Pre-Service Teachers: A Study of Self-Theories of Intelligence and Attitudes about Web 2.0

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PRE-SERVICE TEACHERS: A STUDY OF SELF-THEORIES OF INTELLIGENCE AND ATTITUDES ABOUT WEB 2.0

A Dissertation
Presented to
The Faculty of the Educational Leadership Doctoral Program
Western Kentucky University
Bowling Green, Kentucky

In Partial Fulfillment
Of the Requirements for the Degree
Doctor of Education

By
Lee Ann Smith

December 2014
DATE RECOMMENDED: 10-26-14

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Dean, Graduate Studies and Research 10-26-14
Tammi, 我非常尖刻但是又十分令人鼓舞的妻子, Kate 和 Carter Jonesmith, 我们的儿子
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It is unrealistic to thank or recognize all the individuals or entities that have provided assistance directly or indirectly to me during this journey. So, I will recognize the paid sponsors. The list includes: My committee (Dr. Martha Day, Dr. Janet Applin, and Dr. Jie Zhang); Dr. Jay Fiene; Dr. Randy Capps; The Vanguard Cohort (Group Alpha, Group Omega, and Group that refuses to be grouped); friends, colleagues, and mentors with kind listening ears and words of encouragement; the translators; the shrinks; WKU; WKU Doctoral Educational Leadership team; and WKU SKyTeach folks. I also acknowledge family members (past and present) who instilled in me a respect for learning.
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This study examined the relationship of pre-service teachers’ self-theories of intelligence (mindset) and their attitudes about Web 2.0. The research questions evaluate:

(a) Whether a significant correlation exists between pre-service teachers’ mindsets and attitudes about Web 2.0 (social media), and

(b) Whether significant differences exist between demographic groups (e.g., age, certification area, gender) and their attitudes about Web 2.0 (social media).

Results of the study indicate that a weak correlation between pre-service teachers’ perceived mindsets and perceived attitudes about Web 2.0 was statistically significant. In addition, significant differences were found based upon certification area, gender, and age with the sample’s attitudes about Web 2.0 tools.

Future research might include the manipulation of pre-service teachers’ mindsets to measure the affect on their attitudes toward Web 2.0. Analysis of pre-service teachers’ mindsets and attitudes about Web 2.0 on a more comprehensive scale (state or national), as opposed to regional, will provide greater insights into the affect of mindsets on attitudes about Web 2.0, particularly within specific demographics due to increasing the sample size. One possible outcome of this study is that pre-service teacher programs might better prepare their graduates to utilize Web 2.0 technologies by manipulating pre-service teachers’ fixed mindsets toward growth mindsets. Ultimately, students will benefit, as utilizing Web 2.0 skills is a necessity for the 21st century (Wagner, 2008).
CHAPTER I: INTRODUCTION

Are some teachers like dinosaurs? Millions of years ago, atmospheric disruptions led to the extinction of almost all dinosaur species. The animals that survived the global impact of an asteroid or a comet colliding with the Earth were able to adapt; the dinosaurs, however, did not readily transition to the dramatically changing environment. Teachers today face less dramatic changes, but their environment also is evolving.

Successful teachers in the 21st century recognize the need to adapt. A decade ago, Web 2.0 (i.e., social media) was like the asteroid that impacted life on Earth — it changed the social environment. With the introduction of social media, the educational environment has fundamentally transformed; and teachers must adapt or, as the dinosaurs, fail to thrive.

In order to understand the strategies used by teachers who successfully adapt to the impact of Web 2.0, a distinction is drawn between teachers who participate in both schooling and learning environments. A schooling environment uses the “factory model”; it organizes and governs schools by levels (e.g., classroom, school, district) and combines “instructional, curricular, assessment, and behavioral standards into a comprehensive package of practices and expectations” (Collins & Halverson, 2009, p. 32). In the early days of the factory model (early 20th century), successful students were those prepared to perform repetitive jobs that required little thinking. Educators considered themselves successful if they produced graduates who could understand and follow directions in a work environment (Leland & Kasten, 2002). The schooling or factory model met the needs of the industrial age society - to produce workers for factories. Today, though individuals no longer live in the industrial age, the schooling
model still dominates. The language of the factory can be heard in discussions of performance expectations, rates of success, effectiveness of teachers, standardized test outcomes, and standards-based learning (Leland & Kasten, 2002). Yet, the schooling or factory model, with its roots in the industrial age, might not be the most appropriate model for the information age.

In the schooling environment, teachers essentially become quality control managers. Analoui (1995) proposed acknowledging the managerial responsibilities of teachers and suggested that teachers adopt the strategies of successful business managers. In the *schooling* model that dominates current educational systems, the teacher essentially manages students’ performances in terms of educational outcomes as determined by the state or national standards.

Unlike the factory model, which prepares students for industrial jobs, the *learning* (or inquiry) model conditions learners to work in an information/technology-rich environment (Leland & Kasten, 2002). While the schooling model features “uniformity, didacticism, and teacher control,” the learning model emphasizes “customization, interaction, and user-control” (Collins & Halverson, 2009, p. 4). In the learning model, teachers guide students as they “construct” knowledge; thus, the role of the *learning* teacher is more closely aligned with that of a coach or facilitator rather than manager.

Fisher and Frey (2010) contended that the learning model allows teachers to develop students’ minds by focusing on the functions of social media (e.g., communicating, networking, producing, sharing) rather than on the tools themselves (e.g., Hangouts, Facebook, Prezi, YouTube). For example, communicating is a function that might be demonstrated using text messaging, Twitter, or Skype. In the inquiry
model, comprehending how to learn and to analyze sources of information is becoming the most important goal of education (Dede, 2010). Rather than specific content, the focus in the inquiry model is more on “soft” skills such as problem solving and communication across different media, cultural awareness, and assessing information sources. The U.S. Department of Labor (1992) and Wagner (2008) identified these soft skills competencies as essential for 21st century learners.

DuFour and DuFour (2010) stated that becoming an inquiry model teacher involves collaborating with peers, defining the skills to be fostered in students, and seeking out the best strategies for that skill development. In the inquiry model, teachers are facilitators and co-learners with students; learning is individualized, and both parties can share in authentic, meaningful dialogue about the learning process. Fisher and Frey (2010) explained that, once they switched from being classroom managers to being “inquiry” teachers, they were “no longer stressed about this [technology tools]; we’re excited to learn alongside students as they teach us tools and we help them understand functions” (p. 240).

What type of teachers will survive and thrive in the post-Web 2.0 educational environments? Will teachers who participate in the learning (inquiry) model have a greater chance of survival than those in the schooling (factory) model? Dyer, Gregersen, and Christensen (2009) reported on five discovery skills (questioning, observing, experimenting, networking, and associating) that distinguish the most innovative individuals from others. In an interview with Fryer (2009), Gregersen explained the means by which the schooling model extinguishes the natural curiosity of learners, as students learn that “teachers value the right answer more than provocative questions”
The learning model encourages teachers to adapt procedures to changing technological conditions; teachers and students learn in an atmosphere that encourages inquisitiveness and experimentation. The schooling model rewards those who “manage” successfully, which usually means following established procedures and rules. The learning model characterizes a “growth” mindset; the schooling model resembles a “fixed” mindset.

**Mindsets**

The mindset (fixed or growth) of a person influences how the individual approaches challenges, changes, and even failures. Dweck (2006) described how the same event affects a fixed mindset and a growth mindset individual differently. Those who believe in a growth mindset are more open to learning, energized by challenges, determined, and resilient (Dweck, 2008b). Blackwell, Trzesniewski, and Dweck (2007) maintained that those who maintain a growth mindset perform better than those who maintain a fixed mindset when challenged in mathematics. The main purpose of this research is to investigate whether pre-service teachers’ mindsets correlate with the acceptance of Web 2.0 technologies or social media.

**Web 2.0: A Concept and a Technology**

Reacting to the introduction of Web 2.0 and how people interact online, *TIME* magazine named “You” as person of the year (Grossman, 2006). Web 2.0 Internet experiences are potentially interactive; Web 1.0 Internet experiences were not. With Web 2.0, users upload data, make comments, and offer personal contributions to an increasingly connected global community (Crook, 2008). With Web 1.0, users could view and perhaps download information. Schwartz (2006) wrote that Web 2.0 focuses on
“content creation, management, and dissemination” by participants (para. 2). Grossman (2006) described the possibility of a transforming power shift “from the few” to the millions of users who each bring a small contribution that can shape and “change the way the world changes” using online applications (para. 3).

For example, an individual reading an article on the National Public Radio (NPR) website is given some participation options. By clicking a link, the reader could share the article with others using email, Facebook, etc. The user can post a comment on the article, send questions to the author, and respond to comments by other readers.

Essentially, Web 2.0 is social media; it allows active rather than passive online participation. Social media tools readily applicable to education include social bookmarking (e.g., Diigo, Pinterest); microblogging (e.g., Twitter, Tumblr); and video-conferencing (e.g., Hangouts, Facetime). The key concept of Web 2.0 or social media is the empowerment of the users. During the political upheavals in the Arab Spring and Ukraine, citizens used Twitter and Facebook to organize and to communicate events to the world (Satell, 2014; Wolman, 2013). Learners can be empowered through Web 2.0 to change from “classroom spectators to vital participants, content creators, and empowered adults” (King, 2009, p. 55). For example, middle school science students in northern Kentucky communicate with scientists in the field using Skype. During these sessions, students practice interpreting data and submitting questions to the scientists. After these sessions, some will continue to research topics such as volcanology or climate change.

The following paragraph defines Web 2.0 as a technology.

Research literature abounds with definitions of Web 2.0. O’Reilly (2007) explained that the concept of Web 2.0 is nebulous, without hard boundaries. O’Reilly
(2007) and Myhill, Shoebridge, and Snook (2009) suggested that a Web 2.0 application or tool needs to contain some or all of the following components:

- permitting user control over unique, hard-to-recreate data sources that get richer as more people use and contribute to it
- trusting users as co-developers
- harnessing collective intelligence of the masses
- leveraging the collective power of small sites through customer self-service
- software that works on multiple devices
- encouraging lightweight user interfaces, development models, and business models (p. 229).

Constantinides and Fountain (2008) defined Web 2.0 as:

A collection of open-source, interactive and user-controlled online applications expanding the experiences, knowledge and market power of the users as participants in business and social processes. Web 2.0 applications support the creation of informal users’ networks facilitating the flow of ideas and knowledge by allowing the efficient generation, dissemination, sharing and editing/refining of informational content. (p. 231)

Downes (2005) described Web 2.0 in a practical manner for educators: it allows users to create, share, remix, and/or repurpose content. As all of these definitions imply, Web 2.0 is both a concept and a technology; its unique characteristics, particularly in contrast to Web 1.0, are useful for advancing collaborative, student-centered learning.
Problem Statement

One of the problems faced by pre-service teacher education programs is to effectively prepare future teachers to use and to integrate technology for student-centered learning. Brush, Glazewski, and Hew (2008) suggested that teacher education programs might be a contributing factor in technology integration by teachers. Historically, researchers in technology acceptance have attempted to determine factors (e.g., attitude toward technology, effort expectancy, intention to use) that influence users’ acceptance of technologies with a variety of models/theories (e.g., TAM, theory of planned behavior, unified theory of acceptance and use of technology) (Teo, 2013). Although valuable and insightful, technology acceptance research does not address the mindsets of users. Dweck (2000) has demonstrated that the mindsets (a continuum from fixed to growth) of individuals affect their abilities, talents, and ultimately their successes.

