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THE INFLUENCE OF SITUATIONAL FACTORS ON THE NURTURANCE OF PERSONAL INTEREST AND PERCEIVED COMPETENCE

By

Michael M. Phillips

A DISSERTATION

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ABSTRACT

THE INFLUENCE OF SITUATIONAL FACTORS ON THE NURTURANCE OF PERSONAL INTEREST AND PERCEIVED COMPETENCE

By

Michael M. Phillips

The purpose of this study was to investigate whether situational factors could be used to induce and nurture interest in the domain of technology among preservice teachers. Rooted in the theoretical concepts of situational and personal interest, a field experiment using a quasi-experimental design was conducted with four intact classrooms. Two independent variables – level of learner *involvement* and the *meaningfulness* of the lessons presented – were manipulated, resulting in three experimental and one control group. A mixed methods approach was used to collect closed- and open-ended data before and after the six-week intervention. Results indicated that directly talking about why a lesson is meaningful has the greatest influence on maintaining situational interest and nurturing personal interest. Also, having learners involved in a hands-on environment supports the development of perceived competence. Qualitative analyses of open-ended responses indicated that the majority of the preservice teachers valued technology and were interested to learn about its uses for educators based on a variety of reasons. Limitations of the study, including the use of a field experiment, specific extraneous variables, and generalizability, were discussed. Implications focus on the design of learning environments to influence motivational outcomes.

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TABLE OF CONTENTS

LIST OF TABLES

LIST OF FIGURES

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INTRODUCTION

> I think the big mistake in schools is trying to teach children anything by using fear as the basic motivation. Fear of getting failing grades, fear of not staying with your class, etc. Interest can produce learning on a scale compared to fear, as a nuclear explosion to a firecracker.
>
> -- Stanley Kubrick

So what is interest? Can it be used to start this "explosion" Kubrick refers to? Interest is a commonly used term which describes things individuals enjoy participating in, a feeling that is equated with an object or class of objects, and even a particular quality of an object that gains one's attention. However, the common use of interest does not differentiate individual from environmental factors or take the interaction of the two into account, which has led to confusion on its meaning and how it gets applied (Renninger, 2000).

Dewey (1913) was one of the pioneering researchers to acknowledge the interaction between the individual and the world in terms of interest based on one's experiences. With greater focus on motivational research in the last several decades (see Pintrich, 2003 for a review; Smith, Plant, Carney, Arnold, Jackson, *et al.*, 2003), it has become apparent that the concepts and theories in the literature do not adequately and completely account for interest-based learning (Krapp, 2002; Schiefele, 1991). Thus, in the last 15-20 years, there has been more attention given to the concept of "interest" and to understanding and clarifying the term. In the realm of education and motivational research, little is known about how to "induce or nurture" interest or appreciation for a topic if it does not already exist (Brophy, 1999). To look at whether or not interest really can increase appreciation and learning, or as Kubrick calls it the "nuclear explosion," it is important to understand what is meant by interest.

Personal and Situational Interest

One step in the progression of interest research has been a conceptual and operational separation of interest into two differing types: personal (also referred to as individual) and situational (Hidi & Anderson, 1992; Renninger, Hidi, & Krapp, 1992; Renninger, 2000; Schiefele, 1991). Personal interest has been described as a dispositional trait or characteristic quality that is stable over time and between different situations; whereas interest generated from a reaction to environmental stimuli has been characterized as situational interest (Krapp, Hidi, & Renninger, 1992; Hidi, 2000; Krapp, 1999). A third delineation of the interest concept considers the notion that interest can be a result of an "interesting" environment, as well as a personal interest in the task. The interaction of the two has been thought of as the psychological state (Hidi, 2000) or "actualized" interest (Krapp, 1999) and takes into account that there is an interaction between person and object. Interest is not considered a one or the other phenomenon. It is crucial to understand that personal and situational interest are not on a dichotomous scale. There is always an interaction of the two, at least to some degree (Bergin, 1999).

Objects of Interest

The term object has been used loosely in interest research to describe an "object of interest" as being everything from "...concrete things (Csikszentmihalyi & Rochberg-Halton, 1981), a topic (Schiefele, 1992; Schiefele & Krapp, 1996), a subject-matter, an abstract idea, or any other content of the cognitively represented life-space [e.g., an activity or event]" (Krapp, 2002, p. 6). The term object will be used loosely throughout the following discussion to refer to tasks, activities, subject-matter, ideas, or topics and these terms will be used interchangeably to describe "objects of interest." It is important to note that the level of interest for an object only needs to be perceived as such by an individual for both personal and situational interest. Therefore, an individual's perception of interest is an assumption that most interest researchers work with when it comes to analyzing the construct (Krapp, 2002).

Interest Development

Even though there has been a considerable push towards a theoretical account of interest (Krapp, 2002; Renninger, Hidi & Krapp, 1992; Schiefele, 1991) there is little empirical work on identifying the development of interest (Renninger, 1990; Hidi & Harackiewicz, 2000). Researchers have argued that there is no further need for research to show that interest increases learning (see Iran-Nejad, 1987 for a review; Ainley, 1994; Renninger, 1987, 1990; Schiefele, 1991), because the majority of the time it does (Bergin, 1999; Cole & Bergin, 2004). The focus now needs to be placed on evaluating types of interest, examining how learning is increased, and most importantly, explaining how personal interest develops and is nurtured.

One reason an individual may value and engage with a learning task is because he or she has a personal interest in the content, task or activity. But what if an individual does not have a personal interest in the object? This is more likely to be the issue in educational settings. There has been a long-standing assumption in education that the design of the task or learning environment can be a critical reason for students' willingness to engage with the material. It is easier to make changes to a situation than to individuals' dispositional traits or characteristics. The research area of interest is no different; it is easier to vary features of a situation and see how individuals react. It is important to note that interest resides with the individual, just like other aspects of motivation (Brophy, 2004), but the environment the individual is immersed in can contribute to the direction and strength of interest development (Hidi & Renninger, 2006). We need to understand what type of situational factors can be used to increase value for material and/or tasks and if these factors can nurture personal interest.

Many believe that if situational interest can "hold" a person's interest in the material to be learned, it has the potential to become personal interest (Brophy, 2004; Hidi, 1990; Hidi & Renninger, 2006; Krapp *et al.*, 1992; Mitchell, 1993), but empirical research is needed to support this claim. This may be an unrealistic task in most educational situations, that is, for situational interest to develop into a well-developed personal interest. A better question might be, if a personal interest is not present but the topic is taught in an environment that is considered situationally interesting, can students come to appreciate and value learning about it? Mitchell (1993) states,

> ...from an educational perspective, one would hope that if a classroom is high in situational interest, that environment would change an individual's personal interest level regarding the subject over time. So, a teacher will have no influential impact on the types of personal interests their students may bring to their class, but there is the possibility that the teacher can impact the personal interest the student leaves with. (p. 424)

If students are in a supportive learning environment that also optimizes expectancies for success, the question becomes: what situational factors, as part of the environment, can influence the perception of interest or value in the task? Also, how might these features be manipulated so that students not only try to accomplish the learning goals, but also gain an appreciation for "what they are doing and learning" (Brophy, 1999)?

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Purpose of this Study

There were two main objectives for this study. The first was to explore whether or not situational factors (i.e., involvement and meaningfulness) could be varied in a way to stimulate and sustain situational interest in a real learning environment. Second, could these situational factors nurture personal interest? There has been little attention in the educational literature to the design of instructional tasks with motivational outcomes as the focal point (Bergin, 1999). Previous studies have tended to focus on learning (not interest, value or appreciation, per se). Studying the construct of interest (personal and situational), with a focus on the learning environment, could help clarify what factors increase or nurture interest for subject-matter in a classroom.

There has been praise for increased attention to the construct of interest, but there are areas that need to be further explored or clarified. Alexander, Kulikowich, and Jetton (1994) have pointed out the importance of moving beyond using purely Likert-scale measures to assess students' interest because of the complex nature of the concept. For example, Wade, Buxton, and Kelly (1999) have discussed the use of interviews to assess students' interest in text learning. Another important point, more research is needed on actual students in real classrooms to begin to understand how educators should design and implement ideas to help nurture interest in the classroom, especially if it does not already exist. In Wade's (2001) review, she mentions the need for more research on interest in the larger learning context beyond text-based learning (i.e., beyond exploring students' interest for reading textbooks or articles based on certain textual features). A majority of the current research on personal and situational interest has focused on the interestingness of text (situational interest) and an individual's interest level or preference before reading a text (personal interest).

This study expanded on all three of these aspects by using Likert-scale measures combined with open-ended responses. It was conducted in teacher education (TE) courses as a field experiment. The research focused on whether situational factors could be used to help preservice teachers develop interest in the domain of technology, focusing on web design and the use of the Internet for teaching and learning.

Similar to aspects of knowledge development, it was not expected that students would move from novice to expert status in a semester (Alexander, 1997). The same was true for interest development. It was not expected that preservice teachers would move from having no or little interest in technology to having a strong "well-developed" personal interest. However, I examined whether two situational factors of their learning environment (i.e., involvement and meaningfulness) could nurture an "emerging" personal interest. A secondary outcome was whether perceived competence could be nurtured by the situational factors as well.

The following review of literature centers on interest, perceived competence, and the changes technology has created in education and teacher education. The third section lays out the design and methods of the study, along with the analyses. In the fourth and fifth sections, the findings are presented for the quantitative and qualitative data. And lastly, the discussion section elaborates on the findings and concludes with a discussion of directions for future research.

CONCEPTUAL FRAMEWORK

The expectancy-value model of achievement motivation has been one theoretical perspective used to study cognitive constructs (e.g., beliefs, values, goals) related to action. The expectancy-value model explains motivation as a function of what people expect, as well as the value they hold towards the task, object, or activity. Expectancies are viewed as beliefs about competence and expectancies for success (or failure) in a particular situation. Value beliefs are held for activities perceived as meaningful or worthwhile (Anderman & Wolters, 2006; Brophy, 1999; Wigfield & Eccles, 2002). The product of the two is important for predicting choice behavior, engagement, persistence, and achievement (Pintrich & Schunk, 2002).

Students may be completely confident in their ability to achieve and even *expect* to succeed at a task, but if they do not *value* the task they are less likely to participate. A strong determinant for why a learner may engage or persist at a task is perceived value (Anderman & Wolters, 2006). To date, motivational research in education has focused on the expectancy side of the model to a greater extent than the value side (Brophy, 1999; 2004). There is need to address interest, value, and appreciation for learning tasks.

Interest Research

Personal Interest

Personal interest has been referred to as a dispositional characteristic or feature (Schiefele, 1991; Ainley, Hidi, & Berndorff, 2002; Krapp, 2002) that is usually a stable evaluation toward an object (Eccles & Wigfield, 2002) over an extended period of time and different situations. Personal interest has three different facets that are interconnected – a person views the task as meaningful or worthwhile, has a strong affect toward the task

(Renninger, 1990, 2000; Schiefele, 1991), and is willing to engage with the task when opportunities arise to do so (Krapp, 2002).

The task has personal significance because it is valued (seen as meaningful, important, useful, or worthwhile). Along with value, there is an affective (or feeling) component to personal interest (Schiefele, 1991). Affective qualities (e.g., enjoyment) can lead the individual to become absorbed in the activity and willing to explore its domain in greater detail. This aspect of personal interest has received less attention in the interest literature; yet, willingness to engage with an activity allows the interest to grow, knowledge to develop and expand (Krapp, 2002), and the potential for expertise to develop (Brophy, 1999). These are all issues that discriminate between "emerging" and "well-developed" personal interests (Hidi & Renninger, 2006).

All three of these facets (value, affect, and willingness to engage) are present to a certain degree when an individual has a personal interest. For example, an individual might personally think cancer awareness is an important and valuable topic, but not typically be willing to read about or seek information on cancer. In this case, the person would not be said to have a personal interest in cancer awareness. It is possible for people to reach a point where they value the information they have learned, but still do not have a personal interest for the topic or domain. If a close friend or family member was diagnosed with cancer, the individual might then be more willing to read or learn about cancer and have stronger feelings toward the topic. Thus, a personal interest may develop based on the stimulation of his or her experience with the disease. The three components (value, affect, and willingness to engage) need to be present.

There is also the possibility for saturation of an interest. For example, Christine is an avid backpacker and has been for the last seven years. Even though backpacking has been a long-standing personal interest, she has had little time in the last year to do any backpacking and her interest has waned. Because of her schedule, she does not seek out opportunities to improve her skills or go on trips. However, if one of her friends should take up backpacking as a new hobby and begins to discuss the trips she has taken, this may spark Christine's interest to re-engage with backpacking. Personal interests can wax and wane over years, months, or days, but there is always an interconnection between value, affect, and knowledge about the topic or domain and how willing the person is to engage with it.

Value and Affect

Eccles and colleagues (Jacobs & Eccles, 2000; Eccles, 2005) have developed the concept of subjective task value, identifying three types of value for a task: attainment, utility, and intrinsic (or interest) value. Attainment value is the value an activity has in relation to the individual's self-image, self-beliefs, or identity. If an education major believes that being a good teacher is part of her or his identity and that using technology in the classroom is part of being a good teacher, she or he likely will value technology. Individuals may value tasks and hold certain interests based on cultural influences or as part of becoming a member of a group (Bergin, 1999). Thus, identification with and value for an activity can be influenced by internal and external factors.

Eccles defines utility value as the usefulness a task has in reaching one's future goals (i.e., career, sports, increased GPA, graduation, etc.). Utility value is similar to extrinsic rewards in that it is viewed as a means to an end (e.g., completing a course in order to receive a degree). The course itself might not have attainment or intrinsic value, but the student knows that she or he needs to complete the course to graduate. In fact, the course may be perceived as valuable *only* because of its utility. Eccles uses the example of an individual taking a math course in order to pursue a degree in science. The individual may not intrinsically value mathematics, yet values the math course because it allows her or him to achieve the goal of acquiring a science degree.

Intrinsic value has been defined as the enjoyment an individual derives from the experience of "doing" the task or activity. Jacobs and Eccles (2000) discuss how intrinsic value is closely related to interest and have noted that intrinsic value in their model could also be called interest value. However, Eccles and colleagues' concept of "subjective task value" examines value from the achievement perspective and frames it as an incentive or reward valence. This tends to neglect the aspect of intrinsic or interest value. In one of the more recent reviews of achievement motivation from Wigfield, Eccles, Schiefele, et al. (2006), the model they depict is void of intrinsic value altogether. In contrast, the construct of interest (i.e., personal and situational) is not as closely associated with achievement motivation and looks at value from a different perspective – one that is not associated with incentive or reward valence.

Achievement situations tend to limit the way value is defined, by focusing on the incentive value of the end result. When considering the construct of value from a personal interest framework, the individual with a personal interest is construed as valuing the content being learned and/or the process he or she is going through during the learning experience. The task or activity is not just a means to an end. It is important to

understand what type of value the learner associates with a task and to consider all three aspects of personal interest in order to understand whether a personal interest exists.

Whether an individual sees the task as valuable for the pleasure of participating (intrinsic) or for reaching an end (utility) may determine whether the individual has a personal interest in the task. Attitudes and affect towards the task may differ based on the type of value the individual places on it. Intrinsic value places more importance on appreciation, value or interest in participating in the task, whereas utility value places more importance on the incentive. From this perspective, utility value could be seen as a means to an end.

Eccles and Wigfield (1995) found that valuing an academic activity or task does not predict achievement as strongly as expectancy beliefs do. Value is positively correlated with achievement (Eccles & Wigfield, 1995; Schiefele, Krapp & Winteler, 1992), but is a stronger predictor of intentions to take another course, along with actual future enrollment (i.e., choice behavior).

With many students focused on "the grade," the question becomes how to get students to appreciate learning about a particular subject-matter or domain. Covington (1999) argued that the acquisition of knowledge for performing strongly on achievement measures is not incompatible with appreciation of the material to be learned. One of the participants in his study reported that "The more students learn about a topic…the more students are likely not only to appreciate the knowledge gained, but also to appreciate the processes by which the knowledge was attained" (Covington, 1999). There is a need for further research on how to get students to appreciate or value the content (Brophy, 1999) along with the goal of getting a good grade (Covington, 1999).

It is important for students to come away from a course with value or appreciation for the task, topic, subject-matter, or domain because this is what tends to have a lasting effect on the student. Information remembered for an exam or course is not what students tend to take away from a course. Often, much of this information is forgotten because it is too complex, presented in an immemorable manner (McGrath, 1992; Alexander, Kulikowich, & Jetton, 1994) or not applicable to the students' daily lives (Aikenhead, 2005). Once students finish a course, a vast majority of them will forget most of what they were taught or will not be capable of retrieving it from long-term memory. Therefore, coming away from a course with an appreciation or value for the content is important.

Many adults have forgotten a majority of what they learned in high school (Linn, Slotta, & Baumgartner, 2000). However, if cultivated, positive attitudes and beliefs about school, courses, subject matter and disciplines can be longer lasting (Meece, Wigfield, & Eccles, 1990; Wigfield & Eccles, 1992). These attitudes and value beliefs are thought to be domain specific, but there has been no consensus on how to foster them (Pintrich & Schunk, 2002). It is not uncommon to hear people attribute their interest in a topic (personal) or their pursuit of a career to a teacher or course that cultivated that interest (situational). Therefore, if educators present material in ways that shift attitudes and beliefs, there is a greater chance the student will appreciate the subject-matter or domain (McCombs, 1999). There are other factors besides cognition (e.g., affect and value for content) that should be taken into account when looking at learning (Alexander, Kulikowich, & Jetton, 1994; Pintrich & Schrauben, 1992).

Interest and Knowledge Development

Interest involves aspects of the affective and cognitive domains (e.g., focused attention, persistence, increased cognitive functioning, and affective involvement) and how the individual perceives the object (Hidi, 2000; Krapp, 1999; Krapp, Hidi, & Renninger, 1992). More than just drawing from the affective and cognitive domains, interest creates an interaction between the two. An experience that evokes more emotion may be processed at a deeper level (Krapp, 1999) and connections to prior knowledge or memories may be forged. Usually when there is high personal interest in an activity, there is also greater willingness to engage in the activity, resulting in a higher level of knowledge. A higher level of knowledge is one difference between an emerging and a well-developed personal interest (Hidi & Renninger, 2006).

An object of interest always has the potential of gaining attention, and because of this, the person has the tendency to learn more about the object as well as acquire feedback about efficacy that leads to an increase in perceived competence. This relationship between person and object constantly evolves and grows, while the individual's competence and discourse knowledge expand to allow the individual to organize the new information. Therefore, personal interest is a process of internalizing this psychological state of being interested in the object, where the individual also comes to identify and be identified with the object (Renninger, 2000). This development usually takes place during the transition from an emerging to a well-developed personal interest.

Knowledge and interest share a reciprocal relationship (Bergin, 1999). The more interest an individual has for an object, the more time he or she is willing to spend learning about the object. This results in greater knowledge of the domain. This process permits individuals to ask reflective questions about their interest(s) in order to gain a deeper understanding, giving the process a cyclical nature of asking questions and incorporating answers to their knowledge base. However, Tobias (1994) notes that it is possible to have a personal interest yet have little prior knowledge about the topic. This could be a common occurrence, especially with children or a person with an emerging personal interest.

