.

If you have any questions or concerns regarding this study at any time, please feel free to contact Jim Thompson at 912-451-2000 or my advisor, Dr. Teri Ann Melton at 912-478-0510.

If you give permission for your child to participate in this study, please sign the form below and return it to your child's teacher as soon as possible. Thank you very much for your time.

Jim Thompson  
Educational Leadership Major

Dr. Teri Denlea Melton  
Georgia Southern University

This study has been reviewed and approved by the Georgia Southern University IRB under tracking number H15003

Investigator's Signature \_\_\_\_\_ Date: \_\_\_\_\_

Child's Name: \_\_\_\_\_

Parent or Guardian's Signature: \_\_\_\_\_ Date: \_\_\_\_\_

## Appendix E

### DEMOGRAPHIC SURVEY ITEMS

**Technology and Interest In Math Student Survey**

**Section 1**

The purpose of this section is to find out more information about you. If you would like to quit the survey at any time, click "Exit this survey" in the top right hand corner of the page.

**1. What is your gender?**

- Male
- Female

**2. What is your ethnicity?**

- African-American
- Asian-American
- Hispanic
- Caucasian (White)
- Multi-Racial
- Native American
- Other

**3. What is your grade level?**

- 6th
- 7th
- 8th

## Appendix F

## NETS-S STUDENT SURVEY

Technology and Interest In Math Student Survey					
Section 2					
The purpose of this section is to determine your feelings about technology use in math class. If you would like to quit the survey at any time, click "Exit this survey" in the top right hand corner of the page.					
<b>4. I use technology in math class.</b>					
Almost Never	Not Very Often	Sometimes	Very Often	Almost Always	
<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	
<b>5. I use technology to communicate with other students about math class.</b>					
Almost Never	Not Very Often	Sometimes	Very Often	Almost Always	
<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	
<b>6. I use technology to help me solve problems in math class.</b>					
Almost Never	Not Very Often	Sometimes	Very Often	Almost Always	
<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	
<b>7. I use technology to make pictures and graphs to better explain my ideas and work in math class.</b>					
Almost Never	Not Very Often	Sometimes	Very Often	Almost Always	
<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	
<b>8. Technology helps me understand how the things we learn in math relate to real life situations.</b>					
Almost Never	Not Very Often	Sometimes	Very Often	Almost Always	
<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	
<b>9. I use technology in math to solve complex, real life problems.</b>					
Almost Never	Not Very Often	Sometimes	Very Often	Almost Always	
<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	
<b>10. I work in a team with other students when I use technology in math class.</b>					
Almost Never	Not Very Often	Sometimes	Very Often	Almost Always	
<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	
<b>11. I use technology to help predict how things in the real world might change.</b>					
Almost Never	Not Very Often	Sometimes	Very Often	Almost Always	
<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	
<b>12. I use technology to communicate with my teacher about math class.</b>					
Almost Never	Not Very Often	Sometimes	Very Often	Almost Always	
<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	

**Technology and Interest In Math Student Survey****13. I use technology to create Web pages about math on the Internet.**

Almost Never	Not Very Often	Sometimes	Very Often	Almost Always
<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

**14. I use technology in math class to create presentations about what I am learning.**

Almost Never	Not Very Often	Sometimes	Very Often	Almost Always
<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

**15. I use technology to access games or simulations that help me understand math.**

Almost Never	Not Very Often	Sometimes	Very Often	Almost Always
<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

**16. I use technology to create multi-media presentations (with pictures, movies, sound) in math class.**

Almost Never	Not Very Often	Sometimes	Very Often	Almost Always
<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

## Appendix G

## SITUATIONAL INTEREST SURVEY

Technology and Interest In Math Student Survey					
Section 3					
The purpose of this section is to determine how you feel about math class. If you would like to quit the survey at any time, click "Exit this survey" in the top right hand corner of the page.					
<b>17. My math teacher is exciting.</b>					
Not At All True	Somewhat Not True	Neutral	Somewhat True	Very True	
<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	
<b>18. When we do math, my teacher does things that grab my attention.</b>					
Not At All True	Somewhat Not True	Neutral	Somewhat True	Very True	
<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	
<b>19. This year, my math class is often entertaining.</b>					
Not At All True	Somewhat Not True	Neutral	Somewhat True	Very True	
<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	
<b>20. My math class is so exciting that it is easy to pay attention.</b>					
Not At All True	Somewhat Not True	Neutral	Somewhat True	Very True	
<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	
<b>21. What we are learning in math class this year is fascinating to me.</b>					
Not At All True	Somewhat Not True	Neutral	Somewhat True	Very True	
<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	
<b>22. I am excited about what we are learning in math this year.</b>					
Not At All True	Somewhat Not True	Neutral	Somewhat True	Very True	
<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	
<b>23. I like what we are learning in math this year.</b>					
Not At All True	Somewhat Not True	Neutral	Somewhat True	Very True	
<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	
<b>24. I find the math we do in class this year interesting.</b>					
Not At All True	Somewhat Not True	Neutral	Somewhat True	Very True	
<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	
<b>25. What we are studying in math class is useful for me to know.</b>					
Not At All True	Somewhat Not True	Neutral	Somewhat True	Very True	
<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	
<b>26. The things we are studying in math this year are important to me.</b>					
Not At All True	Somewhat Not True	Neutral	Somewhat True	Very True	
<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	

**Technology and Interest In Math Student Survey****27. What we are learning in math this year can be applied to real life.**

Not At All True	Somewhat Not True	Neutral	Somewhat True	Very True
<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

**28. We are learning valuable things in math class this year.**

Not At All True	Somewhat Not True	Neutral	Somewhat True	Very True
<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

## Appendix H

### PROJECT WEB PAGE

9/14/2014

Mr. Thompson's Project Site

[Preview page as viewer](#)

Mr.

# Thompson's Project Site

Project Homepage

## Project Homepage

Hi, this is the home page for my survey project. Please follow these directions carefully.

If you returned both the parental consent form and the minor's assent form, you have permission to take the survey. Please click on the "Go To Survey Site" link below and you will be directed to a link to the survey. When you finish the survey, you will be directed back to this page; then just click on "USA Test Prep Login" below, log in, and begin the learning activity that your teacher has assigned to you. If you decide to quit the survey at any time, you can just go to the learning activity as well.

If you do not have permission to complete the survey, the survey link won't work for you. Just click on "USA Test Prep Login" and begin on the learning activity your teacher has assigned.

[Go To Survey Site](#)

[USA Test Prep Login](#)

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# Appendix I

## SURVEY WEB PAGE

9/14/2014

Mr. Thompson's Interest Survey

Preview page as viewer



Mr.

# Thompson's Interest Survey

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