A gap appears to exist in the research and scholarship relating to pre-service teachers’ mindsets and perceptions about technology acceptance. A lack of correlational studies exists that examine Web 2.0 in educational settings. Although extensive research has been conducted on mindsets (Blackwell, Trzesniewski, & Dweck, 2007; Good, Aronson, & Inzlicht, 2003; Grant & Dweck, 2003) and technology acceptance (Lee, Kozar, & Larsen, 2003; Ma, Andersson, & Streith, 2005; Teo, Luan, & Sing, 2008), no single study has been found that addresses whether pre-service teachers’ mindsets affect their attitudes about Web 2.0 technologies. This study attempts to discover whether a correlation exists using perceived mindsets and perceived attitudes about technology in pre-service teachers.

The Significance of the Study section explains the means by which individuals
adopt technologies such as Web 2.0 applications. The National and International Standards section highlights the breakdown between the standards and the actions occurring within educational systems. As summarized in the Pre-Service Teacher-Education Program section, researchers have published a considerable amount of literature about attitudes, technology barriers, and technology proficiency with respect to technology integration by educators. These studies tend to focus on teachers’ perceptions. No research has been found that analyzes the problem of technology acceptance by using psychology and information systems theory. Pre-service teacher programs might better prepare future teachers to integrate Web 2.0 technologies using a psychological rather than a technological approach. For example, encouraging a “social media” growth mindset in pre-service teachers might be more effective than requiring a semester-long technology course for the integration of Web 2.0 in their future students’ educational experiences.

**Significance of the Study**

Around the turn of the century, a global shift occurred as cultures moved from the *industrial* revolution to the *information* or *knowledge* revolution (Friedman, 2005). The term “Web 2.0” communicates a change in the ways in which users and developers related to the World Wide Web (O’Reilly, 2005). The new means by which individuals interacted with the World Wide Web was one of the principal factors in the explosion of the information revolution (Maddux, 2008).

Rogers’ (2003) *innovation adoption life cycle* categorizes one’s use of technology along a range from “innovator” to “laggard.” The example of wearable technologies (e.g., Google Glass or Samsung’s Galaxy Gear) can demonstrate the characteristics in each of
the five categories proposed by Rogers. The innovators and the early adopters are willing to use the new technology, even though they know flaws exist. The innovators (2.5%) are those who love being on the cutting edge; the early adopters (13.5%) make their decisions based upon data from the innovators. The innovators and early adopters are those who stand in line for hours to purchase a new technology, rather than waiting a few days and buying one in minutes. For a technology to diffuse among a population, it must be accepted by the “early majority” segment (Fig. 1).

Once the technology reaches the early majority group, it begins to be perceived as customary. The early majority (34%) generally makes decisions based on input from the early adopters. The late majority (34%) will purchase Google Glass or Galaxy Gear when they perceive a social or economic benefit; their primary concern is to maintain status. The laggards (16%) tend to be traditional and suspicious of technology, or they are the “outsiders” not easily influenced by social norms. Teachers working within educational
systems can sometimes be laggards about integrating Web 2.0 into student-centered learning opportunities, which this researcher questions.

Current technologies profoundly affect how people acquire skills and information. Collins and Halverson (2009) contrasted the learning technologies of the *industrial age* (uniform, didactic, teacher-centered) and the *information age* (customized, interactive, student-centered). Skills for the information age include accessing and analyzing information, critical thinking, problem-solving skills, collaboration across virtual networks, and curiosity and imagination (Kay, 2010; Wagner, 2008). The technologies commonly used by most students (smart phones, computers, and on-line networks) influence how they “…produce, consume, communicate, and think” (Collins & Halverson, 2009). Most students live in a Web 2.0 world, with the exception of their formal education. Often when they enter the schools, the students return to the past, to the industrial age philosophies and practices of education (Wallis, 2006). The next sections, National and International Standards and Pre-service Teacher Education Programs, suggest possible reasons that many schools are best categorized as “laggards” using Rogers’ (2003) model.

**National and International Technology Standards**

The National Education Technology Standards (NETS) (n.d.) stated that teachers should demonstrate competency in digital-age learning, student learning, and digital citizenship. The International Society for Technology in Education (ISTE), which created the NET Standards, strives to help teachers integrate technology into classroom instruction. In the “Top Ten in ’10: ISTE’s Education Technology Priorities for 2010,” the organization states, “…the use of technology in teaching and learning is non-negotiable
if we are to make real and lasting change [in education].”¹ The Partnership for 21st Century Skills (P21)², a national organization, advocates “21st century readiness skills” for all students. P21 defines these skills as the fusing of reading, writing, and arithmetic with critical thinking and problem solving, communication, collaboration, and creativity/innovation.

These two organizations charge teachers to examine and enhance their practices to promote innovation through critical thinking, problem solving, collaboration, and technology integration, while building on content and background knowledge. However, despite the emergence of international and national technology standards, beginning teachers are not always able to apply new technologies to enhance student learning (Kumar & Vigil, 2011). Lei (2009) illustrated that pre-service teachers “lacked the experience and expertise in using Web 2.0 technologies with great potential for classroom application” (p. 87). Kumar and Vigil (2011) reported “a large gap between Web 2.0 use in [pre-service teachers] daily lives and coursework” (p.144).

Although the ISTE and P21 organizations attempt to improve student learning using Web 2.0 technologies, they have little, if any, influence on pre-service teacher education programs or individual school systems. For example, the Western Kentucky University (WKU) pre-service teacher education program is not accountable to either organization. In terms of preparing teachers, the WKU program is accountable to accreditation programs such as the Council for the Accreditation of Educator Preparation

(CAEP) and Kentucky’s Education Professional Standards Board (EPSB), and the requirement to meet the “technology standards” does not specifically include Web 2.0 tools. In the CAEP Standards (2013), education preparation programs are called on to “keep up with research, and those preparing educators should model best practices in digital learning and technology applications” (p. 22). As educational institutions tend to focus on what can be measured and quantified for accreditation purposes, competency with Web 2.0 tools, which is difficult to measure, is unlikely to become a priority for the university.

The mastery of Web 2.0 tools also is a non-priority in many public school systems in Kentucky. The Kentucky Department of Education (KDE) was contacted to inquire about technology standards for students in the state, and the Department responded that the standard to be reached by students in order to graduate is “open to interpretation” by the school system. For example, to meet the current established technology standard, School A might require students to use multiple Web 2.0 tools to create, edit, and publish content; at School B, students might be required only to make a PowerPoint.

Even with the addition of Kentucky Core Academic Standards and the Professional Growth and Effective System (PGES), the role of Web 2.0 technologies is vague at best. In the Kentucky Core Academic Standards for English Language Arts Standards, the technology-related standard states, “[Students] use technology, including the Internet, to produce and publish writing and to interact and collaborate with others” (KDE, 2011a). The standard is written in a manner in which students can interact and collaborate with others in their classroom (face to face) or with others across the country using Web 2.0 technologies. Both of the previous scenarios meet the standard. In the
Kentucky Core Academic Standards for Algebra 2, the use of technology is to solve “complicated” problems (KDE, 2011b). In essence, the implementation of technology means that students should learn how to use a graphing calculator. PGES, the new teacher evaluation system in Kentucky, encourages teachers to use technology (Danielson, 2014). In short, the state has no measurable technology standard for its students.

Pre-service teacher education programs across the nation are similar to school systems in Kentucky — without uniform technology standards (Krueger, Hansen, & Smaldino, 2000; Laffey, 2004; Pope, Hare, & Howard, 2005). If pre-service teacher education programs do not hold participants accountable for learning Web 2.0 tools, they will have little motivation to implement those technologies in the classroom. Unless the integration of technology becomes required for certification, it will most likely not be deliberately or thoughtfully addressed on a program level. The next section describes the impact of pre-service teacher education programs on future teachers with respect to technology.

Pre-Service Teacher Education Programs

The experiences of many pre-service teachers in their educational programs do not prepare them appropriately for the realities of today’s classrooms. As Levine (2006) reported, “…teacher education programs cling to an outdated, historically flawed vision of teacher education that is at odds with a society remade by economic, demographic, technological, and global change” (p. 1). Current education programs in the U.S. for pre-service teachers do not usually include a planned, deliberate focus on integrating technology in coursework (Koc & Bakir, 2010). In order to prepare aspiring teachers and their future students for a technology integrated world, pre-service teacher programs must
Research pertaining to pre-service teachers and technology tends to focus on attitudes, technology barriers, and technology proficiencies. Smith and Dobson (2011) argued that the inclusion of 21st century skills for future teachers is an essential reality in a quality teacher educator program. Thompson (2007) asserted that higher education institutions must understand students and their behaviors [with respect to Web 2.0 technologies]. Zhao, Zhang, and Vance (2013) demonstrated that “beliefs about intelligence can be successfully intervened” (p. 170); the authors suggested that, to improve students’ motivation to learn, classroom instructors should identify students’ mindsets and educate them on how to improve or modify their intelligences. For example, if students learn to accept feedback as a way to improve, they can positively change their intelligences (Zhao et al., 2013). If a positive correlation exists between a “growth” mindset and attitudes about Web 2.0, teacher training programs might change to better meet the needs of future teachers. Teacher education programs might systematically integrate Web 2.0 technologies throughout the curriculum, highlighting the connection between pedagogy and content, for all learners along the mindset spectrum. The following section reviews research pertaining to mindset and technology acceptance — foundational concepts of survey instruments used in the project.

**Research on Mindset and Technology Acceptance**

The mindset (i.e., self-theories of intelligence) and the technology acceptance model (TAM) survey instruments are used together in this research project. The juxtaposition might reveal new or unnoticed insights about future teachers’ attitudes about technology. A discussion of the mindset and technology acceptance models
follows.

Murphy and Thomas (2008) described how the work of psychologist Carol Dweck and her colleagues support two means through which individuals view intelligence — static *(fixed mindset)* or malleable *(growth mindset)*. Individuals with a *fixed mindset* think that their intelligence is an inborn trait; they believe in a finite amount of intelligence (Dweck, 2010). Lee (2009) described a *fixed-mindset* person as one who acts as if one has the “ability to learn just so much and no more” (p. 45). Heslin and VandeWalle (2008) explained that persons with a *growth mindset* believe their intelligence can change over time, “particularly when they devote a concerted effort to learn and apply more effective strategies” (p. 219). Thus, those with a *growth mindset* take on difficult tasks because these tasks provide them with an opportunity to improve and learn — to become more intelligent (Lee, 2009). Mangels, Butterfield, Lamb, Good, and Dweck (2006) explained that the likelihood of a person’s success depends upon one’s actual ability and *mindset*. An individual’s mindset influences the ability to rebound from failures (Mangels et al., 2006). Individuals exhibiting a fixed mindset perceive failure as an indictment on their intelligence. Another person exhibiting a growth mindset perceives the failure as an opportunity to improve.

The “technology acceptance model” (TAM) has been popular for over two decades to show users’ acceptance and usage of technology (Liu, 2010). Venkatesh and Bala (2008) reported “substantial empirical support in favor of TAM” (p. 275) and that it “consistently explains about 40% of the variance in individuals’ intention to use an information technology and actual usage” (p. 276). Teo, Luan, and Sing (2008) explained how the TAM postulates that the behavioral intentions of the users determine actual
technology acceptance. They also stated that “behavioral intentions are in turn influenced by the users’ attitude toward technology” (Teo, Laun, & Sing, 2008, p. 266).