Alexander, Kulikowich, and Jetton (1994) explored the relationship between knowledge and interest. They noted how personal and situational interest can impact subject-matter learning and argued that personal interest can have more consistent effects on performance. Situational interest is more likely to be ephemeral and have a negligible impact on knowledge development. For example, Anderson, Wilkinson and Mason (1991) determined that children process stories at a deeper level when they are able to read something that is of personal interest to them. Learners tend to remember things when they have a greater personal interest in the topic. In Alexander, Kulikowich, and Jetton's (1994) review on the interplay between knowledge and interest, they describe the significance of assessing what students or participants know and care about before being introduced to an intervention to measure personal interest. It is only in that manner that researchers and educators can assess what features can be used to design more appropriate learning environments to induce or nurture personal interest (because they know what the individual is bringing to the experience).

Situational Interest

In addition to the dispositional nature of interest that resides with an individual, there are contextual factors that can stimulate individuals' situational interest in the

environment or task. Situational interest has been described as "...an emotional state aroused by specific features of an activity or task" (Eccles & Wigfield, 2002). Yet, situational interest can be more than just an affective component in reaction to the context; cognitive components can be drawn in as well if the task is designed to hold students' interest. When an individual is in an environment that is perceived as interesting, he or she is more willing to engage in the activity. If the individual cognitively engages, he or she is more likely to use features of deep processing (compared to surface processing) of information presented in the context (Schiefele, 1996; as cited in Krapp 1999).

Situational interest is thought to be a spontaneous occurrence that is based on environmental factors and specific to the context (Krapp, 1992, as cited in Krapp, 1999; Schraw, Flowerday, & Lehman, 2001). With this interest being environmentally activated, interaction is possible between personal interest(s) and the situation. This interaction has been considered the psychological state (Hidi, 2000) or actualized interest (Krapp, 1999). On the other hand, if situational interest does not interact with personal interest or is not maintained, the individual's interest generated by the environment can be ephemeral.

Humans have a tendency to be in social settings that they find engaging and worthwhile. Engagement with a task often is based on personal interest, while at other times it may be based on environmental factors or even a combination of the two. Consequently, it is important to not only investigate the construct of personal interest, but to understand the aspects of situational interest in order to engage individuals. As Brophy (2004) notes, not all learning will be intrinsically motivated and many times students are

asked to learn content they do not enjoy. They may be resistant towards learning certain information. For educators, the question is how to create learning environments that elicit more than just short-lived attention and interest for an activity. It is important to understand the environmental factors that can stimulate interest and to explore ways of creating learning tasks that can nurture the perception of value for the content.

Particular aspects of an environment that stimulate interest have been discussed since the early 1950s. Dollard and Miller (1950) identified three characteristics of teaching and learning they felt were imperative to achievement. The three characteristics (i.e., cues, reinforcement and participation) were discussed in relation to how lessons are taught. Cues involve the clarity, meaningfulness, variety, and quality of explanation from the teacher. Reinforcement is praise and acknowledgement students receive in a learning environment. Participation is allowing students to actively engage in the learning process. The idea that the context of learning plays a crucial role is not new, but how, and to what extent certain environmental aspects can motivate students' learning is still being clarified.

There has been recent discussion about factors that make a situation more interesting and help individuals focus their attention on the information presented. These conditions or features of situational interest have been categorized as "catch" and "hold" factors, based on Dewey's ideas (1913; Mitchell, 1993; categorized as "triggered" and "maintained" by Hidi, 2000). Aspects of the learning environment (e.g., active participation, working on a puzzle, etc.) have the potential to catch and hold students' attention. Catch features are situational stimuli that have the ability to attract individuals' attention and generate interest, but not necessarily sustain it. Mitchell (1993) states that

many of the students he interviewed listed "catch" facets because they offered a change of pace from the daily routine in the classroom, what might be considered novelty (see also, Chen, Darst, & Pangrazi, 2001). Whereas, hold features are situational stimuli that sustain interest while the person is in the environment. If students' interest is not held, then interest for the content is not maintained. It is imperative to find environmental aspects that tend to hold individuals' interest because information is processed at a deeper level when it is maintained.

Text-based Situational Interest

Over the years, a number of studies and theoretical discussions in the interest literature have focused on text-based learning (Ainley, Corrigan, & Richardson, 2006; Alexander, Kulikowich, & Jetton, 1994; Harp & Mayer, 1997; Hidi, 2001; Hidi & Baird, 1988; Schiefele, 1996; Schiefele & Krapp, 1996; Schraw, 1998; Schraw, Bruning, & Svoboda, 1995; Schraw, Flowerday, & Lehman, 2001; Wade, Buxton, & Kelly, 1999). Most of the research has been on features of text that generate situational interest. For example, questions such as, "While reading the text on --- I expect to feel _________" are used to look at situational interest in texts. Schraw and Lehman (2001) divided situational interest into text-, task-, and knowledge-based aspects. They take a narrow perspective on situational interest and do not adequately differentiate between these three aspects. Nearly the entire review is spent discussing tasks surrounding the activity of reading (Schraw & Lehman, 2001).

Certain features tend to increase interest for text: personal relevance (Sadoski, Goetz, & Fritz, 1993), coherence, ease of comprehension, vividness, engagement, emotiveness, reader's prior knowledge of the topic (Schraw, Bruning, & Svoboda, 1995),

and seductive details (e.g., sex, death, money, and power; Garner, Brown, Sanders & Menke, 1992; Harp & Mayer, 1998; Schraw, 1998). Some of these features increase recall of the text (e.g., drawing in readers' prior knowledge). However, others (e.g., seductive details) can distract the reader if they do not align with the text's important aspects (Alexander & Jetton, 1996; Wade, 2001).

A narrow perspective on situational interest has been taken by simply focusing on features of text, instructions given for reading text, and knowledge needed to read certain types of text. This has limited how the concept of situational interest is defined and has constructed an incomplete view of the concept. For example, the title of the article "Increasing Situational Interest in the Classroom" (Schraw, Flowerday, & Lehman, 2001) would intrigue most teachers. However, if they were hoping to find which aspects of their classroom could be changed to increase students' interest, they would find that a majority of the article discusses text-based learning. Even when task-based interest is discussed, the emphasis is on tasks surrounding the reading of text (e.g., the instructions given before reading). The situation is much larger than just the interaction between the individual and a textual passage, especially with the increased use of multimedia in the classroom. This area of research has added a lot to the understanding of what textual features are productive for gaining interest (e.g., novelty, vividness and coherence of a text), but has limited the scope of interest research to text-based features.

Other researchers have argued for the expansion of the situational interest concept to include the situation as a whole (Chen, Darst & Pangrazi, 2001; Wade, 2001). There has been little attention in the motivational literature to the design of educational tasks (Bergin, 1999) outside of designing a text passage or textbook for interest purposes. More

research is needed to expand the notion of what constitutes a "situation" in interest research. In particular, if texts were not part of the learning environment, how would situational interest be defined?

Situational Interest in the Entire Context

Researchers in physical education have taken a broader perspective on exploring situational interest (Chen, Darst, & Pangrazi, 2001). They have examined five aspects that influence situational interest: novelty, challenge, attention demand, exploration intention, and instant enjoyment. Mitchell (1993) also identified five dimensions of situational interest for mathematics education: group work, puzzles, computers, meaningfulness, and involvement. Drawing upon Dewey's (1913) ideas, he developed a multifaceted framework that explored the "catch" and "hold" features of situational interest. He categorized group work, puzzles, and computers as "catch" features and meaningfulness and involvement as "hold" features. This piece of research has been a cornerstone study of situational interest. There has been little follow-up to whether there are other aspects that Mitchell (1993) did not capture, whether his five characteristics are generalizable to other subjects, or if they actually generate personal interest. More research is needed on what aspects of a learning environment generate situational interest and whether certain factors have the potential to cultivate personal interest or appreciation.

Catch Features. Catch features are situational stimuli that have the ability to attract individuals' attention and generate interest, but not necessarily sustain it. The three catch features that Mitchell (1993) identified were: group work, puzzles, and computers. Group work seemed to generate situational interest because of the social nature of

working in groups. Humans, social in nature, for the most part need contact with others. However, students often have social goals that compete with academic or learning goals (Eccles & Wigfield, 2002) and group work has the potential to distract them. This could explain why group work would be identified as a catch factor.

Mitchell grouped a variety of tools used to stimulate students' curiosity into the "puzzles" facet. Puzzles were viewed as interesting because they were perceived as different or out of the ordinary. The puzzles used in the math class that he studied offered a reprieve from the typical day.

Computers were viewed as a catch factor because they allow students the opportunity to test their ideas (Mitchell, 1993). Yet, researchers like Cuban (2001) would argue that having computers in the classroom does not help increase student motivation or interest because they are not used or are used in ways that do not maximize their potential. One possible explanation is that computers, along with many new technologies, are viewed as extraneous to the curriculum. Some affordances of computers resemble what Mitchell defined as involvement (a hold feature) and need further investigation. Computers can afford students experiences to explore their environment and to test conjectures, depending on how they are used.

Hold Features. There have been few studies exploring what aspects of the total learning environment draw students' interest with the potential for it to be held and nurtured further. Hold features are situational stimuli that have the ability to attract attention and "hold" an individual's interest. There has been no discussion on the time frame it takes for an individual's interest to move from a triggered (catch) to a maintained

(hold) situational interest. Mitchell (1993) identified two hold factors: meaningfulness and involvement.

Meaningfulness was defined as students viewing the information as being relevant or important to their lives (Mitchell, 1993). Note that meaningfulness may be different for different people based on their past experiences, present circumstances, and future aspirations (Bergin, 1999). With educational content, meaningfulness can be expressed by the connection between the information and the student. To have students appreciate potential applications and connections to their personal lives, content must be personally relevant in some way and/or connected to the outside world. Teachers need to state these connections or enable students to discover them (Brophy, 2004). Learning activities need to be matched to the individual's characteristics (i.e., they must be optimally ready; Motivational Zone of Proximal Development) and the task or subject-matter needs to be perceived as meaningful or relevant (Brophy, 1999). There are different reasons why something may be meaningful to students (e.g., personally significant, relevant to their identity, relevant to the course, relevant to their lives, etc.) and this needs to be taken into account.

Involvement is defined as the degree to which students feel they are active participants in the learning process. The term involvement is closely related to the idea of active learning, where the student is seen as an "active" participant in the learning experience. Involvement has been construed as a "hold" factor, but it can be used in ways that only "catch" interest based on the design of the task, even though most students are "doing" something (Brophy, 2004). Students can be highly involved (physically active) and interested in the material without being cognitively engaged with what they are doing

(Blumenfeld & Meece, 1988). There is a distinction between hands-on activities and those that are both hands-on and minds-on (Bergin, 1999; Brophy, 2004). Therefore, involvement, like computers, has the potential to "catch" and "hold" interest depending on how it is used.

Mitchell (1993) found that students' conception of involvement was inversely related to lecturing. Hence, the focus was put on the act of "doing." The issue of involvement ties in with constructivist and constructionist perspectives of learning and has been discussed in the "learning by doing" and "learning by design" literature. The combination of these two hold factors, meaningfulness and involvement, in the same environment could be considered what many call a hands-on/minds-on environment and have a stronger effect for generating and sustaining interest.

Nurturing Interest

There has been a long-standing assumption in education that the design of the task or learning environment can be a critical reason for students' willingness to engage with the material. It is easier to change features of a situation and see how individuals react than to change individuals' characterisitics. However, situational interest does not equate to learning. So, what types of situational interest generate deep process learning? Also, do certain types of situational interest help individuals see the value in certain topics or domains? Lawless and Kulikowich (1998) found that when learners have less domain knowledge about a topic, situational interest helps in the learning process.

One reason individuals might engage with an object is personal interest. If an individual does not have a personal interest, it might be possible to create and sustain situational interest, with the potential to develop an emerging personal interest (Brophy,

2004; Hidi, 1990; Hidi & Renninger, 2006; Krapp *et al.*, 1992). It might be an unrealistic goal in most educational situations to nurture a personal interest in only a semester. A better question might be, if a personal interest is not present, but the topic is taught in an environment that is considered situationally interesting, can the person come to appreciate and value learning about it? Alexander and her colleagues (1997; Fox & Alexander, 2004: Lawless & Kulikowich, 1998), have proposed a model of domain learning, that during the early stages of learning reliance on situational interest is more critical, while the influence of personal interest is rather low (i.e., when there is no prior personal interest). Hidi and Renninger (2006) proposed a four-phase model of interest development. They theorized that interest can develop from a triggered situational interest, to a maintained situational interest, to an emerging (or less-developed) personal interest, and then finally to a well-developed personal interest. Research is needed on the impact that situational interest has on the development of an "emerging" personal interest, or at the very least, the nurturance of appreciation of learning domains and activities.

Perceived Competence

People tend to reflect upon their actions or actions of others in order to gain feedback for their future engagement with tasks or activities. Based on these reflections, they begin to develop a perception of themselves and their level of competence for the activities. Self-perceptions of competence have been described as self-beliefs or evaluations about one's ability to achieve success in activities or tasks (e.g., a student's perception that she will achieve an "A" on an upcoming test; Pintrich & Schunk, 2002; Wigfield & Eccles, 1992). A number of self-beliefs have been described in the literature (e.g., self-efficacy, self-concept, self-esteem, perceived ability, expectancies for success, etc.) and perception of one's ability or competence level has typically been a component.

Self-assessment of competence can be based on prior experiences, vicarious observation of someone else performing a task, or even an individual's emotional state (Bandura, 1986; Brophy, 2004; Pintrich & Schunk, 2002). Perceived competence does not necessarily reflect actual ability to complete a task. Some individuals have an unrealistic self-perception that is not congruent with their competence or ability level (e.g., as is more typical with younger children). For older students (i.e., high school and college), perceived competence and academic achievement have been consistently found to be positively correlated (Marsh & O'neill, 1984; Multon, Brown, & Lent, 1991; Pajares & Miller, 1995, 1997). Despite this relationship, it is unclear whether successful academic achievement predicts the development of perceived competence (or vice versa). The relationship is most likely reciprocal (Pajares and Schunk, 2001).

Another consistent finding is that global self-perception constructs are not correlated as strongly with academic achievement as more domain- or task-specific

constructs. When perceived competence and academic performance are measured at a domain-specific level (e.g., math), the correlation between self-perception of competence and achievement for that particular domain is strong. When performance and perceived competence are measured at the topic level, the correlation is even higher (e.g., solving quadratic equations; Pajares & Miller, 1994). To assess perceived competence, a focus on measuring the construct at the domain-, topic-, or task-level is needed for greater accuracy.

Bandura (1986) noted that self-efficacy perceptions might be better predictors of behavior than actual abilities. When students are equipped with a strong sense of competence, they are more capable of taking the initiative to learn in the future and persist at the task. When students lack confidence, they are less likely to engage with the task in order to develop the skills they need to perform successfully.

Perceived task difficulty and perceived competence for a task have been found to influence situational interest in the task (Silvia, 2003). When competence is perceived as low and a task is viewed as too difficult, individuals perceive the task to be less interesting and are less likely to reengage with the task (Silvia, 2003). Also, when people perceive their competence as high and the task as too easy, they perceive the task to be less interesting. Silvia (2003) has shown that situational interest tends to increase as task difficultly increases, but once a task is perceived as too difficult interest begins to wane. With moderate task difficulty, it is more likely that a person will re-engage with the task at a later date.

In regards to situational interest, people perceive a moderately difficult task to be of greater interest compared to very easy or extremely difficult tasks. When students feel

more confident in their ability, they tend to persist at an activity longer (Stipek, 1998). The longer an individual engages with an activity on his or her own accord, the more likely it is that an "emerging" personal interest will develop.

Interventions that challenge students' self-beliefs by demonstrating to them that they are capable of achieving a task are one way of trying to increase perceived competence. Participating in an authentic learning environment with the opportunity to master a task with regular feedback is one of the more common ways to increase perceived competence (Brophy, 2004).

Constructivism and Constructionism

Constructivism

Constructivism asserts that human knowledge is not innate or pre-packaged for easy consumption but is actively constructed through interaction with the environment (Bransford, Brown, & Cocking, 1999; Bruner, 1990; Palmer, 2005; Phillips, 1995; Piaget, 1972). This is compared to a more instructivist perspective that places the learner at the end of a unidirectional flow of information from an authority figure (i.e., teacher or text). The constructivist perspective holds that learners actively construct knowledge for themselves, with their experience in the world and their surroundings influencing knowledge construction. The process is continually open to being modified, so it takes place in a spiral effect that builds on prior knowledge (Bruner, 1973).

There are varying perspectives to the constructivist approach, ranging from an individual to a more social, and there have been internal debates in regards to more subtle intricacies (e.g., how culture impacts knowledge, whether knowledge is discovered or created, etc.). As Phillips (1995) discussed, followers of constructivist theory belong to many different sects, and the criteria, methods, and means for how they approach constructivism vary based on the sect. However, the unifying tie between sects is their belief that the learning process is active (Marin, Bennaroth, & Gomez, 2000). For this discussion, the more philosophical debates on where knowledge lies or whether it is created or discovered will not be the focus. The focus will be on the importance of the learner as an active participant in the learning process and how learners' interactions with the environment can lead to understanding through their experiences. Learners bring their prior knowledge, learning and personal goals, interests, and beliefs to the learning

situation (Bransford, Brown, & Cocking, 2000; Palmer, 2005). All of these characteristics may play a role in the learning process.

The argument that learners are not just receptacles for knowledge imparted by the teacher, but are active participants in the learning process (Bransford, Brown, & Cocking, 2000; Hay & Barab, 2001), has led to discussions on pedagogy (Bransford, Brown, & Cocking, 2000) and design of learning environments (Duffy and Jonassen, 1992). The argument has been made for "teacher as facilitator." A shift in views of the teacher as the "sage on the stage" to a stance of "guide on the side" has been argued. The teacher should be there to help (i.e., facilitate or coach) students in the learning process, not dispense knowledge. As Dewey (1916) noted:

> Only by wrestling with the conditions of the problem at first hand, seeking and finding his own way out, does he [the student] think. When the parent or teacher has provided the conditions which stimulate thinking and has taken a sympathetic attitude toward the activities of the learner by entering into a common or conjoint experience, all has been done which a second party can do to instigate learning. *The rest lies with the one directly concerned.* If he cannot devise his own solution (not of course in isolation, but in correspondence with the teacher and other pupils) and *find his own way out he will not learn,* not even if he can recite some correct answer with one hundred per cent accuracy. (Emphasis added, chapter 12 online)

Therefore, for Dewey (1916), knowledge develops out of situations in which the learner is engaged in meaningful learning experiences. This in many ways connects to the two "hold" features of situational interest identified by Mitchell (1993) – meaningfulness and involvement. Learning can be "instigated," but the learner needs to work actively on constructing understanding. There is more to learning than rote memorization; to truly understand, individuals must construct their own meaning. Thus, the theory of constructivism has led to discussions on the pedagogical practice of "learning by doing." Many of these environments use authentic experiences to allow students to interact in

situations resembling real-world contexts. One approach to "learning by doing" is creating knowledge while in the process of constructing an artifact or product.