Does the pre-service teacher’s self-theory of intelligence correlate with attitudes toward Web 2.0 technologies? Dweck’s research on the self-theories of intelligence indicates that individuals think intelligence is “fixed” or “malleable” (Dweck & Leggett, 1988). For those who believe intelligence is a fixed trait, the quality of intelligence does not alter. For example, one who claims to “never get computers to work” might have a fixed mindset. “Malleable” mindset individuals believe that intelligence can develop with effort and guidance. Someone demonstrating such a “growth” mindset exerts effort to master new skills and believes that intelligence can increase. When faced with a technological challenge, the growth mindset person states, “Given enough time, I can figure it out.”

If attributing failure to a lack of ability becomes a pattern, the mindset can be seen as learned helplessness, i.e., believing one is incapable of accomplishing tasks and lacks control over the environment (Eggen & Kauchak, 2010). Firmin, Hwang, Copella, and Clark (2004) describe the components of learned helplessness as:

- Contingency — the uncontrollability of the situation
- Cognition — the beliefs people make regarding the situation or environment
- Behavior — allows individuals to give up or proceed with the task. (p. 688)

Seifert (2004) stated:

Learned helplessness is characterized by unwillingness on the part of the student to engage in tasks because he or she believes that effort is futile and failure is imminent. The student believes that the outcomes are beyond
his or her control, and, regardless of one’s actions, the outcome is the same. Helpless students tend to make internal, stable, uncontrollable attributions for failure but tend to make external attributions for success. They blame themselves for failure but do not take credit for success. They experience much shame and humiliation, boredom and hopelessness. (p. 146)

Students with learned helplessness often suffer from anxiety and depression and exhibit low self-esteem (Graham & Weiner, 1996). Fortunately, learners can change.

An early study by Dweck (1975), often called “classic” and “pioneering,” demonstrated success in increasing student persistence through explicit encouragement about the learning process. Students in Dweck’s study also showed improved attitudes about their own abilities to learn based on the strategies they were given (Eggen & Kauchak, 2010; Robertson, 2000). Additional research corroborates Dweck’s findings (Schunk, 1995; Schunk & Zimmerman, 2007).

Self-theories of intelligence are measured using the “Theories of Intelligence Scale — Self Form For Adults” (Dweck, 2000). Participants agree or disagree with statements such as “Your intelligence is something that you can’t change very much,” and “You can learn new things but you can’t really change your basic intelligence” (Dweck, 2000, p. 21). Differences in mindsets influence preference for performance or learning goals (Dweck & Leggett, 1988); problem-solving strategies (Bandura & Dweck, 1981, as cited in Dweck, 2000; Leggett, 1985, as cited in Dweck, 2000); persistence in the face of failure (Bergen, 1991); and pursuit of remedial help (Hong, Chiu, Dweck, Lin, & Wan, 1999). In essence, the manner in which learners think about intelligence affects
their actions.

Much research on educational technology focuses on the preparation and attitude of pre-service teachers. Researchers report that teachers in training perceive they need a combination of technical and pedagogical learning (Benson, Farnsworth, Bahr, Lewis, & Shaha, 2004; Koc & Bakir, 2010). The thoughts about technology of the pre-service teachers play a significant role in whether those teachers later brought technology into their classrooms (Teo, 2010a, 2010b; Park, 2009; Liu, 2010).

The “Technology Acceptance Model” (TAM) is a theoretical model that predicts how a user accepts and uses technology (Holden & Rada, 2011). Initially, the TAM indicated that individuals’ behavioral intentions to use technology were determined by two beliefs: *perceived usefulness* and *perceived ease of use* (Holden & Rada, 2011).

“TAM has evolved over time... to explain *perceived usefulness* and *usage intentions* including [sic] social influence (subjective norm, voluntariness, and image), cognitive instrumental processes (job relevance, output quality, and result demonstrability) and experience” (Park, 2009, p. 152). Variations of the TAM have described users’ attitudes in different ways: online learning portals (Drennan, Pisarski, & Kennedy, 2005); [teachers’] self-efficacy (Holden & Rada, 2011); educational wikis (Liu, 2010); Web-enhanced course (Pan, Sivo, & Brophy, 2003); e-learning (Park, 2009); course management system (Sivo, Pan, & Hahs-Vaughn, 2007); and [pre-service teachers’] computer use (Teo, 2010b). Teo (2010a) reported that the TAM “is an appropriate model for use as a theoretical framework in research set in an educational context” (p. 67).

**The Present Study**

The purpose of this study is to investigate whether the “mindset” and “TAM”
instruments provide information on pre-service teachers and their attitudes about technology, and to determine whether a correlation exists between the two instruments. It is assumed that the instruments will remain reliable and valid when used together. By implementing an innovative approach that combines psychology and information systems, different solutions to address the integration of technology by teachers and a correlation are expected to result from the data. It should be noted that the pre-service teacher’s K-12 experiences will potentially affect the results of the study. For example, if a pre-service teacher experienced a technology-diverse environment during the K-12 years, the educator could score relatively high on the attitudes about technology, in spite of having a demonstrably fixed mindset; i.e., the experience of using education technology might have a greater effect on attitude than the mindset of the student.

**Research Questions**

(1) Does a relationship exist between pre-service teachers’ self-theories of intelligence (e.g., fixed or growth mindsets) and attitudes about Web 2.0?

(2) Do attitudes about Web 2.0 vary for different demographic groups (e.g., age, certification area, gender)?

**Definition of Key Terms**

**21st century readiness skills**: A holistic view of 21st century teaching and learning that combines a discrete focus on 21st century student outcomes. The students’ outcomes are a blend of “learning and innovation skills” (e.g., critical thinking, communication, collaboration, and creativity); “information, media, and technology skills”; and “life and career skills” (Partnership for 21st Century Skills, 2012).
**Digital immigrants**: The generations that were not born in the environment of ubiquitous digital technologies (e.g., computer games, email, the Internet, smartphones, instant messaging). Characteristics include printing out e-mails or articles, the need to print out a document to edit it (rather than just editing on the screen), and physically showing others an interesting Web site (rather than just sending them the URL) (Prensky, 2001).

**Digital natives**: The generations that were born and mature in the environment of ubiquitous digital technologies; Characteristics include parallel processing and multi-tasking, preference of graphics rather than text, use of hypertext, continually networked, thrive on instant gratification, and choose gaming over “serious” work (Prensky, 2001).

**Fixed intelligence, fixed mindset or entity theory**: Intelligence is interpreted as a fixed trait within a person that cannot be changed (Dweck, 2000).

**Malleable intelligence, growth mindset, or incremental theory**: Intelligence is interpreted as a trait that can be cultivated through learning and increased through one’s efforts (Dweck, 2000).

**Perceived ease of use**: A TAM construct measuring the degree to which a person believes that using a technology will be free of effort (Venkatesh & Bala, 2008).

**Perceived usefulness**: A TAM construct measuring the extent to which a person believes that using the technology will enhance his or her performance (Venkatesh & Bala, 2008).

**Self-theories of intelligence or mindsets**: Individuals’ beliefs about their intelligence that can create different psychological worlds, leading them to think, feel, and act differently in identical situations (Dweck, 2000).
TAM (Technology Acceptance Model): A theoretical model that predicts how a user accepts and uses technology (Holden & Rada, 2011).

Technological complexity: A TAM construct measuring the degree to which a system is perceived to be relatively difficult to understand and use (Thompson, Higgins, & Howell, 1991).

Web 2.0, Web 2.0 technologies, Web 2.0 tools: Digitally enables users to participate in the processes of creating, exchanging, and sharing information. Open communication, decentralized authority, and freedom to share and reuse content characterize Web 2.0. A few Web 2.0 examples include blogging, bookmarking/organizing, social networking, video-conferencing (Linh, 2008). With Web 2.0 technologies, face-to-face meetings can occur via video-conferencing rather than across a table.
CHAPTER II: LITERATURE REVIEW

Throughout history, seemingly unrelated events have been used to solve problems. For example, the Institute of Healthcare Improvement, a nonprofit organization, applied statistical analyses from the automotive industry to the healthcare environment, which saved 100,000 lives in less than 18 months (Heath & Heath, 2010; Rao & Sutton, 2008). Slutkin, an epidemiologist, applied public health protocols used to interrupt or reverse epidemics such as tuberculosis, cholera, and AIDS to the problem of gun violence in the United States. As a result, the public health approach to reducing or interrupting gun violence has been statistically evaluated by the Department of Justice and the Center for Disease Control (Slutkin, 2013). Applying the principles and associated protocols from one field to a seemingly unrelated field occasionally results in innovative, meaningful changes to improve the lives of others.

One challenge for teachers is to train students to use critical thinking skills (Wagner, 2008). The effective use of Web 2.0 tools can encourage critical thinking skills such as analysis, evaluation, and creation of content. Marzano and Heflebower (2012) highlighted researched-based instructional strategies (e.g., cooperative learning, providing feedback) that improve student learning. Teachers can design lessons incorporating Web 2.0 tools to enhance these proven instructional strategies to improve student learning. For example, learners can develop ideas “together” (cooperative learning) in real time from different physical locations using a shared Google Document. Other learners or the teacher can provide feedback by inserting comments into the piece. To some degree, the fluidity of thought might be captured and the evolution of the project tracked using the Web 2.0 tools. However, some teachers find it difficult to use these
technologies in their classes. The assumption can be made that the challenges associated with using Web 2.0 have more to do with teachers’ beliefs or mindsets than the technology (not) being used.

Mindset, technology acceptance, and Web 2.0 research are addressed in this literature review. The body of research into mindset comes primarily from the discipline of psychology; the research on technology acceptance comes from information systems. Both research fields are well established and span at least three decades. However, research on Web 2.0 technologies has occurred mainly in the past decade and comes from a much wider range of fields including sociology, cultural studies, computer science, bibliometrics, and statistics. Pre-service teachers’ Web 2.0 acceptance was investigated from the novel perspective of mindset theory. A void exists in the research literature with respect to pre-service teachers’ mindsets and perceptions about technology acceptance.

Chapter II consists of three literature reviews: Web 2.0, mindsets, and technology acceptance. Relevant and empirical research, defining constructs, and implications are examined for each area. The summary clarifies how these areas will be juxtaposed to reveal previously undiscovered insights about future teachers’ mindsets and how they accept technology.

Web 2.0 or Social Media

Throughout this project, the terms Web 2.0 and social media refer to active user participation in real time on Internet-supported applications, including how users digitally create, exchange, and share information. In Web 2.0, users play a dynamic rather than a passive role; in Web 2.0, users create content, while in Web 1.0 users only viewed content. A partial list of Web 2.0 categories includes blogging, digital collaborating,
media sharing, online social networking, and contributing to wikis. For example, Facebook, Google+, and LinkedIn are Web 2.0; each offers tools for social networking and media sharing. The following section summarizes research focusing on Web 2.0.