Constructionism

The idea of constructionism was put forth by Papert (1980). It builds upon Piaget's constructivist theory of learning. Constructionism is more than just a learning theory, it is also a strategy for educational practice (Kafai & Resnick, 1996). "The word with the v expresses the theory that knowledge is built by the learner, not supplied by the teacher. The word with the n expresses the further idea that this happens especially felicitously when the learner is engaged in the construction of something external or at least sharable" (Papert, 1991, p.3). From a constructionist perspective, not only is the student an active participant, but it benefits the student to engage in the construction of an artifact. As Kafai and Resnick (1996) point out, "Children don't *get* ideas; they *make* ideas." The construction of an artifact allows students to take the knowledge, develop it, and interact with their world by applying it. Consequently, constructionism builds upon the constructivist philosophy that the student should be involved in the active creation of knowledge and intertwines the construction of "knowledge in the context of building personally meaningful artifacts" (Kafai & Resnick, 1996). One of the crucial elements of constructionist, as well as constructivist, learning environments is that the focus is learner-centered instead of teacher-centered and learning happens by doing.

With the constructivist and constructionist theories, there has been an interest in research at the intersection of design and learning. If meaningful learning happens when a learner is cognitively engaged in building and sharing a product, then the "process" of designing the artifact plays an important role on how the learning happens. Areas that have received attention pedagogically are "learning through design" and "project-based learning," because of the focus on designing an artifact. In "learning through design," the process of designing and working on the product is also a source of learning. Therefore, the actual process of designing is just as important to learning as is the final product (Kafai & Resnick, 1996). Students are seen as active instead of passive participants and base their knowledge construction on their experiences (Carey, 1985). Therefore, the learning process is effortful on the learner's part.

There has been consternation regarding the focus American schools have placed on low-level facts and skills. Two practices that have received criticism are 1) the use of the worksheet (Brophy & Alleman, 1991) and 2) the emphasis placed on memorization for performing on standardized assessments (Ames & Ames, 1984). The argument has been made that these low-level tasks have contributed to students' lack of interest in learning, negative attitude towards schooling, and lack of understanding of the material (Blumenfeld, Soloway, Marx, et al., 1991). Researchers and educators alike have argued for learning through a design approach. One of the main reasons is that it allows the student to cognitively engage with and start to think critically about the material.

Constructionism and Technology

Hadley and Sheingold (1993) have reported that in the past, technology has been used as a peripheral to learning, as an "add-on" or extension of the workbook approach. Brophy and Alleman (1991) have been critical of the workbook approach for learning because of the focus on low-level skills. These criticisms also would apply to technology used in this fashion. From Papert's (1991) view, if technology is used in ways that focus on the rote and authoritarian nature of the classroom (e.g., Computer-aided instruction

(CAI), drill-and-practice, individualized tutors, etc.) then it does not change the essence of the classroom. If the more rote and authoritarian use of computers is what Mitchell (1993) meant by computers, then it could be agreed upon that computers might fall under the "catch" facet of situational interest because they are only a novel version of the daily routine. However, technology has the ability to change not only the content but the methods and approach to how teaching and learning transpire.

There are ways to use technology in an educational setting that align more with the constructionist perspective and with hold features of situational interest (Hidi, 1990; Mitchell, 1993). Exploration for uses of new technologies to help increase meaningfulness of subject-matter and student involvement has begun (Kafai & Resnick, 1996). Whether technology can help students without a personal interest in a topic see the value in it depends on how the technology is used and what type of interaction is created for the student. As Papert (1991) so eloquently pointed out, computers have the ability to "alter the nature of the learning process" by shifting the focal point from transfer of knowledge *to* students, to production of knowledge *by* students.

Teachers need to be digitally literate to create productive environments where technology is used in ways that can maintain students' interest instead of using it only for the "bells and whistles" to "catch" their interest. Technologies have affordances for the creation of artifacts that cannot easily be achieved otherwise (Farnsworth, 1994). Therefore, technology allows curriculum designers or teachers to create ways to engage their students with the material by means that are not possible without it.

Technology and Education

In the 21st Century, it has become a struggle to keep pace with rapidly changing digital technologies. These changes have influenced the way individuals think and interact within and across cultures, as well as the way we look at literacy and skills for success in our society. Leu, Kinzer, Coiro, and Cammack (2004) consider a hypothetical student who has just graduated from secondary school:

> Many graduates started their school career with the literacies of paper, pencil, and book technologies but will finish having encountered the literacies demanded by a wide variety of information and communication technologies (ICTs): Web logs (blogs), word processors, video editors, World Wide Web browsers, Web editors, e-mail, spreadsheets, presentation software, instant messaging, plug-ins for Web resources, listservs, bulletin boards, avatars, virtual worlds, and many others. These students experienced new literacies at the end of their schooling unimagined at the beginning. (p. 1571)

How we define literacy has been evolving during the digital-information era (Bruce, 1997; Leu, 2000; Leu et al., 2004; Reinking, 1998). Students beginning preschool or kindergarten this year (i.e., 2007) will experience many changes along their path to graduation, with new technologies emerging every year (Leu et al., 2004). Many of these new digital literacies revolve around the use of the Internet and have changed the way we think, communicate, and interact with others and with information (Leu et al., 2004). Therefore, one of the defining characteristics of digital literacy has become the Internet. Another is the ability to constantly adapt.

A crucial aspect of digital literacy that has not been fully realized is the ability to *produce* information. Literacy is important for students to learn not only to read, but also to communicate. This also is a characteristic of digital literacy. Teachers need familiarity with "writing" digitally in order to guide their students in these endeavors.

How do we teach students to learn with technology and adapt to new technologies? One way is to have their teachers using technology more frequently. To this end, teacher education (TE) programs need to get preservice teachers to see the value of technology in educational settings and develop their abilities. If preservice teachers gain an appreciation, they will be more willing to think of ways to integrate technology into their future classrooms.

Technology Integration

With the pressure to help students become more digitally literate, TE programs have had to examine teacher preparation to meet these needs. Some have argued for stand-alone courses focused on technology for educational purposes, especially teaching and learning. Others have argued for technology integration within content courses. There are pros and cons of both approaches and a balance probably needs to be found between the two. However technology is integrated, it is apparent that the topic is here to stay. As Pierson (2001) noted, turning on a computer is not technology integration, or at least not productive integration.

There are three important features for integrating educational technology – knowledge of, confidence using, and perceived value of technology. The International Society for Technology in Education (ISTE) has been at the forefront of pushing for technological standards for teachers, working with the National Council for Accreditation of Teacher Education (NCATE) to formulate national standards. As Koehler and Mishra (2005) pointed out, many agencies have identified "what" preservice teachers need to know about technology, but the "what" is not as crucial as the "how" (Carr, Jonassen, Litzinger, & Marra, 1998; Mishra & Koehler, 2003). Getting teachers to use educational tech

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technology is more than just having them acquire technological skills. The way technology is incorporated into TE courses can impact students' competence with computers (Gilmore, 1995) and their attitude towards technology (Becker, Ravitz & Wong, 1999). With external pressures to integrate technology into school systems, technology has been integrated haphazardly (Pierson, 2001), and has not been used very efficiently or at all in the classroom (Cuban, 2001). There is a need to understand how to get preservice teachers to see technology as a teaching tool and to increase their competency with it.

Within TE programs across the country, there has been a growing awareness of the need to increase education majors' comfort level, knowledge, confidence with, competence and appreciation of technological affordances to guide their future careers as educators (McKenzie, 2001; Schacter, 1999; Mouza, 2003). To this end, attention has been given to the issue of how to integrate technology into TE programs.

Research Questions

There were three main objectives for this study. The first was to explore whether situational factors (i.e., student involvement and meaningfulness of information presented) could be used to stimulate and maintain situational interest in a real classroom (i.e., the perception of "interestingness"). Second, I wanted to investigate whether these situational factors could nurture personal interest. As a secondary outcome, I was interested to know if these two situational factors could nurture perceived competence as well. The last objective was to explore reasons why preservice teachers were interested in learning about technology and whether they perceived it as valuable for educators.

A mixed methods approach was used to collect data before and after a six-week intervention. The core focus of the quantitative portion of this study was to investigate the influence of situational factors (involvement and meaningfulness) on the nurturance of preservice teachers' interest and perceived competence. The research questions for the quantitative section were as follows:

- Does the nature of the learning task (i.e., the assignment and/or lessons) influence the perception of *Situational Interest* in a real classroom?
- Can certain situational factors (involvement and meaningfulness) increase students' personal interest in a domain?
- Can certain situational factors (involvement and meaningfulness) increase students' perceived competence in a domain?

For the qualitative portion, there were two focal points – to investigate preservice teachers' 1) interest in learning about new technologies and 2) perceived value of technology for educators. To understand how to increase technology use with preservice teacher

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teachers, it is critical to understand where the preservice teachers are in their thinking about technology. The qualitative questions were meant to gain this insight.

METHODS

Participants

The full sample consisted of 101 participants (95 women and 6 men) enrolled in four sections of a senior-level science-methods course for elementary education majors. There was at least one male student in each section except for one group (*ML Only*; see Table 1). The ages of participants ranged from 20 to 35, with a mean of 21.7 ($SD = 2.19$). Out of 103 students enrolled in the four classes, 98% participated in the study (i.e., 101 students). Out of these 101 participants, there was a 92% completion rate from pre to post (93 out of the 101 participants). All analyses were performed with the 93 who completed both pre and post assessments. Attrition was due mainly to absenteeism on the day of the post-assessment, although one participant did not fully complete the pre-assessment and was removed from the data set.

Design

Science methods instructors were recruited several months before the study began to determine whether I could gain access to their classrooms during the fall semester to collaboratively teach in their courses and have their students participate in the technology sessions. The intention was to recruit instructors for three treatment sections and one control section (Table 1). Once treatment conditions were assigned, instructors were consulted to gain feedback on how best to integrate the assignment and/or lessons within their courses to minimize disruption to the flow of their course while maintaining the integrity of the design. Session details were negotiated between the instructors and me before the start of the semester. All of the instructors agreed to allow me full control of the technology sessions throughout the semester. Therefore, all corresponding technology sessions across group conditions were taught in the same week, typically on the same day or consecutive days. One instructor taught two sections, so there were three participating instructors for the four sections involved in the study (Table 1).

The study was a field experiment using a Non-Equivalent Group Design (NEGD) or quasi-experiment conducted with four intact classrooms. A NEGD is similar to a pretest-posttest experiment except for the lack of random assignment of participants to treatments (Trochim, 2006). Field experiments allow researchers to conduct intervention research while examining participants in their natural environment. Consequently, their results allow greater generalization compared to laboratory studies. There are disadvantages as well, due to the lack of control over certain aspects of the environment (see Study Limitations section).

The three different instructors could have been a source for potential nonequivalence. In order to minimize this confounding variable, I measured students' perceptions of their instructors' investment and competence with technology to be used as covariates (Appendix F). Also, to control for instructor influence on the intervention, I taught the technology sessions for all groups over the duration of the semester. In addition to these precautions, the time frame and time allocation for the intervention were the same across the treatment groups (Table 2). Furthermore, the two instructors for all three treatment groups (i.e., instructors 1 and 2; see Table 1) collaborated on their syllabi, readings, and other course assignments, thus maximizing the similarity between sections even outside of the technology sessions for all three of the treatment groups. Also, instructors for the *ML Only* and *Control* groups collaboratively shared lessons for other topics, besides technology, over the course of the semester.

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Variables

Independent Variables

Two independent variables, involvement and meaningfulness, were manipulated for the four groups (Table 1). One group received lessons on why and how to use technology as future educators (*Meaningful Lessons* or *ML Only* Group). Another group received information on how to create a website and developed a website during the intervention (*Involvement* or *I Only* Group). The third group received both treatments, the development of a website and the meaningful lessons (*Involvement* plus *Meaningful Lessons* or *I + ML* Group). Finally, the *Control* group received neither treatment, I nor ML, over the six-week intervention.

Involvement

In the motivational literature, involvement has been defined as the degree to which students are active participants in the learning process. The use of hands-on activities or the term active learning have been used to express the notion of involvement (Bergin, 1999; Mitchell, 1993). Involvement is inversely related to the amount of time students spend in direct lecture (Mitchell, 1993). For this study, involvement was operationalized as whether or not the preservice teachers created their own website during the six-week intervention. The *I + ML* and *I Only* groups created websites, while students in the *ML Only* and *Control* groups did not (Table 1).

Meaningfulness

Everything the three experimental groups did regarding technology during the intervention could be conceived as meaningful (i.e., there was an educational purpose to the sessions). However, within the motivational literature, meaningfulness has been

described as a way to help students make connections between the topic and its application. For this study, meaningfulness was operationalized as lessons to help the education majors connect why and how they might use technology, with a focus on the use of the Internet and websites for teaching and learning. The *I + ML* and *ML Only* groups received the lessons, while preservice teachers in the *I Only* and *Control* groups did not (Table 1).

Dependent Variables

The two main dependent variables focused on preservice teachers' personal interest and perceived competence with technology. These dependent variables were assessed with closed- and open-ended responses both before and after the intervention for all four groups. In addition, preservice teachers in the three experimental groups were assessed on the level of situational interest they perceived for the intervention at the end of the six-week period. Situational interest was operationalized based on a self-report measure used to collect data on the sessions. All three dependent variables are further discussed in the measures section.

Data Collection

A mixed-methods approach (quantitative and qualitative) was used (Creswell, 2003). Survey data were collected concurrently with open-ended questions before and after the intervention. The open-ended responses were used to triangulate the data collected from the preservice teachers' survey responses, but more importantly to expand upon the data at another level. With the survey data, I was not able to explore the preservice teachers' rationale, so open-ended responses were used to address this question in depth and to examine reasons given.

Materials

Instruments and Measures

Personal Interest Measure

Items for the Personal Interest Measure were based on prior work from interest researchers and on the assumption that personal interest can be characterized by three qualities: value, feelings toward, and increased willingness to engage with an object, task, or activity (Krapp, 2002; Schiefele, 1991). In prior research, personal interest has been assessed before having participants engage with a task to gauge their initial interest in the object, topic, or subject that is going to be presented (see Alexander, Kulikowich, & Jetton, 1994 for a review). For this study, personal interest was assessed before and after the intervention, to address whether there was a change in personal interest in the topic based on treatment conditions.

To assess preservice teachers' personal interest in the domain of technology and the topic of website development, questions were developed or adapted from prior measures and from personal correspondence with interest researchers (Alexander, personal communication; Chen, Darst, & Pangrazi, 1999; Flowerday, personal communication; Mitchell, 1993; Pugh, personal communication). The Personal Interest Measure (Appendix C) employed 16 items on value, feelings toward, and willingness to participate and learn about technology and websites (Cronbach's $\alpha = .92$). The preservice teachers rated their level of agreement for each item on a 6-point Likert scale ranging from "strongly disagree" to "strongly agree." Sample items included, "Learning about computers and technology is enjoyable" and "I am interested in learning about website

design and development." The items on the Personal Interest Measure were pilot tested during the summer semester and refined before the study.

Technology Vignettes

As an extension of the Personal Interest Measure, preservice teachers were asked to rate their level of interest in reading articles about technology integration based on three short text-based vignettes, using an 11-point Likert scale ranging from "not at all interested" to "extremely interested." The vignettes described situations of teachers and students using technology (Appendix D). The first two vignettes, adapted from the Texas Center for Educational Technology (TCET) website, were based on real stories of teachers using technology in the classroom (TCET, n.d.). The third vignette was developed specifically for this study. The first two vignettes were pilot tested and refined before the study began in the fall, but the third vignette was developed after the test period. After development of all three vignettes, four educational researchers read them and gave suggestions on further refinement.

Open-ended Interest and Value Questions

Along with the Personal Interest Measure, two open-ended questions, prompted by closed-ended items, were used to gather more information on the preservice teachers' interests in and perceptions of technology's value for educators. Since individuals can have different perceptions for task value (utility, attainment, and intrinsic; Eccles & Wigfield, 2002), and Likert items do not completely address these intricacies, I used open-ended questions to probe preservice teachers' interests and perceptions of value in greater depth.

For example, the *Value* question asked preservice teachers, "How valuable is technology for educators?" Responses ranged from 1- "Not at all valuable" to 5 - "Very valuable," with 3 being "Undecided." They then were asked to elaborate on their response ("Please explain why you think technology is or is not valuable for educators. If you are undecided, please explain why."). This is similar to Pugh's approach (personal communication) to measuring transformative experience by having students respond to open-ended questions after several Likert items in order to gain a deeper understanding of their responses. It allowed me to assess more specifically why preservice teachers did or did not value the domain, at what level, and for what specific reasons.

Perceived Competence Measure

Perceived competence is a belief about one's ability to achieve success at a task (Wigfield & Eccles, 1992). This belief does not always correspond with actual ability. Self-assessments for perceived competence have been measured as cognitions about abilities for a particular domain or topic (Byrne, 1984; Harter, 1982; Pintrick & Schunk, 2002). For this study, perceived competence was assessed before and after the intervention using the Perceived Competence Measure, to address whether preservice teachers' perceived competence changed based on treatment conditions (Appendix B).

The Perceived Competence Measure was used to assess preservice teachers' self-identification of themselves as technology users and their self-perception of their technological competencies. Preservice teachers were asked to respond to 16 items (Cronbach's $\alpha = .93$) by rating their level of agreement on 6-point Likert scales ranging from "strongly disagree" to "strongly agree." Questions were adapted from previous measures of perceived competence, self-efficacy and self-concept (e.g., Harter, 1984 reviewed in Pintrich & Schunk, 2002; Williams & Deci, 1996; Pintrich, Smith, Garcia, & McKeachie, 1991). An example item is, "Personally, I am able to learn to use new technologies rather quickly." The Perceived Competence Measure consisted of four sections: 1) Computer and Technology Use, 2) Website Design and Development, 3) Technology in My Future Classroom, and 4) Future Students. The questions were adapted mostly from self-efficacy measures, but several items asked students to compare themselves to their peers or how others perceived them, which are more typical of self-concept measures. The items were pilot tested during the summer semester before the study.

Situational Interest Measure

In contrast to personal interest, situational interest typically has been measured by having participants characterize their interest during or after a specific task or activity (Alexander, Kulikowich, & Jetton, 1994; Alexander, Sperl, Buehl, Fives, & Chiu, 2004; Chen, Darst, & Pangrazi, 1999). Questions tend to be very specific to the task just experienced (e.g., asking students about their interest in a textual passage they have just read). For this study, specific questions about the technology intervention were used to assess the level of situational interest that the three experimental groups perceived about the intervention. The preservice teachers in the *Control* group were not assessed because they did not receive the treatment sessions.

Questions for the Situational Interest Measure (Appendix E) were developed or adapted from prior interest measures (e.g., Mitchell, 1993; Chen, Darst, & Pangrazi, 1999), but tailored specifically for the technology sessions for this study (Cronbach's α = .91). Some examples include "I didn't find anything interesting about the technology sessions this semester" and "I found the sessions to be engaging and interactive." Preservice teachers rated their level of agreement for each item on a 6-point Likert scale ranging from "strongly disagree" to "strongly agree." For the development of the Situational Interest Measure, four educational researchers read the items and gave suggestions.

Instructor Investment and Competence with Technology

The preservice teachers in the four sections were taking two methods courses as cohorts (science and social studies) during the fall semester. Those who were enrolled in a given science-methods class were also in matched social studies-methods classes. Therefore, to assess whether there were group differences based on the instructors' competency and investment with technology, four questions were used (Appendix F). Two questions asked the preservice teachers to rate their science-methods and social studies-methods instructors' competence with technology. The other two asked them to rate their instructors' investment in technology. Preservice teachers rated their level of agreement for each item on a 6-point Likert scale ranging from "strongly disagree" to "strongly agree."

Procedures

I recruited participants from the four sections during the third week of the fall semester. They were informed that their participation was voluntary and that they could withdraw at any time. The preservice teachers were then asked to read and complete the informed consent form. To thank them for their participation, preservice teachers who completed both the pre- and post-assessments for the study were entered in a raffle. The drawings awarded seven total prizes. Three (a printer, iShuffle, and webcam) were raffled off between all eligible participants across the four groups and another four (USB flash drives) were raffled off to one participant in each of the four sections at the end of the semester. Even if preservice teachers did not consent to participate in the study, they received technological support for the website assignment that was required as part of their course work.

After collecting consent forms, participants were asked to complete a demographic questionnaire, the Instructor Investment and Competence Measure, and the initial surveys (i.e., Perceived Competence Measure, Personal Interest Measure, Technology Vignettes, and the open-ended *Interest* and *Value* questions). Upon completion of the pre-assessment materials during the introductory session, the treatment groups (*I + ML*, *ML Only*, and *I Only*) were given a brief 10-minute overview about the technology sessions. For the two *Involvement* groups developing websites (i.e., the *I + ML* and *I Only* groups), an assignment sheet was distributed.

The intervention for the treatment groups began on the fourth week of the semester and lasted for six weeks. A technology session did not take place every week (see Table 2 for a timeline), but the goal was to have similar time allocations for the technology intervention during the same weeks. Because the instructors were extremely flexible, this was achieved.

Each technology or website session lasted approximately one hour for the three treatment groups. The *ML Only* group received an additional lesson to balance the time allocated for the intervention between groups. This session consisted of a lesson on the basics of web design that the website groups received during the first lesson, except that there was no hands-on portion. At the end of the last technology session, preservice teachers in all three experimental groups completed the Situational Interest Measure to assess their interest in the intervention sessions. On the eighth and final week of the study, preservice teachers in all four groups completed the post-assessment, which included the Perceived Competence Measure, Personal Interest Measure, Technology Vignettes, and the open-ended *Interest* and *Value* questions.

Lessons

Meaningful Technology Lessons

Preservice teachers in the *Meaningful Lessons* groups, *ML Only* and *I + ML*, received three lessons on the importance, value, and relevance of technology for educators and their students. Lessons included examples from the Internet and videos of real teachers discussing how they and their students use technology. The lessons were grounded in the context of elementary science education, since this was the focal point of the course. However, some of the ideas were presented in a more global context (i.e., how they could be used outside of the science curriculum) when applicable. Because the *ML Only* group did not create websites, there was more time to have discussions about the information covered in the lessons (compared to the *I + ML* group). Yet, the information presented was the same for both groups.

Meaningful Lesson 1. The first technology lesson focused on how teachers can use the Internet and websites to find useful teaching resources and to communicate with colleagues, parents and students. As the instructor, I presented examples of teachers who maintain classroom websites, what they could be used for, and how they are used to showcase students' work and talk about things happening in the school and classroom. Along with classroom websites developed by teachers, I presented ways that teachers use online calendars, blogs, and other web 2.0 technologies (e.g., social networking, wikis and other online collaborative tools) to communicate with parents, students, and colleagues. To illustrate the type of resources available online, I used a 36-second videoclip of a teacher discussing the community that the Internet offers for new teachers. The importance of having a web presence and becoming part of a larger community of educators was addressed during the lesson. The last portion of the lesson identified useful online resources for educators. Examples included, how up-to-date information is easily accessible online (e.g., weather.com), the possibilities of joining national or international group projects, and online lessons and ideas (e.g., kramp.com for an experiment of the week).

Meaningful Lesson 2. The second lesson focused on using technology in the classroom and ways to integrate technology with curricular goals. After introducing the lesson, I showed a one-minute videoclip in which a teacher discussed how technology was the focus of her lessons when she began integrating technology, but then she realized that technology needed to be used to support curricular goals and not drive them. I then gave examples of ways technology can be integrated within elementary science based on grade level. Examples included simulations (e.g., moon phase simulations for how the moon cycle works), the use of digital microscopes and blogs to document experiments (e.g., on plant growth), and Webquests to explore science topics.

Webquests were described as inquiry-oriented learning activities where students are provided information and links to search online to solve a problem posed to them in a scenario (http://webquest.sdsu.edu). The particular sections of a Webquest were discussed, along with reasons for why and how teachers can use Webquests and the importance of evaluating the quality of their content. I shared previously constructed Webquests, resources for Webquests about different science topics, and resources on how to adapt or create one's own. Webquests were used as a transitional topic to talk about how technology can be used for inquiry-oriented instruction, which was the focus for the third technology lesson.

Meaningful Lesson 3. The final lesson focused on students as users of technology in the classroom. I discussed reasons why it can be important for teachers to think about ways of having their students use technology, how technology use has been incorporated into the discussion of what it means to be literate in today's society, affordances of web 2.0 and open source technologies for educational purposes, and the differences between consumers and producers of technology. I also addressed the new digital divide between students who are beginning to use technology in the classroom (i.e., mainly as consumers) and those who are learning to produce technological artifacts for a larger web audience (producers). I gave examples of ways students could be producers of technological artifacts and shared a website – www.thinkquest.com – that hosts a student-based competition for creating educational websites.

Website Sessions

The preservice teachers in the two involvement groups, *I Only* and *I + ML*, received short lessons on how to design and create their websites and access their server space, while following along in class. The rest of their time was spent working on their websites in class (with access to my help) during the class sessions. For the *I Only* and *I + ML* groups, the information about how to design and create a website was the same. The sessions were scaffolded with the beginning sessions having more guided instruction and the later sessions being more open-ended. The preservice teachers received in-class help and feedback on their assignment and also had access to technology support outside of class in order to complete their websites. The *I + ML* group did not receive exactly the same amount of free time in class to work on websites as did the *I Only* group, because it received both portions of the intervention. Both groups were expected to work on their websites in and out of class and were asked to complete small sections of their websites from week to week. The groups not constructing a website (*ML Only* and *Control*) were asked to start collecting online resources outside of class for their future website assignment, which took place after the intervention period.

Website Session 1. At the beginning of the first website session, the requirements of the assignment were reiterated and elaborated upon. I introduced the basics of web design by having the preservice teachers think about issues regarding the layout of their sites (e.g., color scheme, text size, navigation system, appropriateness of content, etc.), file management, naming conventions for webpages, and how web browsers interpret code and can differ in their interpretation of specific webpage components. The first session was spent teaching the basics of website design followed by a very brief period of using the software program for web development to familiarize themselves with it.

To prepare for the second website session, preservice teachers were asked to explore other websites to gain ideas for their own. Also, they were given web addresses with resources for design issues (e.g., color schemes and navigation and examples of websites from past seniors and interns to get realistic ideas for what was possible for their websites (many websites are created by teams of professionals). If they were adamant about using a more sophisticated technique or layout, I addressed how they

could do it, provided them with resources, and gave feedback. Preservice teachers were asked to bring, on paper, a structural breakdown for their website along with some ideas in regards to design issues (layout of pages, color schemes, etc). They used the paper when they began to design their webpages during the second session.

Website Session 2. The second session occurred during the fifth week of the semester and focused on having the preservice teachers get familiar with the software program. They were asked to follow along while I gave short mini-lessons (about 5-10 minutes) on how to create webpages interspersed with hands-on periods of working on their webpages. During this session, they learned how to organize their files, connect to the server, and began to create webpages (e.g., creating a navigation bar, inserting images, etc.).

Website Sessions 3 and 4. These two sessions were held toward the end of the intervention to allow preservice teachers the opportunity to work on their websites in class while having access to help and advice when they encountered problems. I addressed the whole class when questions arose that were pertinent to everyone, but otherwise, circulated the room giving advice or feedback.

Analyses

Quantitative Analyses

To determine the relationship between personal interest and perceived competence, a correlation matrix was generated with pre- and post-scores for both measures. A one-way multivariate analysis of covariance (MANCOVA) was conducted to measure between-group differences in personal interest and perceived competence. The MANCOVA was conducted with group condition as the independent variable (*I* +

ML, I Only, ML only and Control) and post-assessments on the Personal Interest Measure and Perceived Competence Measure as the two dependent variables. Preservice teachers' perceptions of their instructors' investment and competence with technology, along with their scores on the Personal Interest and Perceived Competence Measures pre-assessment measures, were used as covariates. *A priori* contrasts were proposed to assess specific hypotheses and follow-up *post hoc* analyses were conducted as needed.

To assess situational interest between experimental groups, an Analysis of Covariance (ANCOVA) was conducted with treatment condition (*I + ML, I Only,* and *ML Only*) as the independent variable and scores on the Situational Interest Measure for the three treatment groups as the dependent variable. Preservice teachers' perceptions of their instructors' investment and competence with technology along with their scores on the pre-assessment measures for personal interest and perceived competence were used as covariates.

Qualitative Analyses

Content analysis was used to devise coding schemes for the two open-ended questions (see Appendix C for questions). The responses were first coded by going through all of the pre and post responses without a guiding structure to allow the themes and categories to emerge from the data. Once all of the responses had been coded and new categories had been exhausted, the categories with the fewest frequencies were collapsed into similar or overlapping categories. This process was repeated for both open-ended questions and a categorical scheme was devised for each question. Once the categories had been collapsed, each question was recoded to verify that the new categories captured the essence of the data.

Once the categories had been fully developed for both questions, a separate rater was trained on a sub-sample of responses. Next, the rater independently coded one-third of the responses for both questions using the new categorical schemes. Inter-rater agreement between the independent rater and author ranged from 86% for the *Interest* question to 91% for the *Value* question. Two categories – *Enhance Learning or Engage Students* and *Teaching Opportunities* – were the source of the majority of the disparities for the *Interest* question, but the percent agreement overall was still high. Once agreement was calculated, data were qualitatively and descriptively analyzed for trends using qualitative software.

For the first question on participants' interest to learn about new technologies, four main themes emerged: 1) *Not at All Interested*, 2) *Interested Only for the Value,* 3) *Comfort Level Connected to Interest*, and 4) *Interested*. For the four major themes, the only two categories that were double coded were *Comfort Level Connected to Interest* and *Interested*. The reason for double coding was that many participants would express an interest for learning about technology, give a reason for their interest, and then qualify it with a comment about wanting to be better or know more about technology because of their low level of comfort with using technology.

Because of the many responses coded for the *Interested* theme, subcategories were identified (Table 14), and responses were coded with multiple subcategories if applicable. For example, one response was, "I think it is important to include a variety of outlets to teach material, to not only engage the students, but to give them experience for their own future." This response was coded for three subcategories: 1) *Teaching Opportunities*, 2) *Enhance Learning or Engage Students*, and 3) *Help Prepare Students*.

However, if respondents mentioned two items that would fit under the same subcategory, these responses were not counted for a double code of the subcategory. The unit of analysis for coding was typically the sentence (this was also true for the *Value* question).

For the second question regarding the value of technology for educators, there were two main themes, *Not Valuable* and *Valuable*. Because the vast majority of responses were coded as *Valuable*, 12 subcategories were identified (Table 22). The coding procedures were the same as for the *Interest* question (e.g., a response could be double coded for different subcategories but not the same subcategory). Once all of the responses were coded, the 12 subcategories were grouped into four clusters based on their overarching themes: external reasons for why teachers should value technology (*External Factors*), ways technology can help educators teach (*Teaching Opportunities*), how and why technology could be used for student learning (*Student Learning*), and the value of technology is dependent on the situation and context (*Dependent on the Situation*).

Hypotheses

Relationship between Personal Interest and Perceived Competence

I predicted a positive relationship between personal interest and perceived competence. When people have an interest in a topic or domain, they tend to seek out opportunities to further their competence (resulting in greater self-perceptions of competence). Also, when people perceive themselves to be highly competent at something, there is a greater likelihood that personal interest in the topic or domain will develop. Thus, I expected these two variables to be moderately correlated with a positive relationship.

Personal Interest

I hypothesized that the three experimental groups (*I Only*, *ML Only*, and *I + ML*) would have a greater increase in personal interest compared to the *Control* group. Second, for the Personal Interest Measure, I expected the *Meaningful Lessons* groups to score higher than the other groups (i.e., *I + ML* and *ML Only* > *I Only* and *Control*). Also, I expected the *I + ML* group to have a greater increase in personal interest compared to the two other experimental groups, *I Only* and *ML Only*, based on what I anticipated to be additive effects of involvement and meaningfulness for nurturing interest. In addition, I hypothesized the *ML Only* would score higher than the *I Only* group.

Over the years, a number of studies and theoretical discussions in the interest literature have focused on text-based learning. Therefore, I wanted to examine if the treatment conditions for this study would influence preservice teachers' willingness to read text-based vignettes about technology integration. I hypothesized that the *I + ML* group would have a greater increase in their willingness to read more about the technology vignettes than the other three groups (*ML Only*, *I Only*, and *Control*).

Perceived Competence

I hypothesized that the three experimental groups (*I Only*, *ML Only*, and *I + ML*) would have a greater increase in perceived competence compared to the *Control* group. Also, I expected that there would be a difference between the *I + ML* group compared to the *I Only* and *ML Only* groups because the *I + ML* group would feel more confident in their abilities after creating a website and receiving information on how to use technology in the future classrooms. Finally, I anticipated that participants who created a website (*I Only* classrooms) would experience a greater increase in perceived competence compared to the *ML Only* group because of the hands-on nature of the *Involvement* treatment.

Perceived Competence Subscales

I expected differences on two subscales, "Website Design and Development" and "Future Students Using Technology," for the Perceived Competence Measure. On the "Website Design and Development" subscale, I anticipated that the *Involvement* groups (*I + ML* and *I Only*) would feel more confident in their ability to design and develop a website based on the opportunity for actually creating a website during the intervention. Therefore, I hypothesized a greater increase on this subscale compared to the groups that did not create a website (*ML Only* and *Control*). On the "Future Students Using Technology" subscale, I hypothesized a greater increase for the *I + ML* and *ML Only* groups compared to the *I Only* and *Control* groups, because they received information on why and how to use technology with their future students.

Situational Interest

I hypothesized there would be a difference on the Situational Interest Measure based on the type of instruction groups experienced in the intervention. My specific hypothesis was that the *I + ML* group would score higher on the Situational Interest Measure compared to the *I Only* and *ML Only* groups, based on the nature of the involvement and meaningfulness factors both being present.

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QUANTITATIVE RESULTS

Development of Personal Interest and Perceived Competence

Preliminary Analyses

Without random assignment to group conditions, two preliminary one-way ANOVAs were conducted to compare the four groups on both pre-assessments – the Personal Interest and Perceived Competence Measures. Group means, standard deviations, and group sizes are presented in Table 3 for both pre-assessments (Personal Interest and Perceived Competence Measures). For both ANOVAs the independent variable was group condition (i.e., *I + ML*, *I Only*, *ML Only*, and *Control*) with the dependent variables as personal interest and perceived competence, respectively. Preliminary analyses yielded no differences between group conditions on the pre-assessment measures for personal interest [F (3, 92) = .571, p = .64, η_p^2 = .03] and perceived competence [F (3, 92) = .868, p = .46, η_p^2 = .02]. Also, homogeneity of variance was assumed between groups on the pre-assessments, based upon Levene's test for both personal interest [F (3, 89) = .606, p = .61] and perceived competence [F (3, 89) = .678, p = .57].

With no statistical difference between the groups on the two pre-assessments, I assumed similar levels on both of the dependent measures (i.e., personal interest and perceived competence) for the four groups. These preliminary ANOVAs were conducted to address whether further adjustments would be needed when evaluating post-assessment data. With no differences between means on the pre-assessment measures, no deviations from variance normality, and all of the measures having high reliability (i.e., all four Cronbach alphas were greater than .90), no further adjustments were conducted.

Along with preliminary ANOVAs, a Pearson product-moment correlation was conducted to investigate the relationship between the two dependent variables, personal interest and perceived competence, for both pre- and post-assessments. Along with examining the relationship between the variables, I wanted to make certain that the variables did not have too high of a correlation (greater than .80). A strong correlation between the variables would indicate a possible overlap between what the two measures had assessed. The prior expectation was that the two dependent variables, personal interest and perceived competence, would have a positive correlation with each other; however, they also would be distinct variables allowing both to be included in the overall analyses.

Based on the correlations between the two dependent variables (Table 4), it can be assumed that a positive relationship exists. The pre-survey measures of personal interest and perceived competence were moderately correlated ($r = .40, p < .001$), as were the post measures ($r = .59, p < .001$). With both correlations being moderate, it was appropriate to use both in further analyses.

Upon further inspection of the correlational data in Table 4, it becomes apparent that the pre-Personal Interest Measure is correlated with the post-Personal Interest Measure ($r = .44, p < .001$) as well as with the post-Perceived Competence Measure ($r = .69, p < .001$). Similarly, the pre-Perceived Competence Measure was correlated with the post measures for both personal interest and perceived competence ($r = .45, p < .001$; $r = .71, p < .001$, respectively). These relationships between the pre and post data on the same measure, pre-Personal Interest with post-Personal Interest and pre-Perceived Competence with post-Perceived Competence, were expected and I intended to use the pre-scores f

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pre-scores for each variable as covariates in the main analyses to control for preservice teachers' initial scores on the same measure from pre to post. However, the cross-relationships, pre-Personal Interest with post-Perceived Competence and pre-Perceived Competence with post-Personal Interest, suggested that both pre-assessments should be used as covariates when assessing the two post-variables in the main analyses to control for preservice teachers' initial level of personal interest and perceived competence for both variables. Therefore, both pre-assessments were used as covariates for both analyses.

Main Analyses

A one-way multivariate analysis of covariance, MANCOVA, was performed to assess the overall model that there was a difference for at least one of the four conditions (*I + ML*, *I Only*, *ML Only* and *Control*) on the two dependent variables (personal interest and perceived competence) and to assess the fit of the regression for the covariates in the model. The scores on the *Instructor Investment and Competence Measure* (Appendix F) were evaluated as covariates in the overall model but were dropped from the analyses for lack of significance. Thus, a one-way MANCOVA was conducted with group condition as the independent variable (*I + ML*, *I Only*, *ML Only* and *Control*) and post-assessments for personal interest and perceived competence as the two dependent variables while adjusting for the pre-assessment scores on the Personal Interest and Perceived Competence Measures.