**Web 2.0 or Social Media Studies**

A considerable amount of literature has been published on the use of Web 2.0 technologies, primarily case studies or surveys about the participants’ perceptions. Before the introduction of social media, educators often used technology to distribute course materials to students and to evaluate their work; teachers can now enhance educational processes through collaborative learning and knowledge building (Collins & Halverson, 2009; Cress & Kimmerle, 2008; Schroeder, Minocha, & Schneider, 2010). Some researchers have discussed the educational benefits (e.g., perceived learning, collaborative learning, reflective learning, student engagement, improved grades, and formative assessments) of blogs and microblogs (Halic, Lee, Paulus, & Spence, 2010; Hemmi, Bayne, & Land, 2009; Junco, Heiberger, & Loken, 2011; Stieger & Burger, 2010; Wheeler, 2009); wikis (Cress & Kimmerle, 2008; Hemmi et al., 2009; Wheeler, 2009); and social networking sites (Arnold & Paulus, 2010; Gazi, Aksal, & Öztuğ1, 2012; Roblyer, McDaniel, Webb, Herman, & Witty, 2010). Wheeler (2009) and Laru, Näykki, and Järvelä (2012) discussed the lack of formal research focusing on the integration of Web 2.0 technologies in education. Crook (2008) and Meyer (2010) have argued for more empirical research on the educational use of Web 2.0. However, previous studies have not dealt with the investigation of its acceptance from the perspective of mindset. The next two sections compare Web 1.0 with Web 2.0 and provide analogies for each.
Comparison of Web 1.0 and Web 2.0

Web 2.0 is more than a newer version of Web 1.0. Downes (2005) described Web 2.0 as a “social revolution” (p. 4) rather than a technological improvement. A comparison of 2.0 with the earlier “version” clearly shows the revolutionary quality of social media — now, rather than a few individuals creating content, millions of users can contribute and create. Web 1.0 pages were static creations by website developers (Hanson, Thackeray, Barnes, Neiger, & McIntyre, 2008) who knew how to program in Hypertext Markup Language (HTML) (McLeod & Vasinda, 2008). According to Rosen and Nelson (2008), the purpose of Web 1.0 (the “Read Web”) is to present information in a one-way conversation with consumers. Web 1.0 limits the participation of the masses to the “receiver of information” role. As shown in Table 1, the users’ experiences and participation level changed between Web 1.0 and 2.0. With the development of social media, users were empowered to create as well as consume information.

Table 1
Comparison of Web 1.0 and Web 2.0 Based Upon Users’ Experiences

<table>
<thead>
<tr>
<th></th>
<th>Web 1.0</th>
<th>Web 2.0</th>
</tr>
</thead>
<tbody>
<tr>
<td>Technical expertise required to create</td>
<td>Limited technical expertise needed to create</td>
<td></td>
</tr>
<tr>
<td>Focus on ownership</td>
<td>Focus on sharing</td>
<td></td>
</tr>
<tr>
<td>One-way interaction</td>
<td>Multi-faceted interaction</td>
<td></td>
</tr>
<tr>
<td>Static content</td>
<td>Dynamic content</td>
<td></td>
</tr>
<tr>
<td>Isolated users</td>
<td>Users form communities</td>
<td></td>
</tr>
</tbody>
</table>

*Note. [Adaptation] from Drumgoole (2006) and Henning (2009)*
Web 2.0 revolutionizes the “who” and “how” of the Internet. Hanson et al. (2008) explained how anyone with Internet access can use Web 2.0 applications to generate and publish content in a highly interactive and dynamic context. The collaborative applications are relatively easy to use and promote social sharing; thus, 2.0 has become the “Read-Write Web” (Rosen & Nelson, 2008, p. 212). Web 2.0 promotes creativity, collaboration, and sharing among users (Hanson et al., 2008). Users have transitioned from consumers of web content to what Tapscott and Williams (2006) call prosumers, signifying an active and empowering role. User generated content and collaboration are the driving forces of Web 2.0.

**An Analogy of Web 1.0 and Web 2.0 Using Education**

Web 1.0 and Web 2.0 are comparable to teacher-centered and student-centered education, respectively. McLeod and Vasinda (2008) described Web 1.0 as the lecturer who provides a monologue to students. The students are “muted” so that the sage-on-the-stage can give specific information without being questioned. The power of the interaction rests solely with the teacher who transmits knowledge to learners.

Conversely, Web 2.0 represents a student-centered environment that encourages engagement by all members of the class. The role of the teacher shifts from knowledge expert to mentor. In the student-centered climate, students can question and even control information (McLeod & Vasinda, 2008). Rosen and Nelson (2008) pointed out that, in a Web 2.0, or student-centered situation, students are active participants rather than “passive recipients of teacher broadcast” (i.e., Web 1.0). Both a student-centered class and participants in social media are in motion — writing, researching, meeting, creating, or evaluating (Pearlman, 2010).
Web 2.0 and Educational Institutions

Unlike innovative businesses and technologies, educational institutions change slowly (Gardner, 2010; Wagner, 2012). Unfortunately, students’ use of Web 2.0 tools is seemingly ubiquitous outside of schools and limited within schools. Fisher and Frey (2010) described how students use technologies between classes — during breaks students send texts, upload videos to YouTube, tweet, and update social media pages. Collins and Halverson (2009) argued that technologies are “moving learning outside school’s walls” (p. 129). The students use technology outside of the classroom to communicate, share, collaborate, and express (Fisher & Frey, 2010).

Although Web 2.0 tools transform what and how individuals, particularly those younger, learn (Wagner, 2008), most pre-service teacher education programs remain firmly entrenched in outdated industrial-age models (Collins & Halverson, 2009). Pre-service teachers are usually the products of conservative, slowly adapting institutions. While students can obviously learn using multimedia, discovering, and creating (Pearlman, 2010; Wagner, 2008), pre-service education programs do not consistently model technology use or application of 21st century skills to future teachers (Kumar & Vigil, 2011).

Teachers often lack the experience and expertise that has been independently obtained by using Web 2.0 tools (Lei, 2009). McTighe and Seif (2010) suggested replacing content-driven curriculum with “a few really important ideas and essential questions that focus on understanding and integrating 21st century skills” (p. 156). Smith and Dobson (2011) called for teacher education programs to be needs-based and contextual for the pre-service teachers. Gardner (2010) believed that the educational
institutions eventually would incorporate the tools of Web 2.0 and more 21st century skills in curriculum. Some argued that the true test of rigor is for students to be able to view at material they’ve never seen before and know what to do with it (Kay, 2010). Lambert and Gong (2010) concluded that pre-service teachers need to know how to leverage emerging technologies to incorporate 21st century skills such as “problem solving, communication, collaboration, information and media literacy, critical thinking, and creativity” (p. 55-56).

Conclusion

If Web 2.0 is a social revolution, then its tools might revolutionize the nature of student learning (Rosen & Nelson, 2008). Web 2.0 tools (e.g., Diigo, Facebook, Twitter) promote and simplify collaboration (Tapscott & Williams, 2008) and collective intelligence (Bonabeau, 2009). Web 2.0 democratizes content creation and restructures the power dynamics of users (McLeod & Vasinda, 2008). As educational institutions sluggishly adopt Web 2.0 characteristics, the divide grows wider between how students learn and how educational institutions operate.

This section summarized pertinent research, differentiated between Web 1.0 and 2.0, and described the role of Web 2.0 in educational institutions. The next section provides a more in-depth analysis of mindsets, a self-theory of intelligence.

Mindset — Self-Theories of Intelligence

Mindsets (fixed or growth) are self-theories of intelligence that influence how one lives life. According to Dweck (2008b), those with a fixed mindset can be defined as believing that qualities such as intelligence are fixed traits. Those exhibiting a growth mindset believe that their qualities can be developed through their efforts and education
(Dweck, 2008b). An individual’s mindset affects characteristics with respect to belief systems, views on effort, response to adversity, response to criticism, view of success, personal development, and effect on others (Walton & Dweck, 2009; Jacobson, 2013; Dweck, 2010). The mindset portion of the literature review provides an historical background and perspective, discusses the impact of the mindset concept in research literature, explores the theoretical models underlying the mindset concept, and examines the application of the mindset theory.

**Background**

The *mindset* that one adopts profoundly affects the quality of life (Dweck, 2006). One of the key questions pertaining to mindset is, “How can the adoption of a growth mindset result in a person better fulfilling one’s potential?” Mindset research indicates that individuals fall on a continuum between fixed and growth mindsets (Ablard & Mills, 1996; Heslin & VandeWalle, 2008). Individuals perceive and react to situations based upon their mindset, and mindsets can be manipulated (Aronson, Fried, & Good, 2002; Blackwell et al., 2007). The major conclusion about mindset research is that the adoption of a growth mindset might result in a richer life — with the possibility to fulfill one’s potential (Dweck, 2006). The key concepts pertaining to mindset involve the means by which individuals with different mindsets perceive and react to various situations (e.g., challenges, successes, and failures). One supposition of the research is that a *fixed mindset* can be altered to a *growth mindset*. If one fails to practice a growth mindset, one might experience a world limited by negative self-perceptions and fear.

**Perspective**

Psychologist Carol Dweck’s (2000) research explores how individuals’ beliefs
organize and give meaning to their lives. The same scenario might result in considerably different interpretations based upon their beliefs (i.e., self-theories). The beliefs of individuals about the rigidity or malleability of personal attributes (e.g., abilities, intelligence, personality) are *implicit theories* (Heslin & VandeWalle, 2008). Chiu, Hong, and Dweck (1997) reported that a person’s judgments about self and others are influenced by implicit theories such as growth and fixed mindsets.

The research-based model of mindsets describes how implicit beliefs influence individuals in how they infer, judge, and react — particularly when challenged (Dweck, Chiu, & Hong, 1995). Anderson (1995) explained that people with a fixed mindset view the world in “dispositional terms” (p. 286), believing that unchanging traits affect behavior; those with a growth mindset perceive the world as dynamic and changing, focusing more on the contextual factors to explain behavior. For example, two students with the same mid-term score of 59% will interpret the grade differently. A fixed mindset student will perceive the failing score as proof that one is dumb. Conversely, the growth mindset student will interpret the failing grade as the result of lack of effort or ineffective strategies. The significance of the mindset model is wide ranging and can be applied to the way in which individuals teach, conduct business, raise children, and interact with others.

Dweck (2010) and colleagues identified distinct ways that individuals view intelligence — static (*fixed mindset*) or malleable (*growth mindset*) (Murphy & Thomas, 2008). Individuals with a fixed mindset think their intelligence is an inborn trait; they believe in a finite amount of intelligence (Molden & Dweck, 2006). As these individuals believe their intelligence is limited, they tend to avoid situations that would cause their
abilities to be questioned. Lee et al. (2003) described a fixed mindset person as one who acts as if one has the “ability to learn just so much and no more” (p. 45). A fixed mindset generates a judgmental internal dialogue that categorizes the person in extremes such as winner or loser, unselfish or selfish, smart or dumb (Dweck, 2006). A win-lose scorecard tends to exist from the perspective of a fixed mindset; one either proves (wins) or disproves (loses) one’s intelligence with every action.