The results for the overall model yielded significant results with Wilk's $\lambda = .728$ [F (6, 172) = 4.932, $p < .001$]. Consequently, univariate F tests were evaluated (Table 6). The results for the univariate ANCOVAs were significant for both the Personal Interest

Measure [F (3, 87) = 5.529, p = .002, η_p^2 = .16] and the Perceived Competence Measure [F (3, 87) = 5.136, p = .003, η_p^2 = .15], suggesting that at least one of the groups differed for both of the dependent variables. Group means, standard deviations, and group sizes for post-assessments are presented in Table 5. Based upon the significant results for the overall model and univariate F tests, the proposed *a priori* contrasts were conducted along with several *post hoc* analyses for both of the dependent variables (i.e., personal interest and perceived competence) to further investigate between-group differences.

Planned Comparisons and Post Hoc Analyses

Planned or *a priori* comparisons were conducted for both dependent variables, based upon the hypothesized comparisons for between-group differences. Also, I conducted several *post hoc* analyses for further clarification of certain *a priori* comparisons.

Personal Interest

For the personal interest comparisons, the alpha (α) level was adjusted based on the potential for type I error (i.e., potentially finding a difference by chance). The Holm's Sequential Bonferroni Adjustment method was used to adjust the α (.05) level to control for family-wise error [.05/k; .05/(k-1); .05/(k-2); .05/(k-3); and .05/(k-4)] for the number of comparisons for the personal interest variable. With a total of five comparisons, three *a priori* and two *post hoc*, the adjusted critical α levels were .010, .013, .017, .025, and .050 for the five comparison analyses (Table 7). There has been much debate as to whether the α needs to be adjusted when conducting *a priori* contrast analyses, but with also conducting two *post hoc* analyses a conservative approach was taken in order to control for the potential for type I error.

I hypothesized that receiving any of the three interventions would have a greater influence on increasing preservice teachers' level of personal interest compared to those in the *Control* group. Therefore, the first *a priori* contrast examined this hypothesis. The three experimental groups (*I + ML*, *I Only*, and *ML Only*) were found to have a greater increase on the personal interest variable when contrasted to the control group ($t = 2.730$, $p = .008$; Contrast estimate = 18.094, 95% CI: 4.921 – 31.267). For the second contrast, I evaluated the hypothesis that the *I + ML* group would have a greater increase on the personal interest variable when compared to the two other experimental groups (*I Only* and *ML Only*). No difference was found ($t = 1.520$, $p = .13$; Contrast estimate = -7.196, 95% CI: -16.605 – 2.212). A third *a priori* contrast was carried out to compare if a difference existed between the groups that received the *Meaningful Lessons* treatment (*I + ML* and *ML Only*) compared to those that did not (*I Only* and *Control*). A significant difference was found in favor of the groups that received the *Meaningful Lessons* treatment ($t = 4.042$, $p < .001$; Contrast estimate = 15.085, 95% CI: 7.667 – 22.503).

A *post hoc* analysis was conducted to further examine the last comparison to assess whether the mean from the *Control* group influenced the result. Therefore, I conducted a contrast comparing the two experimental groups, *I + ML* and *ML Only*, to the *I Only* group. The result showed a similar finding as the *a priori* comparison above. There was a significant difference on the personal interest variable favoring the experimental groups that received the *Meaningful Lessons* treatment ($t = 3.059$, $p = .003$; Contrast estimate = 13.581, 95% CI: 4.439 – 22.404). A second *post hoc* analysis was

conducted to explore whether there was a difference between the *ML Only* group compared to the *I Only* group. A significant difference was found between the two (t = 2.690, p = .009; Contrast estimate = 6.655, 95% CI: 1.737 – 11.573).

Perceived Competence

The Holm's Sequential Bonferroni Adjustment method was used to adjust the α (.05) level to control for family-wise error for the perceived competence comparisons as well. Again, a conservative approach was taken in order to control for potential type I error. With a total of five comparisons (Table 8), four *a priori* and one *post hoc*, the adjusted critical α levels were .010, .013, .017, .025, and .050.

For perceived competence, the first hypothesis stated that receiving any of the three treatments (*I +ML*, *ML Only*, and *I Only*) would increase preservice teachers' perceived competence relative to the *Control* group. The three experimental groups were found to have a greater increase in perceived competence when compared to the *Control* group (t = 2.978, p = .004; Contrast estimate = 17.683, 95% CI: 5.880 – 29.485). I conducted a second *a priori* analysis to assess whether the *I + ML* group had a greater increase on the Perceived Competence Measure compared to the two other experimental groups (*I Only* and *ML Only*). This result was significant as well (t = 2.479, p = .015; Contrast estimate = 10.515, 95% CI: 2.086 – 18.945). For the third *a priori* analysis, I examined if a difference existed between the group that created a website (*I Only*) versus the group that received only *Meaningful Lessons* (*ML Only*). No difference was found (t = 1.159, p = .25; Contrast estimate = 2.570, 95% CI: -1.836 – 6.976).

The final *a priori* analysis assessed whether there was a greater increase on the perceived competence variable for groups that created websites (*I + ML* and *I Only*) compared to those that did not (*ML Only* and *Control*). A significant difference was found ($t = 3.570$, $p = .001$; Contrast estimate = 11.969, 95% CI: 5.305 – 18.634). A *post hoc* analysis was conducted in order to further investigate the last comparison to assess whether the mean from the *Control* group affected the finding. Therefore, the two experimental groups (*I + ML* and *I Only*) that created websites were contrasted with the *ML Only* experimental group. I found a similar significant finding as the *a priori* comparison from above ($t = 2.330$, $p = .02$; Contrast estimate = 9.113, 95% CI: 1.342 – 16.884).

Analyses for Perceived Competence Subscales. To evaluate the two *a priori* comparisons for the subscales on the Perceived Competence Measure, separate analyses were conducted for each of the two hypotheses. With scores on the overall Perceived Competence Measure already assessed, a conservative approach was taken to evaluate the subscale hypotheses by setting the α level at 0.05 and then adjusting it using the Bonferroni method to 0.025 (i.e., 0.05 divided by 2 comparisons). This is more conservative than the Holm's Sequential Bonferroni Adjustment method.

For the Website Design and Development subscale on the Perceived Competence Measure, I expected that the *Involvement* groups (*I + ML* and *I Only*) would have a higher perceived competence based on their opportunity to create a website compared to the groups that did not (*ML Only* and *Control* groups). An *a priori* contrast revealed a significant difference ($t = 3.299$, $p = 0.001$, 95% CI: 1.312 – 5.285).

For the Future Students Using Web Design subscale, I hypothesized that the groups that received the *Meaningful Lessons* (*I + ML* and *ML Only*) would have a higher perceived competence after the lessons compared to the groups that had not received them (*I Only* and *Control*). An *a priori* contrast did not show a significant difference (t = 1.850, p = 0.07, 95% CI: - 0.170 – 4.793).

Technology Vignettes

Scores on the three technology vignettes were aggregated to create a total score on both the pre- and post-assessments. Group means and standard deviations are presented in Table 9. A preliminary one-way ANOVA was conducted to compare the four groups on the aggregated score for the pre-assessment. The independent variable was group condition (*I + ML*, *I Only*, *ML Only* and *Control*). This analysis yielded no differences between group conditions on the pre-assessment scores [F (3, 92) = 0.378, p = 0.77, η_p^2 = .01]. The assumption of homogeneity of variance between groups on the pre-assessment was accepted based upon Levene's test [F (3, 89) = 2.259, p = 0.09].

With the groups being similar on the pre-assessment, a one-way analysis of covariance (ANCOVA) was performed to assess whether a difference existed for at least one of the four conditions (*I + ML*, *I Only*, *ML Only* and *Control*). The ANCOVA was conducted with group condition as the independent variable (*I + ML, I only, ML only* and *Control*) and the aggregated scores on the post-assessment for the technology vignettes as the dependent variable, while adjusting for the aggregated scores on the pre-assessment. The result for the univariate ANCOVA was nonsignificant for the technology vignettes [F (3, 88) = 1.78, p = 0.16, η_p^2 = 0.057], suggesting that there was no group difference on preservice teachers' interest to read more about the technology excerpts.

Based on the significant findings on the Personal Interest Measure (discussed above), a similar analysis was conducted for the technology vignettes between the groups that received the *Meaningful Lessons* (*I + ML* and *ML Only*) and those that did not (*I Only* and *Control*). A *post hoc* analysis was conducted using the *Meaningful Lessons* treatment as the independent variable and the aggregated post-assessment scores as the dependent variable while adjusting for the aggregated pre-assessment scores. A significant difference was found [F (1, 90) = 4.71, p = 0.03] with a moderate effect (d = 0.44) for the groups that received the *Meaningful Lessons*.

Situational Interest for Experimental Groups

A one-way ANCOVA was conducted to assess whether a difference existed for at least one of the three treatment conditions (*I + ML*, *I Only*, and *ML Only*) on the dependent variable, situational interest, and to assess the fit of the regression for the covariates. Based on the literature (Renninger et al., 1992), it was expected that preservice teachers' personal interest for the topic would have the potential to influence their perception of how interesting the learning environment was to them (situational interest). Along the same line, it was thought that the preservice teachers' perceived competence would influence their perception of how interesting they perceived the intervention. Consequently, covariates were used to control for pre-existing personal interest and perceived competence (i.e., initial scores on the Personal Interest and Perceived Competence Measures). Two outliers were removed from the analyses, one from the *I Only* group and the other from the *ML Only* group.

A one-way ANCOVA was conducted with the three treatment conditions as the independent variable and their score on the Situational Interest Measure as the dependent variable while controlling for the pre-assessment scores for the Personal Interest and Perceived Competence Measures as covariates. The ANCOVA yielded a significant result for situational interest with F (2, 62) = 10.064, $p < 0.001$, $\eta_p^2 = 0.25$, suggesting that at least one of the treatment groups differed. Group means, standard deviations, and group sizes for the Situational Interest Measure are presented in Table 11.

I hypothesized higher scores on the Situational Interest Measure for the *I + ML* group compared to the groups receiving only one, but not both treatments (i.e., *I Only* and *ML Only*; see Table 10). For that reason, the *I + ML* group was compared to both the *I Only* and *ML Only* groups using pairwise comparisons. In addition, a *post hoc* analysis was conducted comparing the *I Only* to the *ML Only* group. The Holm's Sequential Bonferroni Adjustment method was used to adjust the α (0.05) level to control for family-wise error for the three comparisons [0.05/k; 0.05/(k-1); and 0.05/(k-2)]. There was a significant difference between the *I + ML* group and both of the other groups, *I Only* [t (40) = 4.481, $p < .001$, d = 1.518] and *ML Only* [t (41) = 2.766, p = .007, d = .722]. There was no significant difference between the *I Only* and *ML Only* groups [t (47) = 1.849, p = .07, d = .592].

QUALITATIVE RESULTS

Based on the quantitative results, it could be suggested that the way technology and website development is taught to elementary education majors has the potential to influence their interest and perceived competence. However, the quantitative results did not clarify why the preservice teachers were or were not interested in learning about technology or their perceptions regarding the value of technology for educators. The research questions for this section centered on exploring preservice teachers' level of interest in learning about technology and reasons why they perceived technology as valuable or not for educators. For the qualitative portion of the study, data were collected using two questions consisting of two parts, a closed-ended prompt and an open-ended item asking for further clarification. The two items were as follows:

1) I am interested in learning about new computer technologies.

Six-point Likert scale, "Strongly Disagree" to "Strongly Agree"

1a) Please explain *why* or *why not*.

2) How valuable is technology for educators?

Five-point Likert scale, "Not at all valuable" to "Very valuable"

2a) Please explain why you think technology is or is not valuable for educators.

The pre- and post-assessment means of the closed-ended Likert items exhibited narrow ranges for both questions for all four groups and the means were extremely high (Tables 12 and 13). These data were not analyzed statistically for several reasons. First, a multiitem measure was already used to gather quantitative data. Secondly, single items are not recommended as measures of behavior, attitudes, beliefs, or even learning. And lastly, a ceiling effect was observed for the second question, so a difference between the groups would not be expected. The closed-ended items were only used as prompts for the open-ended questions.

The purpose of collecting the qualitative data was to explore reasons given by the preservice teachers regarding their interest in learning about new technologies and their perceptions of the value of technology for educators. Therefore, their responses were coded for multiple themes using a categorical system.

Interest in Learning about Technology

For the first question, "I am interested in learning about new computer technologies," very few participants made statements indicating no interest (3 pre and 2 post responses; see Table 14 – *Not at all Interested* category). The majority wanted to know more about technology or, at the very least, expressed that it was something they needed to use as future educators. Explanations were quite varied, ranging from knowing that technology would be valuable to them as educators, to identifying affordances it provides for educators, to stating they would like to learn for their own personal use outside of school. For the *Interest* question, there were four major categories—*Not at All Interested*, *Interested Only for the Value*, *Comfort Level Connected to Interest*, and *Interested*. Responses in the *Interested* category were delineated into subcategories (Table 14).

The analyses for this question centered on trends expressed for learning about technology. Instead of focusing solely on group differences, I explored the categories of responses to see where differences and similarities occurred between and within groups. The goal was to gain insight as to why preservice teachers might have an interest in learning about technology.

Interested Only for the Value

On the pre-assessment, eleven individuals from the four sections indicated that they were only interested in knowing more about technology because they saw it as valuable to them. They did not have more personal interest in learning about it (Table 15). One response was, "[I'm] indifferent, it's not something that I would go out of my way to learn about, but I know that it's an important skill to have to make me a better teacher." Another preservice teacher responded, "Although I know it is important to learn, and I am willing, it is not something that really interests me." These responses indicate that these individuals felt that, as future educators, technology is something valuable (the aspect of value will be explored in detail in the following section, *Value of Technology for Educators*), but they were not inherently drawn to learn about it.

In this category, the most noticeable shift from pre to post was for the *I + ML* group (Table 15), which dropped from five to just one response coded as *Interested Only for the Value*. The other three groups remained fairly consistent across the pre- and post-assessment. The shift for the *I + ML* group was investigated by exploring one of the preservice teacher's responses to this question in greater depth. Her initial response was:

> I would like to learn about new computer technologies because I can see how that knowledge could be utilized in my future classroom. However, I don't have a strong excitement about learning new computer technologies. I think it can sometimes be very boring.

This response indicated a lack of interest for learning about technology. However, on the post-assessment there was a slight shift. Her response after the *I + ML* treatment was:

> I can see how learning more about computer technologies can help me as a future educator. Technology in the classrooms is only continuing to grow, so I would like to know as much as possible about it. I think I could be interested in learning more about it for teaching.

Both responses expressed a need to know more about technology. However, her first response expressed lack of excitement about technology, which she found boring at times. Her response on the post-assessment does not have the same negative connotation attached. She even describes interest in learning about technology for teaching purposes. There does not seem to be a dramatic change, but a drastic shift could take time based upon one's stance and attitude towards technology.

Comfort Level Connected to Interest

A theme expressed by a quarter of the preservice teachers was that their level of interest was directly connected with their comfort and confidence in using technology (21 responses on both pre- and post-assessments, Table 14). One participant directly linked her lack of a strong interest in technology with the idea that she did not feel comfortable using technology. She expressed that she would be even more interested if she was more competent and not as frustrated to use it. Another preservice teacher responded, "I tend to be pretty bad at learning new technology, so it has never really been that exciting for me." Still another noted, "I am interested in learning more about computers because I am not that competent in this area." For both the pre- and post-responses, these three preservice teachers linked their interest with their confidence in using technology or their frustration in learning new technologies.

The frequency counts for this category did not vary greatly within groups from pre to post or between groups (Table 16). Also, the qualitative responses tended to be similar. A majority of the comments for this category did not change from pre to post. However, at least one response from each experimental group shifted from negative to positive about their confidence or comfort level. One preservice teacher in the *I + ML* group explained on the pre-assessment that she checked "moderately interested" on the prompt "...because I am not confident in my technological abilities." On the post-assessment she checked "strongly interested" because "Seeing that I could make a website gave me more confidence in my technology abilities!" Her interest had been influenced by the fact that she now felt capable and her confidence had increased. This will be explored further in the discussion section.

Interested

Many of the preservice teachers across all four groups expressed an interest in learning more about new technologies for one reason or another (Table 14). Their responses were grouped into subcategories that were present on both the pre- and post-assessments. No new subcategories emerged in the post data. The themes were:

1) To enhance learning or engage students in their future classroom (*Enhance Learning or Engage Students*)
2) In order to prepare students for the new realities they will face (*Help Prepare Students*)

3) The opportunities technology affords for new teaching practices (*Teaching Opportunities*)
4) To keep up with the changing times, or their future students, so they are not at a disadvantage in the classroom (*Keep Up with Times or Students*)
5) To help get a job as a teacher (*Job Utility*)
6) Technology is the future direction, or is already a major part, of our society (*Future Direction or Part of Society*)
7) To make life easier (*Make Life Easier*)
8) For personal use outside of educational settings (*Personally Interested*)

A majority of the reasons centered on the benefit of learning about technology for future purposes as educators (e.g., to enhance learning, teaching opportunities, prepare students, etc.). Only some of these subcategories will be addressed in this section because many overlapped with those given for the second question on *Value* and were articulated in greater detail.

Personally Interested

A few individuals (5 pre and 8 post responses) wanted to learn more about new technologies for personal use or as a hobby, not particularly for their future careers as educators or technology's affordances in the classroom. Interest in digital photography was a common theme. One individual was interested "...in photography and technology because I enjoy photography (my digicam is one of my best friends)." Another expanded upon this line of thought: "Technology is an important part of the 21st century. I am interested in learning about digital cameras, photo editing, and video editing at home. I would use these things to document important/special events in my life and family."

Digital media allow individuals to capture and document occasions in their lives, enabling them to share memories more easily than ever before. As one preservice teacher put it, "I am interested in Photoshop and photography programs. I have a website to display my work. It is important to create media to display and...[share with] a greater audience." For this subcategory, digital photography (and software for digital pictures) was a common reason given for interest.

Job Utility

The responses coded for this theme expressed a strong need to know how to use technology to get a job or specifically for their future careers. Three responses exemplify this subcategory: "I would definitely like to learn about them [new technologies]. I feel that knowing how to use technology is useful and vital to my career," "I would like to know something about them for my future teaching jobs," and "I am interested in them, and feel that a better knowledge and stronger confidence in using certain technologies will be very beneficial, if not necessary as a future teacher." The first two responses were from the pre-assessment, while the last was a post response. It is unclear why the number of responses dropped from pre to post for the *ML Only* and *Control* groups.

Teaching Opportunities

The most popular response in the *Interested* category focused on the opportunities technology affords teachers (e.g., ideas for diversifying instruction and lesson plans, means to create communities for sharing, ways to help them stay organized). The mean across all four groups on the pre- and post-assessment was 5.75 responses. This type of response was very common across the four groups for both pre and post responses (Table

19). Descriptively, there were no major differences in the types of responses given between the groups.

There were different reasons for why the preservice teachers viewed technology as offering opportunities for teaching. One individual noted, "It is a great form of communication of ideas and it allows us [educators] to provide resources for one another and grow in our learning." Another expressed how technology could offer new opportunities for her to expand the curriculum "because I plan on teaching a lot about art and art history, software or technology used for different types of art (graphic design, etc.) would be useful. Foreign language/ESL instruction connected to technology would also be beneficial to me." The *Teaching Opportunities* subcategory reoccurred in the responses given for the second question on *Value* and will be examined in greater depth and further delineated in the *Value of Technology for Educators* section.