If the fixed mindset keeps a win-lose scorecard, then the growth mindset keeps a win-win scorecard. Heslin and VandeWalle (2008) explained that persons with a growth mindset believe their intelligence can change over time, “particularly when they devote a concerted effort to learn and apply more effective strategies” (p. 219). Thus, those with a growth mindset take on difficult tasks because these duties provide them with an opportunity to improve and learn — to become more intelligent (Lee, 2009). The growth mindset produces an internal dialogue that focuses on learning and positive acts (Dweck, 2006). One with a growth mindset is excited to learn new skills. As intelligence is malleable, the growth mindset person knows that one’s skill level will improve with effort. Appropriate feedback provides the means to improve the skill and become more intelligent. One showing a growth mindset understands that mastery of any skill occurs by learning from mistakes, practice, and strategic effort. Mangels et al. (2006) explained that the likelihood of a one’s success depends upon actual ability and mindset. As shown in Table 2, the characteristics associated with a fixed or growth mindset result in individuals plateauing early and achieving less than their full potential, or reaching ever-higher levels of achievement, respectively (Dweck, 2000, 2007).
Table 2

Characteristics of Fixed and Growth Mindsets

<table>
<thead>
<tr>
<th>Characteristics</th>
<th>Fixed mindset</th>
<th>Growth mindset</th>
<th>Reference</th>
</tr>
</thead>
<tbody>
<tr>
<td>Belief</td>
<td>Intelligence is static</td>
<td>Intelligence can be developed</td>
<td>Blackwell et al. (2007)</td>
</tr>
<tr>
<td>Challenges</td>
<td>Tends to avoid</td>
<td>Tends to embrace</td>
<td>Dweck (2000, 2006)</td>
</tr>
<tr>
<td>Desire</td>
<td>To look smart</td>
<td>To learn</td>
<td>Dweck (2000, 2006)</td>
</tr>
<tr>
<td>Effect on others</td>
<td>Can impede cooperation, feedback, and growth</td>
<td>Can invite cooperation, feedback, and stimulate growth</td>
<td>Dweck (2000, 2006)</td>
</tr>
<tr>
<td>Effort</td>
<td>Fruitless; seen as proof of lack of talent</td>
<td>Path to mastery; seen as normal and necessary step to grow</td>
<td>Blackwell et al. (2007)</td>
</tr>
<tr>
<td>Response to adversity or failure</td>
<td>Seen as an indication of lack of talent; leads to giving up quickly</td>
<td>Seen as an indication that more effort and/or better strategies are required</td>
<td>Blackwell et al. (2007)</td>
</tr>
<tr>
<td>Response to criticism</td>
<td>Self-defeating defensiveness</td>
<td>Interested and questioning; wants to learn and open to feedback</td>
<td>Good et al. (2003)</td>
</tr>
<tr>
<td>Success of others</td>
<td>Feels threatened</td>
<td>Finds lessons and inspirations</td>
<td>Dweck (2000, 2006)</td>
</tr>
<tr>
<td>Tendency</td>
<td>Tries to appear as capable as possible, and does so as often as possible</td>
<td>Tries to learn and improve as much as possible</td>
<td>Good et al. (2003)</td>
</tr>
</tbody>
</table>

These fixed and growth mindsets describe individuals’ implicit theories about intelligence along a continuum. Unlike scientific theories that are explicitly articulated (the “big bang” and evolution/natural selection), implicit theories, as mindsets, are more difficult to communicate. Mindsets are beliefs that become a habit of thought. Schunk (1995) stated that implicit theories are like dispositions — individuals tend to have a preferred mode — fixed or growth. Mindsets provide a useful framework to categorize how information is processed (Chiu et al., 1997). Both mindsets are equally valid.
Molden and Dweck (2006) reported that no one mindset is “consistently linked to people’s ability level, education, or cognitive complexity” (p. 194). Dweck et al. (1995) explained that the fixed and growth mindsets are different “ways of constructing reality” (p. 268).

**Impact**

Dweck has published two books, *Self-theories: Their role in motivation, personality, and development* (2000) and *Mindset: The new psychology of success* (2006), one directed toward professionals and the other at general readers. Her theory applies to forming goals, predicting self-esteem, and judging others (Dweck, 2000). The journal, *Psychological Inquiry*, devoted an entire 1995 issue to examining Dweck’s theories. The mindset theory applies to social perception (Molden & Dweck, 2006); motivation (Plaks, Grant, & Dweck, 2005); and achievement goals (Grant & Dweck, 2003). Dweck provided webinars that informed educators on how mindsets impact instruction (“Changing mindsets, motivating students,” 2012). Mindset Works™ was awarded an $849,000 contract by the U.S. Department of Education's Institute of Education Sciences to develop a Growth Mindset Learning Platform founded on the research of Dweck and Blackwell (“Mindset Works™ wins,” 2010). The Mindset Works program is used in over 600 schools nationwide; it also is being integrated into Scholastics MATH 180™, a mathematics intervention program designed to prepare middle school students for Common Core standards (Sparks, 2013). Obviously, the mindset model continues to be relevant after three decades.

Dweck and Leggett (1988) introduced a theoretical model that specifies how implicit theories (*fixed* or *growth mindsets*) position individuals’ motivation and
behavior. Dweck et al. (1995) explained that the model is domain-specific, not a generalized cognitive style. For example, one might have a fixed mindset toward developing healthy dietary habits and a growth mindset about learning another language (Murphy & Dweck, 2010).

A partial list of how the mindset model applies to research includes motivation (Diener & Dweck, 1978, 1980; Dweck, 1975); achievement goals (Blackwell et al., 2007; Elliott & Dweck, 1988); effort (Dweck, 2000); confidence (Hong et al., 1999); stereotypes (Aronson et al., 2002; Good et al., 2003; Levy, Stroessner & Dweck, 1998); praise (Kamins & Dweck, 1999; Mueller & Dweck, 1998); and self-esteem (Dweck, 2000). It is applicable to different education levels and business/professional situations with varying control factors (culture, size, type of organization) (Ablard & Mills, 1996; Chiu et al., 1997; Glenn, 2010; Heslin & VandeWalle, 2008; Molden & Dweck, 2006; Murphy & Dweck, 2010). The research repeatedly supports the influence of mindset on an individual’s perceptions and actions.

As with all theories, other perspectives should be considered when analyzing the mindset model. Anderson (1995) questioned the generalizability of the mindset model between cultures. Kurtz-Costes, McCall, Kinlaw, Wiesen, and Joyner (2005) reported a difference between the way in which U.S. and German children interpret intelligence; U.S. children were more likely than the Germans to believe that intelligence can increase with effort. Chinese and Japanese mothers’ and children's beliefs about the influence of effort and ability on academic achievement reflect a growth mindset more so than American mothers’ and children (Stevenson et al., 1990). Schunk (1995) raised concerns about the mindset survey items, particularly whether respondents’ opposite judgments
(one strongly agrees and the other strongly disagrees to the same item) support two different types of mindsets. He argued that the survey items do not consider that one respondent could hold both sets of beliefs, depending upon the scenario. Although the researchers question some aspects of the mindset model, the consensus is that the model is useful and presents an approach to understanding implicit theories.

**Theoretical Model**

The mindset model has its roots in Kelly’s (1955) theory of personal constructs (patterns of individuals’ makeup) and in Heider’s (1958) theory about interpersonal relations. Kelly’s 1955 premise in *The Psychology of Personal Constructs* is that processes are psychologically guided by how people anticipate events rather than of how they react to events. If one can realize the anticipations, then one is able to create alternative ideas, which might result in finding meaning or gaining control over the environment. The implicit assumptions of Kelly’s theory “guide the way information about the self and other people is processed and understood” (Dweck et al., 1995, p. 267). In Heider’s 1958 *The Psychology of Interpersonal Relations*, one key idea pertains to the way in which individuals comprehend and explain the causes of behaviors. Dweck et al. (1995) summarized Heider’s work by saying that implicit theories “influence the way self and other people are perceived” (p. 267). Both Kelly and Heider described how individuals interpret the world and how that interpretation guides their actions.

Weiner’s (2010) work in attribution contributed to Dweck’s work on learned helplessness (Dweck, 2000). Attribution theory attempts to explain how people interpret the world, with an emphasis on how they explain their observations and experiences (Weiner, 2010). The attributions (ability, effort, luck, and task difficulty) made by
learners for their outcome (successes or failures) determine the impact of the outcome
in terms of a more variable factor, like luck or effort, will leave you more optimistic
about future success than explaining the failure in terms of a more stable factor, like task
difficulty or ability” (p. 140). How individuals explain a success or failure influences
their interpretation of future events. Dweck (2000) differentiated her model from
attribution and learned helplessness theories; her model precisely describes the personal
thories and the goals that set up the explanatory theories.

Application of Mindset Theory

Self-theories of intelligence are measured using the “Theories of Intelligence
Scale — Self Form for Adults” (Dweck, 2000). The original version contains only fixed-
mindset items to assess one’s beliefs about intelligence (Henderson & Dweck, 1990). The
survey now contains eight items, four fixed and four growth items. Participants agree or
disagree with statements such as, “Your intelligence is something that you can’t change
very much,” and “You can learn new things but you can’t really change your basic
intelligence” (Dweck, 2000, p. 21).

By convention, lower scores represent a fixed mindset, and higher scores
represent a growth mindset; growth mindset items are reverse-coded. The growth mindset
items of the survey have strong negative correlations (between -0.69 and -0.86) with the
original fixed mindset items, indicating that disagreement with the fixed items represents
agreement with the growth items (Levy et al., 1998; Dweck, 2000). The differentiation of
mindsets is based upon averaging the results from the mindset survey. Mangels et al.
(2006) and Hong et al. (1999) tended to use “unambiguous” averaged scores (i.e., scores

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3.0 or lower and scores 4.0 or higher) excluding “ambiguous” or borderline scores (i.e., scores falling between 3.1 and 3.9). Ablard and Mills (1994) rejected Dweck’s dichotomy, arguing convincingly that mindsets should be assessed along a continuum rather than as either fixed or growth.

Reliability and validity data for the mindset instrument has been reported in numerous articles (Erdley & Dweck, 1993; Erdley, Loomis, Cain, & Dumas-Hines, 1997; Levy et al., 1998). Dweck reported that the internal consistency reliability estimates (Cronbach’s alpha coefficients) ranged from .94 to .98 (Dweck, 2000; Dweck et al., 1995). Hong et al. (1999) reported a high internal reliability for the survey (α = .81, N = 69) and a high test/retest reliability (r = .83, N = 50) after one week. Moreover, Dweck et al. (1995) found the constructs to be valid when compared with other implicit theory measures. The instrument appears to be unaffected by social desirability, intellectual ability, political beliefs, or religious preference, indicating discriminate validity with a range of potentially confounding variables (Dweck et al., 1995). The mindset instrument is not correlated with other scales (e.g., self-esteem, optimism) or cognitive abilities; the theory “represents assumptions about the self that have cognitive, motivational, emotional, and behavioral consequences, but they are distinct from other cognitive and motivational constructs” (Dweck, 2000, p. 176).

The “Theories of Intelligence Scale — Self Form for Adults” is domain-specific (Chiu et al., 1997). The mindset survey links variables such as goals, attributions, affect, and behavior (Dweck, 2000). Researchers link the mindset survey with surveys on behavioral predictions (Chiu et al., 1997); teaching efficacy (Deemer, 2004); and student-readiness inventory (Peterson, Casillas, & Robbins, 2006).
Mindsets clearly impact the way in which individuals learn. Those with a growth mindset believe that learning is possible with hard work and persistence; they tend to confront deficiencies and correct them (Dweck, 2007). Practicing a growth mindset results in positive changes such as increased motivation and (for students) scores on academic measures (Aronson et al., 2002). If students believe their minds can grow, the effects on motivation, learning, and school achievement can be profound (Dweck, 2008a). Differences in mindsets influence preference for performance or learning goals (Dweck & Leggett, 1988); problem-solving strategies (Dweck, 2000); persistence in the face of failure (Bergen, 1991); and pursuit of remedial help (Hong et al., 1999).