Enhance Learning or Engage Students

Many of the preservice teachers noted that their interest in learning more about new technologies stemmed from a need they would face when they reached the classroom. Several noted that students are interested in technology and one way to engage them in learning is to use technology (see Table 14; *Enhance Learning or Engage Students* subcategory). For example, "I am interested in new computer technologies, especially for educational environments because I see them as a powerful tool to spark students interest and utilize different types of learning." Some preservice teachers noted that technology has the ability to enhance learning by accommodating different types of learners. One stated that, "As a special education major, it is important for me to be able to incorporate technology with my students in order to make effective accommodations."

The *ML Only* group had an increase in *Enhance Learning or Engage Students* responses (Table 20). The *Meaningful Lessons* treatment focused on ways to use technology to enhance student learning. This could be a potential explanation for the shift, but the results are unclear because the *I* + *ML* group also received the *Meaningful Lessons* and did not have a similar increase. However, in order to keep the time on task equivalent across all three treatment groups, the *ML Only* group had more time to discuss the lessons than did the *I* + *ML* group. Also, the *ML Only* group had more pre-responses coded for this subcategory (Table 20).

The quality of the responses did not vary substantially between pre and post for the *ML Only* group. However, twice as many responses were coded for this subcategory on the post-assessment. Several individuals from the *I* + *ML* group noted that technology is a way to engage students "…because kids today love computers." Because they are fascinated with technology and "…I want to build on that." Two other individuals noted that technology has the potential to engage students "because it is hands-on" and "kids would enjoy [using technology] and it would be a motivational tool…" because they get to interact with the material. Another preservice teacher stated, "It can assist/help me to engage students in learning, plus they can also use it for assignments. More options for the students is better because then they can do something they are interested in." A similar notion emerged for this subcategory as for *Teaching Opportunities* – technology has the ability to make things more interactive for teaching, learning, or both. Many of the preservice teachers equated interactive teaching with engaging students.

Besides using technology to enhance lessons or engage students, another preservice teacher noted that technology could be used to have students show their understanding as a way to enhance learning: "[To] use technologies in presenting lessons, and for the students showing me they understand the material by allowing more interesting and intriguing ways for them to show it." She claimed that technology allows students to show they understand, but through a medium that is more intriguing to them. This unique emphasis on the benefit for students (i.e., not the teacher) was not expressed in her pre response or by other individuals.

In sum, the focal point for the majority of responses to Question #1, why they were interested in learning about new technologies, focused on ways technology can be used for their future careers (e.g., for teaching opportunities, to enhance learning, to help prepare students, etc.). Thus, many of the reasons coded for the *Interested* subcategories mapped onto reasons given for Question #2, which assessed the value of technology for educators. The preservice teachers expanded upon their line of reasoning for many of these subcategories and articulated their responses in greater depth for the *Value* question.

Value of Technology for Educators

Before exploring the responses and themes for the second question, it is important to note that considerably fewer responses were coded for the post-assessment compared to the pre-assessment. All four groups drastically reduced the length of their responses to Question #2 for the post-assessment. The mean difference for word count from pre to post was $M = 130.3$ (Table 21). Therefore, differences in categories and subcategories for this question are discussed in percentages of pre- and post-responses.

For both the pre- and post-assessment, the vast majority of the responses (99%) indicated that the preservice teachers in all four groups perceived technology as valuable for educators (Table 22). Reasons given varied from making teaching duties easier (e.g., grading) to opportunities to engage students with the curriculum. A few individuals (i.e., 4 pre and 8 post responses) indicated that the value was dependent upon the actual situation. Finally, one preservice teacher expressed that technology was not valuable in any way. The responses from this individual will be explored first.

Not Valuable for Educators

This individual believed that technology was not valuable for educators at any level. On the post-assessment she stated, "I am not sure about the long term validity of technology. I think kids have been doing great without it." This was the only sentiment expressed of this type. It was not surprising, given her response to the first question about whether she was interested in technology: "I have never grown up with technology and I am doing great in school so far with using minimal technology." She had resisted learning about technology at every level throughout the semester and even voiced her opposition to learning more about how to use technology in the classroom. The surprising comment was that this 22-year-old had "never grown up with technology…" nor used it throughout her schooling.

Valuable for Educators

Twelve subcategories emerged for the *Valuable for Educators* category (Table 22) which were later grouped into four clusters by their overarching themes: 1) external reasons for why teachers should value technology (*External Factors*), 2) ways technology can help educators teach (*Teaching Opportunities*), 3) how and why technology could be used for student learning (*Student Learning*), and 4) the value of technology is dependent on the situation and context (*Dependent on the Situation*).

External Factors

This theme accounted for approximately 40% of the responses for both the pre- and post-assessments (see Figures 1 and 2). The first four subcategories (Table 22) demonstrate external factors:

1) Technology is the future direction, or is already a major part, of our society (*Future Direction or Part of Society*)
2) There are expectations for teachers to use technology in the classroom (*Expectations to be used in Schools*)
3) Teachers need to keep up with the times, or with their students, so they do not become disadvantaged in the classroom (*Keep Up with Students or Times*)
4) Teachers need to help prepare students for the technological future they will face (*Need to Prepare Students*)

For the first subcategory, *Future Direction or Part of Society*, approximately 10% of the participants (on both the pre- and post-assessment; see Figures 1 and 2) stated that technology was valuable for educators to know about because of the technological change our society has experienced in the last several decades. As one individual put it, "I think it is valuable because our world revolves around technology." Many expressed that because of our society's reliance on technology and the future projection of technology use, it is more valuable for teachers to know how to use now than ever before. A recurring sentiment was that "technology is a huge part of our everyday lives." Several expressed the outlook that "it is the future" and "its valuable because our world is getting so technologically based." Unlike the one individual that saw no value in technology for educators, many of these individuals expressed that they saw the "…long term validity of technology" based on society's direction and dependence on technology.

With the increased use of technology in our society, the preservice teachers noted that the *Expectation to be used in Schools* has increased. Teachers have to learn how to use technology in order to *Keep Up with Students or the Times*. These two subcategories accounted for approximately another 10% of the pre and post responses when considered together (see Figures 1 and 2). One preservice teacher saw this as a concern, and noted "Younger generations only continue to become more technologically advanced than older generations, this is a problem." This response reinforced the theme that it becomes increasingly more difficult to meet the expectations to use technology in the classroom.

In addition to expectations and keeping up with the changing times, 19% of participants (pre and post) felt technology was valuable for educators because they *Need to Prepare Students* for the future. One noted, "It is something students need to know, so teachers should know how to use it." This was a common response for why technology was valuable for educators to know, reflecting cognizance of the fact that, "there will be many types of technology that [students] will need to use…" in order to be prepared for the future workforce. This is one reason why the expectations for teachers to use technology, according to the preservice teachers, have increased. In sum, the preservice teachers observed that with the direction of our society being reliant on technology, there have been expectations placed on the educational system and teachers to keep up with technological advancements to prepare students for the future.

Teaching Opportunities

There was a focus on technology as being important for educators to know about because of the teaching opportunities it affords. For the second question regarding the value of technology, the preservice teachers greatly expanded upon why they perceived technology as valuable compared to this subcategory for the *Interest* question. Close to a third of the responses for the *Value* question (i.e., 30% and 37%, respectively for pre and post; see Figures 1 and 2) were grouped into the *Teaching Opportunities* cluster. The five general ideas expressed for the *Teaching Opportunities* cluster were:

1) The opportunities technology affords for new teaching practices (*Afford New Ways to Teach*)
2) Technology makes it faster or easier to do things (*Things are made Easier or Faster*)
3) It helps teachers organize things like grades, lesson plans, etc. (*Teacher Organization*)
4) It allows teachers access to information, research, or resources that might not be accessible otherwise (*Access to Information*)
5) In order to communicate with others, specifically other teachers (*Communicate with Others*)

For the first subcategory, *Affords New Ways to Teach*, a typical response centered on how technology changes teachers' practice to be more interactive. One preservice teacher noted, "…it allows for different ways to teach lessons and can be more interactive." A few elaborated upon technology's potential to expand pedagogical practice (e.g., the expansion of assessment methods). As one stated, "Technology offers educators possibilities to explore content (of all types) in new ways, more in depth, and with different types of assessment." However, these types of responses were rare. The first example was more representative of the majority of responses. Also, the second example still did not clearly expand on how technology could be used for assessment purposes.

Another common line of reasoning was that technology can make life easier for teachers to prepare and organize. The two subcategories, *Things are Made Easier or Faster* and *Teacher Organization*, accounted collectively for 6% and 5%, respectively, of pre and post responses (see Figures 1 and 2). A few individuals stated that technology has the potential to make tasks easier or faster for teachers but did not clarify how. Others noted that technologies allow teachers to keep student records (e.g., attendance and grades) and to calculate grades, all within a software program that helps them to stay organized.

Participants also noted that technology has given teachers a way to create and organize lesson plans with greater ease. In particular, the web has allowed educators access to others' ideas to be used as resources for their own lessons because "you can get lots of ideas off of the web [and] it connects lots of teachers to share ideas." As another individual proclaimed, there are "Unlimited resources!" that allow teachers access to others' ideas (e.g., designing lesson plans).

Even though *Access to Information* was a common idea, the percentage of overall responses for this subcategory declined from 17% to 9% from pre to post (see Figures 1 and 2). The decrease was evident across all four groups (Table 24). Descriptively, the quality of responses did not vary from pre to post. A number of responses expressed the ease at which teachers can gain access to ideas, resources, and research. On the pre-assessment, one individual stated, "It's just another resource. It can help you do so many things, help share ideas, research teaching practices and strategies." This was a typical response for this subcategory. Many expressed the idea that technology, particularly the Internet, allows teachers access to a greater amount of information they might not find elsewhere. It's unclear why responses in this subcategory declined in the post-assessment, especially since none of the other subcategories showed a drastic decline or upsurge.

Student Learning

Two subcategories, *Enhance Learning or Engage Students* and *Globalize the Classroom,* centered on using technology with students. When considered together, the two accounted for 18% of the pre and 23% of the post responses (see Figures 1 and 2). A few examples of the pre responses for the *Enhance Learning or Engage Students* subcategory were:

1) "It's a great way to involve students in the curriculum."

2) "It will benefit students."

3) "Children love using computers – keeps them engaged"

4) "Some students may learn better when technology is used. So an educator has to be able to reach every student."

5) "It is also useful to educators in making the classroom more interesting."

6) "[Educators] can also use technology in the classroom to help the students."

A few representative examples of participants' post responses were:

1) "I feel students can take a lot of information away from projects using technology."

2) "...more engaging than lessons without technology."

3) "Technology is another way to engage, involve, and educate students. It is also an option for students who may not be interested in other common educational avenues."

4) "Knowledge is power – and the more we know the better we will be able to incorporate it into the classroom – which will enrichen [*sic*] their lives."

5) "It keeps children engaged and motivated to learn."

6) "It adds an element of excitement for students..."

7) "Greater engagement can be achieved"

As is evident in Table 25, there were no clear differences in the frequencies between the pre and post responses for the four groups. However, the post-assessment responses were slightly more articulated.

The focal point of the second subcategory in this grouping was that technology, specifically the Internet, has the ability to move the classroom beyond its four walls and instantly allows teachers to *Globalize the Classroom*. Only two pre and post responses were coded in this subcategory. However, they went beyond the general and vague responses coded as *Enhancing Learning or Engaging Students*. One response was, "Technology is valuable because it can open your classroom up to other people in the world for the students to learn from." Responses in this subcategory gave examples of how educators might go about enhancing learning with the use of technology instead of just stating that it can enhance learning.

Dependent on the Situation

The last subcategory was coded for only 12 total responses in the pre- and post-assessments (Table 26). Although some of these responses could have been integrated with the *Student Learning* cluster due to their focus on how to use technology to benefit student learning, they focused more on how and when technology is appropriate. The overall percentage of responses coded for this subcategory increased from pre to post (3 to 6 %, respectively; see Figures 1 and 2). As one of the preservice teachers stated, "They [i.e., teachers] should at least be educated, then they can decide whether it will benefit the students or not." Another asserted that technology "...allows for more diverse material, but it depends on how it is used." It should be noted that the two groups that had an increase in frequency for this theme received the *Meaningful Lessons* treatment.

In sum, there were a number of overlaps between the categorical themes coded for the *Interest* and *Value* questions. Although participants described multiple reasons for why they were interested in technology or thought it was valuable for educators, the majority reported the affordances of technology for teaching and learning (e.g., to enhance learning, teaching opportunities, prepare students, etc.). Almost all of the preservice teachers (99%) thought technology was valuable for educators and a number of them were interested to learn more about technology's affordances for teaching and learning.

DISCUSSION

The purpose of this study was to investigate whether situational factors (e.g., student involvement and meaningfulness of a task) could be used to nurture personal interest and perceived competence. I hypothesized that situational interest would be the greatest for the *I + ML* group because it received both portions of the intervention (Table 10). Based on the question of whether certain situational factors (i.e., involvement and meaningfulness) increase students' personal interest and perceived competence, I hypothesized that the development of personal interest would be greater for the groups that received the *Meaningful Lessons* (*I + ML* and *I Only*). For perceived competence, I expected an increase for the groups that created websites (*Involvement* groups – *I + ML* and *I Only*). For the open-ended questions, I examined reasons given by the preservice teachers in response to the *Interest* and *Value* questions, but had no preconceived expectations about what might be expressed.

Development of Interest

There has been speculation about what type of situational factors (e.g., student involvement, computers, meaningfulness, etc.) generate interest (Bergin, 1999; Harackiewicz *et al.*, 2000, Hidi & Renninger, 2006; Mitchell, 1993). Hidi and Renninger (2006) have theorized that a learner's interest has the potential to develop from a triggered situational interest, to a maintained situational interest, to an emerging personal interest, and finally developing into a well-developed personal interest if the interest is sustained. For this study, two factors were manipulated for the intervention – the level of student involvement and the meaningfulness of the information presented – to investigate whether they could stimulate and maintain situational interest and possibly nurture an "emerging" personal interest. The findings supported my hypotheses that situational factors can be used to induce and nurture interest.

Situational Interest

Certain situational factors have been identified in the interest literature as having the ability to hold individuals' interest while in a learning environment (e.g., student involvement and meaningfulness of the task; Bergin, 1999; Harackiewicz *et al.*, 2000, Hidi & Renninger, 2006; Mitchell, 1993). When both portions of the intervention – *Involvement* and *Meaningful Lessons* – were presented together in the *I + ML* group, this resulted in the highest rating on the Situational Interest Measure. The *Involvement* plus *Meaningful Lessons* treatment was deemed significantly more interesting than the treatments provided to the other two groups (*I + ML > I Only*, $p < 0.001$ and *I + ML > ML Only*, $p = 0.007$; Table 27). Moderate to large effect sizes were observed for the differences between the *I + ML* group and both the *ML Only* and *I Only* groups ($d = 0.72$ and $d = 1.52$, respectively).

The preservice teachers in the *Meaningful Lessons* treatment (*ML Only* group) reported greater interest than those in the *Involvement* treatment (*I Only* group). Even though the difference was not significantly ($p = .07$; Table 27), the effect size was moderate ($d = 0.59$). This suggests that the *Meaningful Lessons* treatment was effective, but there might not have been enough power to detect a significant difference (i.e., a possible Type II error). The small sample size may have contributed to this finding.

The results from the Situational Interest Measure (Appendix E) supported my hypothesis that including both portions of the intervention – *Involvement* and *Meaningful Lessons* – together (*I + ML* group), would be the most effective for generating situational interest. Therefore, the type of instructional task had the potential to stimulate situational interest.

Personal Interest

The next step was to examine whether situational interest was maintained (i.e., by involvement and meaningfulness) to allow for an "emerging" personal interest to develop. The findings supported my hypothesis that personal interest has a greater potential to develop when the meaning of what will be learned is explicitly made known to the learner. The groups that received the *Meaningful Lessons* (*I + ML* and *ML Only*) had the greatest increase on the Personal Interest Measure. A significant difference ($p < 0.001$) was found in favor of the groups that received the *Meaningful Lessons* (*I + ML* and *ML Only*) compared to those that did not (*I Only* and *Control*), with a moderate effect size ($d = 0.70$). Follow-up analyses confirmed that the *Meaningful Lessons* treatment (*I + ML* and *ML Only*) increased personal interest. That is, a significant difference was found when comparing *I + ML* and *ML Only* groups to the *I Only* group ($p = 0.003$; $d = 0.68$). Also, when the *ML Only* group was compared solely to the *I Only* group, a significant difference was found with a moderate effect ($p = 0.009$; $d = 0.63$). Therefore, no matter how the groups were compared, the *Meaningful Lessons* treatment was significantly more effective for nurturing personal interest.

The data from the technology vignettes supported the previous findings on personal interest. A significant difference was found ($p = 0.03$) favoring the groups that received the *Meaningful Lessons* (*I +ML* and *ML Only*), with a small to moderate effect ($d = 0.44$). The technology vignettes were never mentioned during the intervention, which was not designed to increase participants' willingness to read more about the technology vignettes. However, willingness to engage or reengage with a topic has been identified as a characteristic of personal interest (Krapp, 2002). The results support the previous findings that the *Meaningful Lessons* treatment was more effective for nurturing personal interest.

Lawless and Kulikowich (2006) found that when an individual starts to understand the connection between a domain and his or her professional goals or practice, the individual's personal interest for the content and the procedures of the domain tends to increase. For this study, the purpose of the *Meaningful Lessons* was to help preservice teachers connect why and how they might use technology, and more specifically websites and the Internet, in their future classrooms. This could partially explain why the *Meaningful Lessons* treatment was more effective than the *Involvement* treatment for nurturing personal interest. This implies that the meaningfulness of a task should be explicitly connected to the task as one way to nurture personal interest. In sum, the *Meaningful Lessons* played a greater role in the nurturance of interest compared to the *Involvement* treatment.

Development of Perceived Competence

The main intent of this study was to explore the development of interest, but based on the instructional tasks presented in the intervention, I anticipated the potential for perceived competence to develop as well. Therefore, I examined whether perceived competence developed as a secondary outcome of the treatment conditions. I expected the type of instruction to have the potential to nurture perceived competence even though the direct goal of the intervention was interest development.

The *Involvement* treatment was operationalized as having preservice teachers create a website for their professional development during the intervention. I hypothesized that the groups that received the *Involvement* treatment (*I + ML* and *I Only*) would have an increase in perceived competence compared to those that did not (*ML Only* and *Control*), since they had the opportunity to create a website and hone their technological abilities. A significant difference ($p = 0.001$) was found in favor of the groups that received the *Involvement* treatment (*I + ML* and *I Only*), with a moderate effect ($d = 0.61$). Even when the *Control* group was removed for a follow-up analysis, a similar finding was found when comparing the *I + ML* and *I Only* groups to the *ML Only* group ($p = 0.02$, $d = 0.46$).