The mindset tendency of the teacher affects students’ outcomes. Rattan, Good, and Dweck (2012) reported that instructors with a fixed mindset about mathematics more readily judge students to have lower ability than those with a growth mindset. Furthermore, the fixed mindset teachers communicated lower expectations of students they perceived as having low math skills and used strategies that disengaged the students from mathematics (Rattan et al., 2012). Yorke and Knight (2004) reported that teachers should “(1) Appreciate the significance of self-theories for student learning; (2) Be able to infer whether students are inclined towards fixedness or malleability [growth]; [and] (3) Possess strategies for encouraging fixed students to move towards malleability” (p. 29). Murphy and Thomas (2008) maintained that growth mindset teachers are more likely to help students and influence their academic success. Lee (2009) encouraged teachers who want to develop a growth mindset in students to emphasize “many different ways that correct outcomes can be achieved” (p. 46), as well as empowering students to evaluate the most valuable path to learning. Dweck (2007) explained that teachers create
growth mindsets by focusing on effort and persistence, by sharing stories emphasizing hard work and lifelong learning, and by teaching students about how the brain functions.

**Conclusion**

Mindsets are individuals’ beliefs about themselves and their most basic qualities (e.g., intelligence, talents, personality). Individual beliefs about perceived ability might be described as fixed or growth minded. A fixed mindset person tends to possess a deterministic view of the world; a greater sense of free will occurs for those who believe in a growth mindset (Dweck, 2006). For example, imagine a basketball player who misses a free throw during a high pressure situation. An athlete with a fixed mindset might believe that the miss was due to lack of talent. Nothing can be done to change the outcome if the situation occurs again. The athlete lacks the ability to hit a free throw in a high pressure situation. Conversely, a growth mindset player believes that the shot can be made by practicing more and devising strategies to remain calm and focused during tense moments. The growth minded athlete looks forward to the challenge of shooting a free throw when the game is on the line. “People’s beliefs about themselves can create different psychological worlds, leading them to think, feel, and act differently in identical situations,” explained Dweck (2000). The mindset portion of the literature review addresses the development of the theory, provides examples and applications of the theory, as well as providing reliability and validity data. The next portion of the literature review assesses the TAM — Technology Acceptance Model.
TAM — Technology Acceptance Model

In this study, the TAM will be adapted to measure the acceptance of Web 2.0 or social media perceptions in pre-service teachers. The section provides background information about the TAM, after which the theoretical model and applications of the TAM are reviewed. Last, the constructs for the TAM are defined.

Perspective

Both modern computing and the field of information systems developed in the 1970s. By creating lists of factors that “seem to influence the use of technology” (Legris, Ingham, & Collerette, 2003, p. 192), information systems researchers focused on identifying how to facilitate technology integration. During the mid-1980s, information systems research grew from descriptive to predictive, as researchers developed and tested models that predicted technology use by corporate employees. During this era of predictive research, Fred Davis proposed the “Technology Acceptance Model” in his doctoral thesis (as cited in Legris et al., 2003).

The TAM predicts how a person comes to accept and use a given technology (Teo, 2010c). The TAM is the most significant and utilized theory for describing an individual’s acceptance of technology (Lee et al., 2003). Davis (1989) introduced and developed the TAM to address the issue of how “knowledge users” such as managers and professionals accept technologies for work (Davis, 1989, p. 326; Thompson et al., 1991). Davis (1989) postulated that “perceived usefulness” and “perceived ease of use” (p. 320) were major variables in users’ acceptance of technology. Proponents of the TAM attribute the robustness of the model to its diversity; it applies to different technologies (word processors, e-mail) in different situations with different control factors (gender,
size, type of organization) using different subjects (knowledge workers, pre-service teachers) (Lee et al., 2003). Although the majority of TAM research takes place in the field of information systems (Lee et al., 2003), it applies to different contexts such as e-learning systems (Park, 2009); with school teachers (Holden & Rada, 2011); and with pre-service teachers (Teo, 2009b, 2010a, 2010b).

The TAM theory predicts the degree of likelihood with which an individual will accept and use a technology. As with all theories, there are other perspectives to consider when analyzing the TAM. Legris et al. (2003) argued that the TAM has three limitations: using students as research subjects rather than of actual employees in the fields being studied, evaluating software applications not used by actual employees in the fields being studied, and using self-reported data. Lee et al. (2003) acknowledged these limitations and added two more: lack of longitudinal comparisons and insufficient explanation of variance in causal relationships.

**Theoretical Model**

The TAM stands alone as a model for predicting users’ intentions and acceptance of technology (Lee et al., 2003; Venkatesh & Davis, 2000; Venkatesh, Morris, Davis, & Davis, 2003). The roots of the TAM grew from the Theory of Reasoned Action (Ajzen & Fishbein, 1980). Venkatesh et al. (2003) describe the Theory of Reasoned Action as “one of the most fundamental and influential theories of human behavior” (p. 428). The theory’s core constructs of “attitude toward behavior” and “subjective norm” (p. 428) predict behaviors (Venkatesh et al., 2003). Teo (2010a) described the Theory of Reasoned Action as the basis for “specifying the causal linkages between perceived usefulness and perceived ease of use and users’ attitudes, intentions, and actual computer
adoption behavior” (p. 66). According to Venkatesh et al. (2003), the TAM is more specific than the Theory of Reasoned Action — it applies only to technology usage behavior.

The TAM predicts users’ technology acceptance and usage with respect to job performance (Venkatesh & Davis, 2000). The TAM creators attempted to “provide an explanation of the determinants of computer acceptance that is general, capable of explaining user behavior across a broad range of end-user computing technologies and user populations, while at the same time being both parsimonious and theoretically justified” (Davis, Bagozzi, & Warshaw, 1989, p. 985). The core constructs of the TAM are “perceived usefulness” and “perceived ease of use” (Davis, 1989, p. 319). Figure 2 illustrates how the core constructs of “perceived usefulness” and “perceived ease of use” depend upon external variables.

External variables influence users’ technology acceptance behavior (Holden & Rada, 2011). In their meta-analysis of the TAM, Lee et al. (2003) reported that over 20 external variables (e.g., attitudes toward technology, technological complexity, usability, perceived enjoyment) apply to the TAM; the results indicated varying significance. Although the TAM grew out of the Theory of Reasoned Action, it has evolved into its own species.

Application of the TAM Theory

This study strives to use the TAM to examine pre-service teachers’ attitudes about Web 2.0. Pajares (1992) argued that teachers’ beliefs should be a focus in educational
research. Sugar, Crawley, and Fine (2004) said that responding to teachers’ beliefs toward technologies helps to meet their technology needs. Bitner and Bitner (2002) explained how teachers’ attitudes toward technology usage play an essential role in classroom technology integration. Baylor and Ritchie (2002) reported that teachers’ “openness to change” (p. 395) and use of technology in collaboration with other teachers predicted technology integration. Norton, McRobbie and Cooper (2000) discovered that mathematics teachers in a technology-rich secondary school rarely used technology in their teaching. Their results indicate that the teachers’ resistance to technology is connected to their pedagogical beliefs and perceptions about using technology in their classes. Ertmer, Ross, and Gopalakrishnan (2000) found that “exemplary technology-using teachers” (p. 1) willingly integrate teaching and learning using available technologies.
Diverse research exists that examines the factors involved in teachers’ stated intention to use technology in their teaching (Baek, Jung, & Kim, 2008; ChanLin, Hong, Horng, Chang, & Chu, 2006; Franklin, 2007; Teo, Lee, Chai, & Wong, 2009; Teo, 2010c; Vannatta & Fordham, 2004). Many of these studies use psychology or information systems models to investigate the factors that influence teachers’ beliefs. The concept of “behavioral intention to use technology” is based on the “cognitive/behavioral approach” (Teo, 2010b, p. 254). Using the cognitive/behavioral approach, the individual is aware of his or her decision to accept a technology: “...acceptance can be explained by underlying intention” (Teo, 2010b, p. 254). The TAM is a useful mechanism for measuring teachers’ intentions to use technology, and several researchers have applied the TAM to investigate topics involving pre-service teachers (Kiraz & Ozdemir, 2006; Ma et al., 2005; Teo, 2008; Teo, 2009b; Teo, Ursavas, & Bahçekapılı, 2011).

The Technology Acceptance Model is a theoretical model that predicts how a user accepts and uses technology (Holden & Rada, 2011). Initially, the TAM indicated that individuals’ behavioral intention to use technology was determined by two beliefs — perceived usefulness and perceived ease of use (Holden & Rada, 2011). However, the “TAM has evolved over time. . . to explain perceived usefulness and usage intentions[,] including social influence (subjective norm, voluntariness, and image), cognitive instrumental processes (job relevance, output quality, and result demonstrability) and experience” (Park, 2009, p. 152). Variations of the TAM have described users’ attitudes in different ways: online-learning portals (Drennan et al., 2005); teachers’ self-efficacy (Holden & Rada, 2011); educational wikis (Liu, 2010); Web-enhanced courses (Sivo & Brophy, 2003); e-learning (Park, 2009); course management system (Sivo et al., 2007);
and pre-service teachers’ computer use (Teo, 2010a). Teo (2010a) reported that the TAM “is an appropriate model for use as a theoretical framework in research set in an educational context” (p. 67).

Conclusion

The TAM predicts the likelihood that an individual will accept and use a new technology. Although a variety of factors affect a person’s decision, the most influential constructs are “perceived usefulness” and “perceived ease of use” (Teo, 2008, p. 414). The TAM portion of the literature review addressed the development and applications of the theory, as well as provided reliability and validity data. The next portion of the literature review defines the constructs for the Technology Acceptance Model.

Defining TAM Constructs

The following constructs are relevant to the TAM.

*Perceived usefulness:* The degree to which a user believes that using the technology would enhance job performance (Davis et al., 1989). One decides to use a technology based upon a belief that the technology will enhance job performance (Teo, 2010a). Relevant factors include greater efficiency and accuracy in job performance (Teo, 2010a).

*Perceived ease of use:* The degree to which an individual believes that using a particular technology will be free of effort (Davis et al., 1989). Perceived ease of use influences perceived usefulness because, other things being equal, the easier the system is to use, the more useful it can be (Venkatesh & Davis, 2000). Moon and Kim (2001) reported that perceived ease of use directly impacts attitudes toward using technology, and indirectly affects perceived usefulness.
**Technological complexity:** “…the degree to which a system is perceived to be relatively difficult to understand and use” (Teo, 2010a, p. 68). The technological complexity construct was adapted from the work of Thompson et al. (1991). Teo (2010a) found that technological complexity was significant in influencing perceived ease of use.

**Attitudes toward computer use:** The degree to which a user enjoys or likes using a computer (Teo et al., 2011). The measures for attitudes toward computer use were adapted from research by Thompson et al. (1991) and Compeau and Higgins (1995).

**Summary of Literature Review**

The research into mindset has special relevance to educational contexts, as mindset underlies, not only what people learn, but how they learn. The reviewed literature on mindset established its relevance to education and provided insights on ways in which mindset can be changed and even manipulated by educators through classroom coaching and other techniques. In general, the literature on technology acceptance draws no direct links to the educational context, but the conclusions relative to organizations and business models can be applied to student learning. The primary exception, however, was the work of Timothy Teo, whose version of the Technology Acceptance Model was adapted for the project’s survey instrument. The TAM studies are well established, but the empirical research into Web 2.0 is in its infancy, and educators have only just begun to acknowledge and utilize the research into 2.0 applications and tools. The mindset model and TAM, originating from two seemingly unconnected fields, were utilized to possibly uncover insights about Web 2.0 technology usage by pre-service teachers. From the juxtaposition of the mindset and TAM, insights might be gained into improving pre-
service teacher education with respect to technology integration that increases students’ critical thinking skills.
CHAPTER III: METHODS

This study combines the theoretical frameworks of “self-theories of intelligence” (Dweck, 2000) and the “technology acceptance model” (Teo, 2009b) to investigate pre-service teachers’ attitudes about Web 2.0. The “self-theories of intelligence” survey developed from the psychology field, and the “technology acceptance model” originated in the field of informational systems (Davis, 1989; Dweck, 2000).