For the two experimental groups, *ML Only* and *I Only*, I hypothesized that the *I Only* group would have a greater increase in perceived competence compared to the *ML Only* group. No difference was found between the *I Only* and *ML Only* groups for perceived competence ($p = 0.25$, $d = 0.23$). Even though student involvement has been identified as a potential "hold" feature (Mitchell, 1993; Bergin, 1999), it needs to be taken into account that just "doing" something might not be enough by itself. There is a need for instructional tasks to be both hands-on <u>and</u> minds-on (Bergin, 1999; Brophy, 2004). Even though creating a website for their professional portfolio was meaningful in its own right, elaborating on the purpose and applicability of technology made a difference.

Students tend to report being more interested in and having higher levels of motivation for learning challenging tasks (Csikszentmihalyi, 1988; Zahorik, 1996). When the task is viewed as beyond their ability, or out of their zone of proximal development (Vygotsky, 1978), students tend to be less motivated to learn (Csikszentmihalyi, 1988; Turner, Meyer, Cox, et al., 1998). Even though the material was scaffolded for the *Involvement* lessons and specific strategies were given for developing their websites, students may have felt overwhelmed by the task. As Silvia (2003) found, perceived task difficulty and perceived competence influence situational interest, which tends to increase as the task difficultly increases (until a threshold is reached).

Some individuals in the *Involvement* groups were frustrated with the assignment because of their perceived technological limitations. This connection between perceived competence and interest was expressed by a number of preservice teachers in response to the open-ended *Interest* question. This could have potentially explained why the *I Only* group had the lowest score on the Situational Interest Measure. The task difficulty for creating a website was not evaluated in this study and probably should have been, to assess whether the difficulty of the task moved past the threshold of the preservice teachers' perceived competence. Even though the task might have been perceived as too difficult, participants in the *Involvement* groups, which created websites, had an increase in perceived competence. Without knowing how difficult the preservice teachers perceived the task to be, it is impossible to predict what influence task difficulty had on the development of interest or perceived competence.

Open-ended Responses

For the qualitative portion of the study, there were two focal points – to investigate preservice teachers' 1) interest in learning about new technologies and 2) perceived value of technology for educators. The qualitative questions were meant to gain insight about their perceptions and reasons in response to these two questions.

Interest in Learning New Technologies

One of the more fascinating reasons given for the open-ended *Interest* question focused on the connection between interest in technology and comfort level using it. A quarter of the preservice teachers on the pre- and post-assessment responded that their interest in learning about new technology centered on their confidence or comfort level (Tables 14 and 16). Even though the *Interest* question never asked about their confidence or perceived ability to use technology, the question asked them to explain why they were or were not interested in learning about new technologies. This connection between their level of confidence and interest was a recurrent and commonly expressed response across all four groups, both before and after the intervention. This finding corroborated the correlational relationship found between the Personal Interest and Perceived Competence Measures (Table 4).

At least one response from each experimental group shifted from negative to positive about their confidence or comfort level from pre to post. One of the preservice teachers in the *I + ML* group responded that her low level of interest was tied to her lack of confidence with using technology since creating a website. Her response on the post-assessment indicated that her increased interest level had been affected by her increased confidence in her ability to create a website. It is unclear in the motivational literature which develops first, interest or perceived competence, and how they influence each other. I expect that the relationship is similar to that between personal interest and knowledge – there is a cyclical relationship. However, for this preservice teacher the increase in her perceived competence seemed to have influenced her interest to learn more about technology.

A number of the preservice teachers (11 pre and 6 post) stated that they were interested in learning about technology only because they saw it as valuable (Table 15). Task value has been speculated as the rationale for why someone might be interested in a domain or topic. The reasons given by these preservice teachers is utility value (Eccles and Wigfield, 2002), which has been defined as the value a task has for achieving a goal (e.g., getting an "A," finding a job teaching, etc.). Many of the preservice teachers may have perceived technology as having utility value based on the task utility expressed in the larger educational community.

The majority of responses for the *Interest* question focused on the affordances of technology for teaching and learning (e.g., to enhance learning, teaching opportunities, prepare students, etc.). The *Interested* category had a number of these subcategories based on the high frequency of responses (Table 14). The greatest number of responses was coded for the *Teaching Opportunities* subcategory (23 pre- and post-responses). Responses for the *Teaching Opportunities* subcategory were articulated in greater detail for the open-ended *Value* question which illuminated the overlap in the preservice teachers' reasoning.

Another important finding was that the number of responses coded for *Enhance Learning or Engage Students* doubled from pre to post (from 4 to 8 responses) for the *ML Only* group (Table 20). It was encouraging that one-third of the *ML Only* group gave this response on the post-assessment. One of the goals of the *Meaningful Lessons* was to help preservice teachers make a connection to the importance of technology integration for student use. The most sophisticated post responses for this subcategory noted how technology allows students options to express themselves and affords teachers more opportunities for formative assessment. From my perspective, it is beneficial for preservice teachers to understand that integrating technology should be more than having computers in the classroom or using PowerPoint for lessons. Having preservice teachers come to the realization that technology can be used to *Enhance Learning or Engage Students*, possibly by individualizing instruction or by using students' interest in technology to motivate them, is progress towards understanding how to use technology's affordances.

Value of Technology for Educators

The overlap of responses for the *Interest* and *Value* questions indicated that the preservice teachers had started to identify themselves as educators already. Many phrased their responses to the *Value* question in terms of "I" or "me." For example, two responded: "I think it is valuable because technology is going to be a major part of upcoming students' lives. I want to be a good role model for them so they get multiple education[al] opportunities." and "…to teach our students." This could potentially explain the similarities between the two categorical systems and the overlap of subcategories that emerged from the *Interest* and *Value* questions.

The majority of responses (99%) for the *Value* question indicated that the preservice teachers perceived technology as valuable for educators. These responses were coded into twelve subcategories and further clustered into four groupings based on the type of reason: 1) *External Factors*, 2) *Teaching Opportunities*, 3) *Student Learning*, and 4) *Dependent on the Situation.*

For the subcategories in the *External Factors* cluster, the responses focused on external pressures educators are faced with for why they should value or use technology. A number of the preservice teachers realized that with our society's increased reliance on technology, expectations placed on the educational system to prepare students for the future have been escalating.

For the two most commonly coded clusters, *Teaching Opportunities* and *Student Learning*, a number of the preservice teachers responded that the value of technology lies with its affordances for teachers and students. The most common perception was that technology is another tool or resource that can expand the type of teaching or learning that takes place in the classroom. Zhao (2007) identified three categories of responses for the use of technology integration when she explored middle- and high-school social studies teachers' perspectives: 1) Effiency-oriented, 2) Enhancement-oriented, and 3) "Relaxation" or "win-win." The subcategories for the *Teaching Opportunities* and *Student Learning* clusters (see Table 22 for a breakdown of subcategories under these clusters) were similar to Zhao's (2007) first two categories. For example, two of the subcategories in the *Teaching Opportunities* cluster were, 1) technology helps teachers stay organized and 2) it makes things easier or faster. Like Zhao's social studies teachers, these preservice teachers realized that technology can be used by educators to be more efficient. In addition, a number of subcategories fit into the enhancement-oriented classification. For example, a number of the preservice teachers noted that technology *Affords New Ways to Teach* (15 pre and 18 post) and allows for teachers to *Enhance Learning or Engage Students* (24 pre and 27 post).

One of the trends for the qualitative data was that the *Meaningful Lessons* groups (*I + ML* and *ML Only*) demonstrated an increase for the subcategory *Dependent on the Situation* (i.e., from 1 pre-response to 5 post-responses). The term, "it depends," was not directly mentioned during the intervention, but was alluded to throughout the *Meaningful Lessons* treatment (e.g., technology integration should depend on the teacher's curricular goals for the lesson and there are times when technology might not fit with the goal). Even the slight increase from pre to post was encouraging because the number of post responses represented 11% of the 47 participants in these two groups.

Teacher educators need to inform preservice teachers about appropriate ways to integrate technology to meet curricular goals, to make the use of technology within a classroom more meaningful. As Mishra and Koehler (2003) noted, it is important to understand how technology, content, and pedagogy are interconnected. To find the optimal use of technology, knowledge of all three is needed. Therefore, getting preservice teachers to understand that the value of technology is *Dependent on the Situation* is a first step.

Implications for Teacher Education

The focus of this study was to explore factors that could be used to stimulate and maintain situational interest in order to encourage the development of personal interest. One way to engage learners is to use their personal interest that already exists (Bergin, 1999). This was not the focus of this study; yet, a common response coded for the *Personally Interested* subcategory mentioned digital photography an area of interest. Research has shown that when learners have opportunities to pursue tasks that interest them, they are more motivated to work towards their goals (Flowerday, Schraw, &

Stevens, 2004). In TE courses, if preservice teachers are taught how to use digital photography and integrate it with curricular goals and for assessment purposes, it could be a way to introduce and model technology integration.

Bergin (1999) has discussed how using students' personal interest can increase what they take away from a lesson. The idea of preservice teachers learning about technology integration is no different. However, more research is needed to determine if digital photography can be used as a way to get preservice teachers thinking about technology integration. Exposure to technology and technology integration strategies is needed in TE courses to foster interest (or at the very least, appreciation) and perceived competence. More research is needed on the development of preservice teachers' identification as educators, their instrumental value of technology, and their perceived competence with using technology for educational purposes.

Study Limitations

This study was conducted as a field experiment using a Non-Equivalent Group Design (NEGD), conducted with intact classrooms. Although field experiments allow researchers the opportunity to examine participants in their natural environment, there are disadvantages to their use. The preservice teachers were self-selected to their course section, not randomly assigned. However, they were not aware of the technology intervention when they registered. It is assumed that the technology intervention played no role in course selection, which could have been based on a number of other reasons (e.g., preference for an instructor, their peers' course selection, etc.). Another extraneous factor was that the groups had different instructors. The types of classroom interactions, physical classrooms, and different classroom meeting times might have also influenced the findings. Many of these extraneous variables come with conducting a field experiment and are part of working within a real classroom setting. Even with the drawbacks of conducting a field experiment, few studies have explored interest in this type of setting.

To manage some of the extraneous factors, there were several ways I tried to control for group variability. First, I taught all of the technology lessons for the three experimental groups, to control for instructor variability with the technology lessons. Second, all three of the science-methods instructors (one instructor taught two sections, accounting for all four sections) agreed on the proposed intervention schedule; thus, tasks were happening at the same time during the semester. Third, students' perceptions of their instructors' (science and social studies) investment and competence with technology were assessed. Along with these precautions, appropriate covariates (initial levels on the Personal Interest and Perceived Competence Measures) were also used from the pre-assessments to account for group non-equivalence. Appropriate adjustments for measurement error from the pre-assessments were assessed based on standards for the NEGD design. Even with all of these precautions, there could have been extraneous variables unaccounted for that could have influenced the findings.

Another extraneous variable that may have influenced the preservice teachers' responses was the nature of the subtasks for the experimental groups. Even though the total time for the intervention was held constant, time on subtasks differed. For example, the *I + ML* group received both portions of the intervention, so they had less in-class time to work on their websites compared to the *I Only* group. Likewise, the *I + ML* group received the same lessons as the *ML Only* group, but they did not have the time to discuss the lessons in class like the *ML Only* group.

Another limitation of the study pertained to the administration of the Situational Interest Measure with the three experimental groups. I would have preferred to administer this measure after each intervention session, but due to time constraints this was not possible. With limited time for the lessons, it was critical not to overwhelm the preservice teachers with new information from the lessons and the completion of the Situational Interest Measure in every session. If they felt rushed and pressured to take the Situational Interest Measure after every session, it is likely that their frustrations would have been discernible in their responses. For these reasons, it was more appropriate to collect the Situational Interest Measure at the end of the intervention to assess the "interestingness" of the entire intervention instead of the "interestingness" of each session. There is the possibility that the Situational Interest Measure only assessed the "interestingness" of the last intervention session because of when it was administered.

Another important aspect that needs to be accounted for was the sample (i.e., elementary education majors). The demographics for this population have been shown largely to be white, early 20's, middle-class, and female. The sample for this study was no exception. These characteristics need to be considered when focusing on interest development with technology and technology integration strategies. For example, research has identified more negative attitudes towards technology for females compared to males (Barron, 2004; Badagliacco, 1990; Busch, 1995). Therefore, sample demographics need to be taken into account when discussing the generalization of the results. That being said, elementary teachers are still predominantly female, and these results likely generalize to the majority of elementary teachers in training.

Future Research

The findings illustrate that personal interest can be nurtured. A more thorough investigation as to how and why personal interest develops is needed. For example, longitudinal research on interest development will aid our understanding of whether an emerging interest ends up developing further or dissipates. It is important to understand the motivational forces at work if a personal interest develops further. Also, more research is needed on exploring whether an "emerging" personal interest can stimulate similar interests for other topics that an individual might not have explored previously.

Conclusion

There has been a long-standing assumption in education that the design of learning environment or instructional task can influence students' willingness to engage with the content, activity, or task. The question is how to create learning environments or instructional tasks that create more than short-lived attention and interest. This study aimed to address the lack of attention given the design of instructional practices within the context of students' motivational outcomes.

It can be concluded that certain situational factors influence the development of students' personal interest and perceived competence. The results suggest that directly talking about reasons why a lesson is meaningful has the greatest influence on stimulating and maintaining situational interest and nurturing an "emerging" personal interest. The findings also suggest that having students work in a hands-on environment has the potential to increase perceived competence. When the two situational factors (involvement and meaningfulness) are presented together, there is an effect that tends to influence both interest and perceived competence to a greater extent (e.g., the *I + ML* group). If an educator has to decide between the two situational factors, these findings suggest that educators explicitly and clearly express the meaningfulness of the task to the learner.

Table 1.

Learning tasks based on group assignment.

Groups	**Instructor**	**Technology Assignment and/or Lesson**	**Variable**
Lesson Group	1	Meaningful Lessons Collect online resources	*ML Only*
Website Group	2	Design website	*I Only*
Website + Lesson	2	Design website Meaningful Lessons	*I + ML*
Control Group	3	No assignment, No Lesson Collect online resources	*Control*

Note. Group assignment for the three experimental groups was randomly assigned.

Table 2.

Data Collection and Lesson Schedule.

Week:	***I + ML* Group**	***I Only* Group**	***ML Only* Group**	**Control Group**
1st Week	Consent **Pre-Assessment**	Consent **Pre-Assessment**	Consent **Pre-Assessment**	Consent **Pre-Assessment**
2nd Week	First Technology Lesson First Website Session	First Website Session	First Technology Lesson	
3rd Week	Second Technology Lesson Second Website Session	Second Website Session	Second Technology Lesson	
4th Week				
5th Week [a]	Third Website Session	Third Website Session	Start of Web Design Principles from – First Website Session	
6th Week				
7th Week	Third Technology Lesson Fourth Website Session	Fourth Website Session	Third Technology Lesson	
8th Week	**Post-Assessment**	**Post-Assessment**	**Post-Assessment**	**Post-Assessment**

[a] This was only a 45 minute session, the rest were approximately one hour time periods

Table 3.

Pre-Assessment scores for Personal Interest (PI) and Perceived Competence (PC).

Groups	PI		PC		N
	Mean	SD	Mean	SD	
I + ML	72.98	15.31	46.20	11.51	20
I Only	68.08	11.17	42.68	8.34	25
ML Only	70.19	11.86	41.37	11.71	27
Control	69.50	12.64	41.64	12.27	21
Total	70.06	12.59	42.82	10.97	93

Table 4.

Correlation Coefficients for the Pre- and Post-Assessments (N = 93).

Variables	Pre PI	Pre PC	Post PI	Post PC
Pre Personal Interest (PI)	1	.40**	.44**	.69**
Pre Perceived Competence (PC)		1	.45**	.71**
Post Personal Interest (PI)			1	.59**
Post Perceived Competence (PC)				1

** significant at the 0.001 level

Table 5.

Post-Assessment scores for Personal Interest (PI) and Perceived Competence (PC).

Groups	PI		PC		N
	Mean	SD	Mean	SD	
I + ML	77.2	14.2	54.3	12.3	20
I Only	66.4	10.5	47.1	8.9	25
ML Only	74.0	12.5	44.0	13.5	27
Control	65.4	14.2	41.2	10.9	21
Total	70.7	13.5	46.4	12.3	93

Table 6.

Between-Condition ANCOVAs for Personal Interest (PI) and Perceived Competence (PC)

Source	DV	SS	MS	df	F	p-value
Intercept	Post PI	673.52	673.52	1	8.560	.004
	Post PC	76.67	76.67	1	1.214	.274
Pre PI [a]	Post PI	4733.41	4733.41	1	60.157	.000*
	Post PC	377.38	377.38	1	5.975	.017*
Pre PC [a]	Post PI	545.57	545.57	1	6.934	.010*
	Post PC	4063.20	4063.20	1	64.332	.000*
Condition	Post PI	1305.04	435.01	3	5.529	.002**
	Post PC	973.19	324.40	3	5.136	.003**
Error	Post PI	6845.58	78.69	87		
	Post PC	5494.89	63.16	87		

Note. This table represents the two between-condition univariate ANCOVAs that were conducted for Personal Interest and Perceived Competence.

[a] covariates

* significant covariates

** significance between conditions

Table 7.

Analyses for Personal Interest (PI) Comparisons.

	Comparisons				Contrast estimate	t-test	p-value
	A priori						
	I + ML	*I Only*	*ML Only*	*Control*			
1)	1	1	1	-3	18.094	2.730	0.008
2)	-2	1	1	0	-7.196	-1.520	0.132
3)	1	-1	1	-1	15.085	4.042	0.000
	Post Hoc						
4)	1	-2	1	0	13.581	3.059	0.003
5)	0	1	-1	0	6.655	2.690	0.009

Table 8.

Analyses for Perceived Competence (PC) Comparisons.

	Comparisons				Contrast estimate	t-test	p-value
	A priori						
	I + ML	*I Only*	*ML Only*	*Control*			
1)	1	1	1	-3	17.683	2.978	0.004
2)	2	-1	-1	0	10.515	2.479	0.015
3)	1	1	-1	-1	11.969	3.570	0.001
4)	0	-1	1	0	2.570	1.159	0.249
	Post Hoc						
5)	1	1	-2	0	9.113	2.330	0.022

Table 9.

Pre- and Post-Scores for the Technology Vignettes.

	TV 1		TV 2		TV 3		TV Total	
Groups	Pre	Post	Pre	Post	Pre	Post	Pre	Post
I + ML	7.00	7.30	6.85	7.25	7.65	8.55	21.25	23.10
	(2.08)	(1.89)	(1.98)	(1.80)	(1.87)	(1.39)	(5.30)	(4.05)
I Only	7.08	7.16	6.28	7.00	8.24	7.92	21.60	22.08
	(2.14)	(1.99)	(2.11)	(1.78)	(1.33)	(1.68)	(3.77)	(4.50)
ML Only	7.59	7.70	7.07	8.18	7.81	8.41	22.48	24.30
	(1.31)	(1.46)	(1.80)	(1.39)	(1.47)	(1.62)	(3.47)	(3.48)
Control	6.90	7.19	6.76	6.67	7.76	7.76	21.42	21.61
	(1.84)	(1.72)	(2.28)	(2.08)	(1.30)	(1.51)	(3.88)	(4.26)
Total	7.17	7.35	6.74	7.32	7.88	8.16	21.74	22.83
	(1.84)	(1.75)	(2.03)	(1.82)	(1.49)	(1.58)	(4.05)	(4.14)

Note. Mean scores are presented for each group for each of the three technology vignettes (standard deviations below). The total column represents the pre- and post-aggregated scores for each group that were used for analyses.

Table 10.

Groups by Treatment Conditions.

Treatments (types of instruction)		
No Instruction	One type of Instruction	Two types of instruction
Control	*I only or ML only*	*I + ML*

Table 11.

Situational Interest Measure Assessment Scores.

Groups	Mean	SD	N
I + ML	79.22	4.87	18
I Only	69.75	7.36	24[a]
ML Only	74.36	8.18	25[a]
Total	74.01	7.96	67

[a] one outlier removed from each group

Table 12.

Pre- and Post-Means for the Interest Question Prompt.

	Pre		Post	
Groups	*M*	*SD*	*M*	*SD*
I + ML	4.90	1.25	5.10	0.97
I Only	4.76	0.77	4.52	0.59
ML Only	4.96	0.81	5.04	1.02
Control	4.95	0.86	4.67	0.80
Total	4.89	0.91	4.83	0.88

Note. This question was on a six-point scale.

Table 13.

Pre and Post Means for the Value Question Prompt.

	Pre		Post	
Groups	*M*	*SD*	*M*	*SD*
I + ML	4.95	0.22	4.90	0.31
I Only	4.96	0.20	4.72	0.54
ML Only	4.85	0.46	4.74	0.59
Control	4.71	0.46	4.57	0.60
Total	4.87	0.37	4.73	0.53

Note. This question was on a five-point scale.

Table 14.

Categories and Subcategories for Open-ended Interest Question.

Codes	Pre	Post
Not at all Interested	2	3
Interested Only for the Value	11	6
Comfort Level Connected to Interest	21	21
Interested	97	90
Enhance Learning or Engage Students	9	12
Help Prepare Students	11	5
Teaching Opportunities	23	23
Keep Up with Times or Students	13	18
Job Utility	8	4
Future Direction or Part of Society	23	16
Make Life Easier	5	4
Personally Interested	5	8

Note. The codes for this question had four categories. The fourth category, *Interested*, was broken down into eight subcategories based on the high frequency of responses.

Table 15.

Interest Question - Interested Only for the Value Category.

Groups	Pre	Post
I + ML	5	1
I Only	2	2
ML Only	1	1
Control	3	2
Total	11	6

Table 16.

Interest Question - Relationship between Comfort Level and Interest Category.

Groups	Pre	Post
I + ML	7	6
I Only	4	3
ML Only	5	6
Control	5	6
Total	21	21

Table 17.

Interest Question - Personally Interested Subcategory.

Groups	Pre	Post
I + ML	1	2
I Only	1	2
ML Only	0	1
Control	3	3
Total	5	8

Note. This was one of the subcategories for the *Interested* category.

Table 18.

Interest Question - Job Utility Subcategory.

Groups	Pre	Post
I + ML	1	2
I Only	1	1
ML Only	3	1
Control	3	0
Total	8	4

Note. This was one of the subcategories for the *Interested* category.

Table 19.

Interest Question - Teaching Opportunities Subcategory.

Groups	Pre	Post
I + ML	6	5
I Only	6	6
ML Only	7	7
Control	4	5
Total	23	23

Note. This was one of the subcategories for the *Interested* category.

Table 20.

Interest Question - Enhance Learning or Engage Students Subcategory.

Groups	Pre	Post
I + ML	1	1
I Only	3	2
ML Only	4	8
Control	1	1
Total	9	12

Note. This was one of the subcategories for the *Interested* category.

Table 21.

Value Question - Word Count Difference between Pre- and Post-Assessments.

Groups	Pre	Post	Difference	N
I + ML	475	365	110	20
I Only	582	487	95	25
ML Only	759	575	184	27
Control	573	441	132	21
Average	597	467	130	

Note. The average number of words given for each group in response to the *Value* question on the pre- and post-assessment.

Table 22.

Categories and Subcategories for Open-ended Value Question.

Codes	Pre	Post
Not Valuable	1	1
Valuable		
External Factors		
Future Direction or Part of Society	16	15
Expectations to be used in Schools	3	4
Keep Up with Students or Times	14	8
Need to Prepare Students	29	24
Teaching Opportunities		
Affords New Ways to Teach	15	18
Things are Made Easier or Faster	5	4
Teacher Organization	4	2
Access to Information	26	12
Communicate with Others	6	2
Student Learning		
Enhance Learning or Engage Students	24	27
Globalize the Classroom	2	2
Dependent on the Situation		
It Depends	4	8
Total Responses	**150**	**126**

Note. With the number of subcategories for the *Valuable* category, clusters were grouped together after coding the subcategories.

Table 23.

Value Question - Affords New Ways to Teach Subcategory.

Groups	Pre	Post
I + ML	1	5
I Only	6	4
ML Only	5	6
Control	3	3
Total	15	18

Note. This was one of the subcategories for the *Valuable* category in the *Teaching Opportunities* cluster.

Table 24.

Value Question - Access to Information Subcategory.

Groups	Pre	Post
I + ML	7	2
I Only	7	4
ML Only	8	5
Control	4	1
Total	26	12

Note. This was one of the subcategories for the *Valuable* category in the *Teaching Opportunities* cluster.

Table 25.

Value Question - To Enhance Learning or Engage Students Subcategory.

Groups	Pre	Post
I + ML	6	4
I Only	5	7
ML Only	8	10
Control	5	6
Total	24	27

Note. This was one of the subcategories for the *Valuable* category in the *Student Learning* cluster.

Table 26.

Value Question - It Depends Subcategory.

Groups	Pre	Post
I + ML	0	2
I Only	2	2
ML Only	1	3
Control	1	1
Total	4	8

Note. This was one of the subcategories for the *Valuable* category in the *Dependent on Situation* cluster.

Table 27.

Group Differences for Situational Interest Measure.

Group	Mean	SD	N	Group Differences	p value	Cohen's d
I + ML	79.22	4.87	18	*I + ML > I Only*	< .001**	1.52
				I + ML > ML Only	.007**	0.72
ML Only	74.36	8.18	25[a]	*ML Only > I Only*	.07	0.59
I Only	69.75	7.36	24[a]			
Total	74.01	7.96	67			

[a] indicates that one outlier has been removed from each group
** significant at the 0.01 level

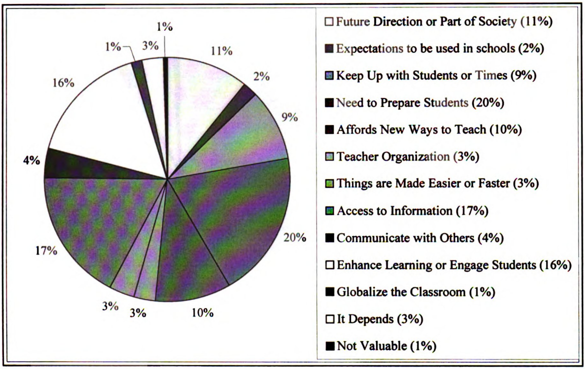

Figure 1. *Pre-Responses for Technology's Value for Educators.*

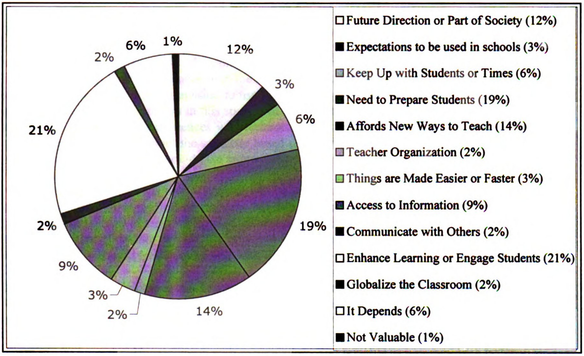

Figure 2. *Post-Responses for Technology's Value for Educators.*

Appendix A - Participant Consent Form

This study investigates students' interest, knowledge and experiences with technology and technology integration in teacher education (TE) courses. Throughout the semester you will be participating in technology assignments in your TE course. The surveys for this study will be used to gather information about your experiences with the topics covered in your course. Your participation in the study will consist of giving permission to use your responses to the surveys and to any technology assignments. Your participation in this study will help further the understanding of preservice teachers' knowledge and experiences with technology and technology integration. The survey will be given several times throughout the semester based on when your instructor has technology assignments scheduled and should take approximately 20 minutes to complete.

Your responses to questions on the surveys will be kept confidential and your name will be removed and replaced with an identification number. All data will be treated with strict confidence and your name will not be used in any reporting of the research findings. Your privacy will be protected to the maximum extent allowable by law. If you would want to know the results of the study (within these restrictions) you should leave your name with us.

Your decision to participate or not in the research will have no effect on your grade or any future recommendation your instructor may make. Your instructor will *not* have access to your individual responses from the surveys or the research data.

There are no known risks associated with participating. The benefits to you may be a better understanding of your interests, knowledge and competence with technology and technology integration in educational environments. To be eligible for the raffle of the Apple iShuffle at the end of the semester, you will need to complete the three technology surveys throughout the semester. Participation is voluntary; you have complete freedom to discontinue the surveys at any time without penalty. You have the freedom to not respond to certain items. If at any point you feel any discomfort with the materials or questions please do not hesitate to stop.

If you have any questions about this study feel free to contact:

Michael Phillips	or	Jere Brophy
(517) 355-0262		(517) 353-6470
phill345@msu.edu		jereb@msu.edu

If you have questions or concerns regarding your rights as a study participant, or are dissatisfied at any time with any aspect of this study, you may contact – anonymously, if you wish –

Peter Vasilenko, Ph.D.
Director of Human Research Protections
202 Olds Hall, Michigan State University, East Lansing, MI 48824-1047
(517)355-2180, fax (517)432-4503, e-mail: irb@msu.edu

Your signature below indicates your voluntary agreement to participate in this study.

Name: (printed) ____________________________________

Signature____________________________Date: ___________________

IRB #X06-730 has been deemed exempt.

Appendix B - Perceived Competence Measure

Instructions: Please read the questions carefully and circle the degree to which the following statements are true of you or not. Use the following scale:

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

COMPUTER AND TECHNOLOGY USE:

1) Other people come to me for advice when they have questions about technology and computers.	1	2	3	4	5
2) I am able to learn how to use new technologies rather quickly.	1	2	3	4	5
3) I consider myself to be a highly skilled computer user.	1	2	3	4	5
4) Compared to my peers, I am extremely skillful at using technology.	1	2	3	4	5
5) Thinking about learning a new technology (e.g., a new software, photo editing, digital camera, etc.), it is likely I could teach myself how to efficiently use it.	1	2	3	4	5
6) Compared to most other topics, technology is easy for me to learn.	1	2	3	4	5

WEBSITE DESIGN AND DEVELOPMENT:

7) Compared to learning other technologies, creating a website is easy for me.	1	2	3	4	5
8) I am confident in my ability to develop and publish a website.	1	2	3	4	5
9) I am capable of learning about the technologies needed for the web assignment in this course.	1	2	3	4	5

TECHNOLOGY IN MY FUTURE CLASSROOM:

10) I am confident I will be able to integrate technology in my future classroom.	1	2	3	4	5
11) I am well prepared to use technology in the classroom.	1	2	3	4	5
12) I feel confident in designing activities where my future students would use technologies to complete assignments.	1	2	3	4	5

FUTURE STUDENTS:

13) I am confident in my ability to teach my future students how to create websites.	1	2	3	4	5
14) Assuming I will have computers available to me, I feel confident that I could have my future students creating websites for assignments in my classroom.	1	2	3	4	5
15) In my future classroom, I could create an assignment incorporating website development with my curricular goals.	1	2	3	4	5
16) I am well prepared to use web design in my future classroom.	1	2	3	4	5

Appendix C - Personal Interest Measure

Please list a few of your interests and hobbies:

____

Instructions: Please read the questions carefully and circle the number that corresponds to the degree to which you disagree or agree with the following statements. Use the following scale:

1	2	3	4	5	6
Strongly Disagree	Moderately Disagree	Somewhat Disagree	Somewhat Agree	Moderately Agree	Strongly Agree

1) Compared to other topics, I find technology to be exciting.	1	2	3	4	5	6
2) Being good at solving technological problems is important to me.	1	2	3	4	5	6
3) I prefer *not* to learn about technology if I have a choice.	1	2	3	4	5	6
4) Being able to create a website will be a skill that will help me get a good job.	1	2	3	4	5	6
5) I enjoy using technology for course assignments (e.g., producing a video, creating a website, making a multimedia product, etc.).	1	2	3	4	5	6
6) Learning about website design and development is valuable to me.	1	2	3	4	5	6
7) Technology is interesting to learn about.	1	2	3	4	5	6
8) Learning about computers and technology is enjoyable.	1	2	3	4	5	6
9) I would be interested in attending a workshop on advanced features of web design.	1	2	3	4	5	6
10) I do *not* enjoy doing assignments that require the use of technology.	1	2	3	4	5	6
11) I would be interested in learning more about website development on my own.	1	2	3	4	5	6
12) Learning about computers is worthwhile.	1	2	3	4	5	6
13) I am interested in learning about website design.	1	2	3	4	5	6
14) I enjoy learning about new ways of using technology in educational settings.	1	2	3	4	5	6
15) I am interested in learning how to have my future students develop websites.	1	2	3	4	5	6
16) I would be willing to take a course on how to create and use web design for teaching.	1	2	3	4	5	6

Instructions: Please read the questions carefully and if you need more room for your responses, please turn the page over, number the response on the back, and finish answering the question.

1) I am interested in learning about new computer technologies.

☐	☐	☐	☐	☐	☐
Strongly Disagree	Moderately Disagree	Somewhat Disagree	Somewhat Agree	Moderately Agree	Strongly Agree

1a) Please explain w*hy* or *why not*?

____

____

____

____

____

____

2) How **valuable** is technology for educators?

☐	☐	☐	☐	☐
Not at all valuable	Not valuable	Undecided	Somewhat valuable	Very valuable

2a) Please explain why you think technology is or is not valuable for educators. If you are undecided, please explain why.

____

____

____

____

____

Appendix D - Technology Vignettes

On a scale from 0 – 10, please rate how interested you are in reading more about the following excerpts by circling the corresponding number below.

Excerpt 1: Student-to-Student Multimedia

Students at Montgomery Middle School created short interactive programs using computer graphics and animation for students at the nearby elementary school. The middle-school students began by reading nursery rhymes used in the elementary classes, then chose one to create a storyboard to plan his or her multimedia project. Using Macromedia Director, a software program used to create multimedia, the middle school students then adapted the nursery rhymes and turned them into simple interactive programs that allowed the kindergartners and first-graders to interact with the stories. The middle-school class evaluated their creations using a rubric they developed, burned them onto a CD-ROM and as a final evaluation of their projects shared them with the grade-school students.

0 1 2 3 4 5 6 7 8 9 10

Not at all Interested — Extremely Interested

Excerpt 2: Web Mastering Portfolio Project

Mrs. Christopher has used portfolios to help her fourth-grade students evaluate their progress throughout the year. For this project, students gather web pages and images they have created during the year into a portfolio site to showcase their work. Not only does this project help the students put their work into perspective, it also gives them the experience of building a large website that is important to them. Since the site must have a consistent look, some of their early work must be revised. The site must have an introduction page where the students introduce themselves and explain the purpose of their portfolio site. Before a final grade is given, students do peer evaluations using the rubric for this assignment. In the final week of class, students give portfolio presentations while Mrs. Christopher evaluates the sites using the rubric.

0 1 2 3 4 5 6 7 8 9 10

Not at all Interested — Extremely Interested

Excerpt 3: Documenting the Life Cycle

Second-graders at Lincoln Elementary worked in groups to plant seeds for their science experiment to track the growth and development of a plant's life cycle. In order to have students track the growth cycle, Mrs. Smith had them take digital photos and make notes each day (e.g., notes on height, amount of water used, etc.) of their plant's progress. The students then uploaded their photos to www.flickr.com (a digital picture hosting site with blog capabilities) which allowed them to make notes on their photos, along with track, share, and compare their data with other groups in their class. Once the plants had been cross-pollinated and seeds harvested, Mrs. Smith had the groups share their experience with the rest of the class and compare their data.

0 1 2 3 4 5 6 7 8 9 10

Not at all Interested — Extremely Interested

Appendix E – Situational Interest Measure

Instructions: When you answer these questions, **think about the technology sessions** you have had over the last six weeks. Please read the questions carefully and circle the number that corresponds to the degree to which you disagree or agree with the following statements. Use the following scale:

1	2	3	4	5	6
Strongly Disagree	Moderately Disagree	Somewhat Disagree	Somewhat Agree	Moderately Agree	Strongly Agree

1) I enjoyed what we learned from the technology sessions.	1	2	3	4	5	6
2) To be honest, I didn't find the technology sessions very interesting.	1	2	3	4	5	6
3) I would like to share the information I received from these sessions with others.	1	2	3	4	5	6
4) The technology sessions helped me think about ideas for how to integrate technology in my future classroom.	1	2	3	4	5	6
5) The material covered in the technology sessions grabbed my attention.	1	2	3	4	5	6
6) The information from the technology sessions was all new to me.	1	2	3	4	5	6
7) The technology sessions gave me really strong ideas for how I plan to get my students creating products using technology.	1	2	3	4	5	6
8) These sessions were useful for my pedagogical development (to help me use websites and technology with my teaching).	1	2	3	4	5	6
9) I found the technology sessions to be very relevant for me.	1	2	3	4	5	6
10) The technology sessions were rather boring.	1	2	3	4	5	6
11) I found the sessions to be engaging and interactive.	1	2	3	4	5	6
12) The technology sessions gave me ideas for how I might use technology with my future students.	1	2	3	4	5	6
13) What we learned in the technology sessions is important for me to know.	1	2	3	4	5	6
14) I found these sessions to be meaningful to me.	1	2	3	4	5	6
15) The information I learned from the technology sessions will never be used.	1	2	3	4	5	6

Appendix F - Instructor Investment and Competence Measure

Instructions: Please read the questions carefully and circle the degree to which you agree or disagree with the following statements about your instructors. Use the following scale:

1	2	3	4	5	6
Strongly Disagree	Moderately Disagree	Somewhat Disagree	Somewhat Agree	Moderately Agree	Strongly Agree

1) My **science**-methods instructor is highly invested in using technology.	1	2	3	4	5	6
2) My **social studies**-methods instructor is highly invested in using technology.	1	2	3	4	5	6
3) My **science**-methods instructor is extremely competent using technology.	1	2	3	4	5	6
4) My **social studies**-methods instructor is extremely competent using technology.	1	2	3	4	5	6

Appendix G - Demographics

Name:______________________________

Age: __________

Gender:____________

Year in school: __________________

Academic Major and Minor: __________________________________

Cumulative Grade Point Average (College): ___________________________

Favorite School Subject: ______________________________

Favorite Science Topic (e.g., Physics, Biology, etc.):__________________________________

Have you taken a course on web design or technology?

- ❑ No
- ❑ Yes

If yes, which one?:_______________________

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