This chapter includes the following: participants, research design, sampling procedures, measures (conceptual definitions and operational indicators), instrumentation, reliability and validity, data collection, data analysis, research hypothesis, and summary.

Participants

Participants consisted of a sample of pre-service teachers enrolled in introductory teacher education classes at a regional college campus in southern Kentucky. A total of 235 pre-service teachers completed the survey. The participants were selected from the introductory teacher education courses. The survey was administered to 14 of the 16 introductory education classes offered at the university. Two Faculty members administered the survey to pre-service teachers. A script was read to the participants (Appendix A) to provide instruction on completion of the surveys.

Descriptive Statistics

The descriptive statistics for the sample population \( n = 235 \) of the pre-service teachers are shown in Table 3. The demographic variables included age, gender, ethnicity, and certification area of the pre-service teacher. The ratio of females to males was 177 (75%) to 58 (25%). The age demographic was defined as traditional (18-24
years) and adult (25+ years) learners; these categories are commonly used to aggregate age data for college students (U.S. Census Bureau, 2012). In the study, 201 (86%) of the participants self-identified as traditional learners, while 32 (14%) self-identified as adult learners.

The population overwhelmingly identified 216 as Caucasian/white (92%), with 19 (8%) identifying as other. The teacher certification area was classified into elementary education (68 participants, 29%); humanities (88 participants, 38%); and STEM (78 participants, 33%) disciplines. Humanities majors include art education; business and marketing; English/language arts; family and consumer sciences; middle level education in social studies and language arts; modern languages education (French, German, and Spanish); music education; physical education; and social studies. STEM majors include biological science, chemistry, earth and space science, mathematics, middle school mathematics, and middle school science.

Table 3

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Research Design

This study used a descriptive research design, and the data collection method was through survey. All participants were given two surveys: “The Theories of Intelligence — Self Form for Adults” (Dweck, 2000) and the adapted “Attitudes about Web 2.0” (Teo, 2010a). The surveys were completed in one administration period.

This correlational study was an attempt to describe pre-service teachers’ attitudes about Web 2.0 or social media using the framework of mindsets (Dweck, 2000). The goal is to determine, through surveys, whether a correlation exists. The “mindset survey” (The Theories of Intelligence — Self Form for Adults) developed from psychology, and the “attitudes about Web 2.0” originated in the information systems field. The mindset describes how individuals perceive their intelligence and face challenges (Dweck, 2000). The “attitudes about Web 2.0” survey predicts how they undertake and use technology (Davis, 1989).

If a positive correlation exists between attitudes about Web 2.0 and growth mindset type, then pre-service teacher education programs might consider supplementing their courses with growth mindset practices to better prepare teachers in the use of Web 2.0. It is impossible for pre-service teachers to master the continually increasing number of Web 2.0 technologies specifically designed for education. However, if pre-service teachers can be taught strategies to develop a growth mindset, then those future teachers might be more willing to engage in using Web 2.0 technologies with their students. Dweck (2000) has shown that mindsets can be manipulated through counseling or teaching. For example, students who were taught that the brain was a muscle and could get stronger with exercise (effort and effective strategies) persisted longer at attempting
to solve problems. If mindsets correlate with positive attitudes about Web 2.0, then pre-service teacher education programs have a reason to change the means by which Web 2.0 integrates into the curriculum.

The teacher education programs might focus on fostering a growth mindset, rather than a specified (and quickly outdated) list of technology competencies. Some teacher education programs require a semester-long technology course. If the course was designed to incorporate mindset and technology skills, the future teachers might be better prepared to demonstrate technology competencies over their career as the technologies change. Future teachers equipped with a growth mindset might possess the skill set to apply effort and multiple strategies when in a new learning situation. It is hypothesized that, given a sufficient sample size, the study will reveal a significant positive correlation between increasing positive attitudes toward technology and a growth mindset. The assumption can be made that the use of well-established surveys will be applicable for meaningful results in the experimental design. If a strong correlation exists between growth mindset and technology acceptance, then future experimental research can be conducted to determine whether the change of pre-service teachers’ mindset will affect their attitudes toward Web 2.0.

Measures

Conceptual Definitions

The following constructs are relevant.

*Self-theories of intelligence or mindsets:* Individuals’ beliefs about their intelligence that can create different psychological worlds, leading them to think, feel, and act different in identical situations (Dweck, 2000).
• *Fixed intelligence, fixed mindset, or entity theory.* Intelligence is interpreted as a fixed trait that dwells within a person and cannot be changed (Dweck, 2000).

• *Malleable intelligence, growth mindset, or incremental theory.* Intelligence is interpreted as a trait that can be cultivated through learning and increased through one’s efforts (Dweck, 2000).

**TAM (Technology Acceptance Model):** A theoretical model that predicts how a user accepts and uses technology (Holden & Rada, 2011). The constructs of perceived ease of use, perceived usefulness, technological complexity, and attitudes toward computers are utilized.

*Web 2.0, Web 2.0 technologies, Web 2.0 tools:* Digitally enables users to participate in the processes of creating, exchanging, and sharing information. Open communication, decentralized authority, and freedom to share and reuse content characterize Web 2.0. Some Web 2.0 examples include blogging, bookmarking/organizing, social networking, and video-conferencing (Linh, 2008). With Web 2.0 technologies, face-to-face meetings can occur via video-conferencing rather than across a table.

**Operational Indicators**

The following constructs are relevant.

**Theories of Intelligence Scale — Self Form for Adults** (Dweck, 2000): “The Theories of Intelligence” survey uses a 6-point Likert-type scale. Participants agree or disagree with eight statements such as, “Your intelligence is something that you can’t change very much,” and “You can learn new things but you can’t really change your basic intelligence” (Dweck, 2000, p. 178). Answers ranged from “strongly disagree” (1)
to “strongly agree” (6). The “fixed mindset” items were reverse-coded. Lower scores indicated a perceived “fixed mindset,” and higher scores indicated a perceived “growth mindset.”

**Web 2.0 or Web 2.0 technologies or Web 2.0 tools:** The “Attitudes about Web 2.0” survey is adapted from the Teo (2010a) survey for pre-service teachers. The adapted survey consists of 15 items that measure four constructs: *perceived usefulness* (4 items), *perceived ease of use* (3 items), *technological complexity* (4 items), and *attitudes toward computer* (4 items). The phrase “Web 2.0” was substituted for “computer.” For example, “Using computers will improve my work” in Teo’s survey became “Using Web 2.0 will improve my work.” Items were scored on a 6-point Likert-type scale ranging from “strongly disagree” (1) to “strongly agree” (6). A sum of the items and taking the mean resulted in the total scores. Higher scores indicated a greater positive attitude about Web 2.0.

**Instrumentation**

The WKU Institutional Review Board approved the research study. Informed consent forms that contained information about the nature and purpose of the survey, procedures, possible discomfort and risks, possible benefits, confidentiality, and refusal or withdrawal from project, as well as contact information for the researcher and research advisor, were used during the survey administration. The participants read the informed consent form, which explained that they indicated their consent by completion of the survey.

The survey contained three sections: background information and demographics, “Theories of Intelligence,” and “Attitudes about Web 2.0.” The researcher utilized two
previously used surveys — “Theories of Intelligence” (Dweck, 2000) and an adapted “Attitudes about Web 2.0” (Teo, 2010a). Dweck and Teo gave permission to use the surveys (Appendices B and C).

The “Theories of Intelligence” survey was designed to measure the extent to which participants view their intelligence as fixed or malleable. The “Theories of Intelligence” survey consisted of eight items. Participants indicated the extent to which they agreed or disagreed with statements such as, “You can change even your basic intelligence level considerably,” and “Your intelligence is something about you that you can’t change very much” (Dweck, 2000, p. 178). Dweck reported that the internal consistency reliability estimates (Cronbach’s alpha coefficients) ranged from .94 to .98 (Dweck, 2000; Dweck et al., 1995). Maureen Sullivan, administrative assistant for Carol Dweck, gave written permission for the researcher to use the survey (see Appendix B).

The “Attitudes about Web 2.0” survey is adapted from the Teo (2010a) survey for pre-service teachers to measure their attitudes about Web 2.0 technologies. Timothy Teo gave permission to adapt the survey for this research project (see Appendix C). The adapted survey consists of 15 items that measure four constructs: *perceived usefulness* (4 items), *perceived ease of use* (3 items), *technological complexity* (4 items), and *attitudes toward computer* (4 items). The phrase “Web 2.0” was substituted for “computer.” For example, “Using computers will improve my work” in Teo’s survey became “Using Web 2.0 will improve my work.” Participants indicated the extent to which they agreed or disagreed with statements such as, “I find Web 2.0 useful in my work,” and “Learning to use Web 2.0 takes up too much of my time.” Internal consistency estimates and
confirmatory factor analysis will quantify the reliability and validity of the “Attitudes about Web 2.0” survey.

**Reliability and Validity**

“A test can do whatever it does over and over (that’s reliability), but still will not do what it is supposed to (that’s validity)” (Salkind, 2004, p. 294). The reliability and validity of the “Theories of Intelligence” and “Attitudes about Web 2.0” have been previously reported (Dweck, 2000; Teo, 2010a). Although there is no statistic for face or content validity (Shrock & Coscarelli, 2007), both instruments are assumed to have both face and content validity, as both have been vetted by experts in the psychology and information systems fields.

Both the “Theories of Intelligence” and “TAM” instruments include data on their reliability. Dweck reported that the internal consistency reliability estimates (Cronbach’s alpha coefficients) ranged from .94 to .98 for the “Theories of Intelligence” instrument (Dweck, 2000; Dweck et al., 1995). The “Theories of Intelligence” survey was administered without any changes.

The “Attitudes about Web 2.0” survey was adapted from the TAM. Four of the TAM constructs were chosen for use: perceived ease of use, perceived usefulness, technological complexity, and attitudes toward computers. These constructs were the most relevant to the research questions identified in the study. The reliability of the adapted TAM was calculated. Using the collected data, the internal consistency was measured with Cronbach’s alpha coefficients.
Data Collection

Pre-service teachers in the introductory teacher education courses took the surveys in paper-pencil format during Fall 2012. Two instructors and the researcher administered the surveys. The survey administrators read a script to the students (Appendix A). On each 32-item survey, participants filled in circles pertaining to background information and describing the extent to which they agreed or disagreed with items about intelligence and Web 2.0. The participants took approximately 15 minutes to complete the survey. The surveys were placed in an envelope, returned to the researcher, and securely retained in an office at the university. After three years, the surveys will be destroyed.

Data Analysis

The data analysis for this study utilized Microsoft Excel and Statistical Package for the Social Sciences (SPSS) Statistics. Demographic data of the participants was reported. The use of correlation analysis was conducted between the “Theories of Intelligence” and “Attitudes about Web 2.0.” The Pearson correlation analysis was performed to determine whether mindsets of pre-service teachers significantly predict their attitudes about Web 2.0 technologies. T-tests showed the degree to which the attitudes about Web 2.0 varied for different demographic groups (e.g., age, certification area, gender). The findings of the data analysis were shared with the individuals (faculty members, pre-service teachers) who wished to see the results.

Research Hypotheses

The first research question in this study was correlational or predictive in nature: 

*Does a significant correlation exist between pre-service teachers’ mindsets and attitudes*
Null hypothesis: There is no correlation between pre-service teachers’ self-theories of intelligence and attitudes about Web 2.0. The second research question is descriptive in nature: Do significant differences exist between demographic groups (e.g., age, certification area, gender) and their attitudes about Web 2.0? Null hypothesis: Attitudes about Web 2.0 will not vary for different demographic groups.

**Summary**

The exploratory research sought to discover whether a correlation exists between pre-service teachers’ mindsets and attitudes about Web 2.0. The correlation coefficient, also called “Pearson’s r,” is a summary statistic that describes the strength of the association between the variables (i.e., the two instruments) (Check & Shutt, 2011). The participants were pre-service teachers enrolled in introductory teacher education courses.

The reliability and validity of the “Theories of Intelligence” instrument used in this study were those reported by the creator (Dweck, 2000). Because the “Attitudes about Web 2.0” instrument was adapted from the TAM, the reliability and validity of the instrument were calculated using Cronbach’s alpha coefficients for internal consistency.
CHAPTER IV: RESULTS

The relationship of pre-service teachers’ self-theories of intelligence (mindset) and their attitudes about Web 2.0 were addressed in this study. The research questions addressed:

1. Whether a significant correlation exists between pre-service teachers’ mindsets and attitudes about Web 2.0, and
2. Whether significant differences exist between demographic groups (e.g., age, certification area, gender) and their attitudes about Web 2.0.

The purpose of the research was to gain information about Web 2.0 technology acceptance by pre-service teachers using two survey instruments. One far-reaching goal of the study was to gain insights on how to improve pre-service teacher education with respect to technology integration that increases students’ critical thinking skills.

Findings Related to Research Question 1

Table 4 provides the descriptive statistics used in the analysis and interpretation of Research Question 1. The Mindset scale measured one variable — mindset. The TAM scale measured four variables to determine an individual’s perceived acceptance of technology.

Table 4

Descriptive Statistics and Reliability of Mindset and TAM Scales (N=235)

<table>
<thead>
<tr>
<th>Scale</th>
<th>Sub-scales</th>
<th>Items (#)</th>
<th>Mean (M)</th>
<th>Standard deviation (SD)</th>
<th>Cronbach’s alpha (α)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Mindset</td>
<td>-</td>
<td>8</td>
<td>4.71</td>
<td>0.27</td>
<td>0.91</td>
</tr>
<tr>
<td>TAM</td>
<td>Average</td>
<td>15</td>
<td>17.34</td>
<td>4.12</td>
<td>0.89</td>
</tr>
<tr>
<td></td>
<td>Attitude toward usage</td>
<td>4</td>
<td>4.80</td>
<td>0.83</td>
<td>0.86</td>
</tr>
<tr>
<td></td>
<td>Perceived ease of use</td>
<td>4</td>
<td>5.01</td>
<td>0.73</td>
<td>0.84</td>
</tr>
<tr>
<td></td>
<td>Perceived usefulness</td>
<td>4</td>
<td>4.34</td>
<td>1.04</td>
<td>0.92</td>
</tr>
<tr>
<td></td>
<td>Technological complexity</td>
<td>3</td>
<td>4.73</td>
<td>0.85</td>
<td>0.80</td>
</tr>
</tbody>
</table>
Research Question 1 asks whether a significant correlation exists between pre-service teachers’ mindsets and attitudes about Web 2.0. Before determining the Pearson’s correlation between the mindset and technology acceptance of Web 2.0, the descriptive statistics and reliability of the mindset and TAM scales were calculated using Excel and SPSS. Table 4 shows the number of items, mean (M), standard deviation (SD), and Cronbach’s alpha (α) for the Mindset and TAM instruments, as well as the sub-scales for the TAM. Cronbach’s alpha is a measure of the internal consistencies of the items in a survey. Tavakol and Dennick (2011) reported acceptable values for Cronbach’s alpha range between 0.70-0.95. Based upon the Cronbach’s alpha results, the survey instruments consistently measure the constructs of mindsets and technology acceptance with values ranging from 0.80 to 0.91.

Table 5

<table>
<thead>
<tr>
<th>Measure</th>
<th>1</th>
<th>2</th>
<th>3</th>
<th>4</th>
<th>5</th>
<th>6</th>
</tr>
</thead>
<tbody>
<tr>
<td>1 Mindset</td>
<td>1</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>2 TAM</td>
<td>0.16*</td>
<td>1</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>3 Attitudes toward usage</td>
<td>0.09</td>
<td>0.84**</td>
<td>1</td>
<td>-</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>4 Perceived ease of use</td>
<td>0.18**</td>
<td>0.65**</td>
<td>0.40**</td>
<td>1</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>5 Perceived usefulness</td>
<td>0.04</td>
<td>0.71**</td>
<td>0.60**</td>
<td>0.12</td>
<td>1</td>
<td>-</td>
</tr>
<tr>
<td>6 Technology complexity</td>
<td>0.18**</td>
<td>0.72**</td>
<td>0.42**</td>
<td>0.54**</td>
<td>0.20**</td>
<td>1</td>
</tr>
</tbody>
</table>

Note. * p < 0.05, two-tailed; ** p < .01, two-tailed.

A Pearson’s correlation matrix was created in Table 5 for the variables of Mindset and TAM, as well as the four sub-scales of the TAM instrument. A Pearson’s correlation coefficient, r, measures the strength of the correlation with values between -1 to 1 (Bennett, Briggs, & Triola, 2009). A weak positive correlation was noted between the
two variables of Mindset and average TAM, $r = 0.16$, $n = 235$, $p = 0.02$. Participants with an increasing mindset (growth) score reported greater Web 2.0 technology acceptance than those with a lower (fixed) mindset.

In the sub-constructs of the TAM, two other variables were significant. A weak positive was found correlation between Mindset and perceived ease of use, $r = 0.18$, $p = 0.01$. Another weak positive correlation occurred between Mindset and technology complexity, $r = 0.18$, $p = 0.01$. Pre-service teachers with higher mindset scores (growth mindset) are more likely to find Web 2.0 technologies easy to use and not too technologically complex in comparison with those with lower mindset scores (fixed mindset). With respect to Research Question 1, a significant (although weak) correlation was found to exist between Mindset and attitudes about Web 2.0 technologies.

**Findings Related to Research Question 2**

Research Question 2 asks whether significant differences exist between demographic groups (e.g., age, certification area, gender) and their attitudes about Web 2.0. To examine Research Question 2, a series of analyses of variances (ANOVA) was conducted to assess whether differences exist in the acceptance of Web 2.0 technologies based upon age, certification area, or gender. The ANOVA results follow the descriptive statistics for each demographic variable.

**Attitudes About Web 2.0 Technologies by Certification Area**

The three teacher certification programs that were studied were defined as elementary education, humanities, and science, technology, engineering, and mathematics (STEM). The number and percentage of each of the demographic variables (age and gender) for the certification areas are illustrated in Table 6.
Table 6
Demographics of Pre-service Teachers by Certification Areas, Age Groups, and Gender (N=235)

<table>
<thead>
<tr>
<th>Certification area</th>
<th>Demographic variable</th>
<th>Number (n)</th>
<th>Percentage (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Elementary Education</td>
<td>Age</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Traditional</td>
<td>59</td>
<td>87</td>
</tr>
<tr>
<td></td>
<td>Adult</td>
<td>9</td>
<td>13</td>
</tr>
<tr>
<td></td>
<td>Gender</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Female</td>
<td>43</td>
<td>63</td>
</tr>
<tr>
<td></td>
<td>Male</td>
<td>25</td>
<td>37</td>
</tr>
<tr>
<td>Humanities</td>
<td>Age</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Traditional</td>
<td>84</td>
<td>95</td>
</tr>
<tr>
<td></td>
<td>Adult</td>
<td>3</td>
<td>3</td>
</tr>
<tr>
<td></td>
<td>Gender</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Female</td>
<td>82</td>
<td>93</td>
</tr>
<tr>
<td></td>
<td>Male</td>
<td>6</td>
<td>7</td>
</tr>
<tr>
<td>STEM</td>
<td>Age</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Traditional</td>
<td>57</td>
<td>73</td>
</tr>
<tr>
<td></td>
<td>Adult</td>
<td>20</td>
<td>26</td>
</tr>
<tr>
<td></td>
<td>Gender</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Female</td>
<td>52</td>
<td>67</td>
</tr>
<tr>
<td></td>
<td>Male</td>
<td>26</td>
<td>33</td>
</tr>
</tbody>
</table>

The means (M) and standard deviations (SD) for the three teacher certification areas are shown in Table 7.

Table 7
Demographic Statistics of the TAM by Certification Area of the Pre-service Teachers (N=232)

<table>
<thead>
<tr>
<th>TAM</th>
<th>Elementary Education</th>
<th>Humanities</th>
<th>STEM</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>M</td>
<td>SD</td>
<td>M</td>
</tr>
<tr>
<td>Average</td>
<td>4.72</td>
<td>0.69</td>
<td>4.76</td>
</tr>
<tr>
<td>Attitudes toward usage</td>
<td>4.79</td>
<td>0.82</td>
<td>4.94</td>
</tr>
<tr>
<td>Perceived ease of use</td>
<td>5.18</td>
<td>0.64</td>
<td>5.00</td>
</tr>
<tr>
<td>Perceived usefulness</td>
<td>4.14</td>
<td>1.23</td>
<td>4.41</td>
</tr>
<tr>
<td>Technology complexity</td>
<td>4.79</td>
<td>0.82</td>
<td>4.69</td>
</tr>
</tbody>
</table>
Results of the ANOVA based upon area of teacher certification are presented in Table 8.

<table>
<thead>
<tr>
<th>TAM</th>
<th>df</th>
<th>MS</th>
<th>F</th>
<th>p</th>
<th>$\eta^2$</th>
</tr>
</thead>
<tbody>
<tr>
<td>Average</td>
<td>2</td>
<td>0.11</td>
<td>0.28</td>
<td>0.76</td>
<td>0.00</td>
</tr>
<tr>
<td>Attitudes toward usage</td>
<td>2</td>
<td>1.41</td>
<td>2.06</td>
<td>0.13</td>
<td>0.02</td>
</tr>
<tr>
<td>Perceived ease of use</td>
<td>2</td>
<td>1.48</td>
<td>2.83</td>
<td>0.06</td>
<td>0.02</td>
</tr>
<tr>
<td>Perceived usefulness</td>
<td>2</td>
<td>2.04</td>
<td>1.90</td>
<td>0.15</td>
<td>0.12</td>
</tr>
<tr>
<td>Technology complexity</td>
<td>2</td>
<td>0.22</td>
<td>0.30</td>
<td>0.74</td>
<td>0.00</td>
</tr>
</tbody>
</table>

A one-way between subjects ANOVA was conducted to compare the Web 2.0 technology acceptance for elementary education, humanities, and STEM pre-service teachers. No significant effect was noted on the average TAM based upon certification at the $\alpha = 0.05$ level for the three conditions $F (2, 233) = 0.28, p = 0.80$. However, a marginally significant effect was found on the perceived ease of use construct based upon certification at the $\alpha = 0.05$ level for the three conditions $F (2, 233) = 2.83, p = 0.06$. Post hoc comparisons using the Tukey Honest Significant Difference (HSD) test indicated that the mean score for the pre-service teachers who identified as elementary education ($M = 5.18, SD = 0.64$) was significantly different than the pre-service teachers who identified STEM ($M = 4.89, SD = 0.74$). However, the pre-service teachers who identified as with humanities ($M = 5.00, SD = 0.77$) did not significantly differ from the elementary education or STEM groups. These results suggest that the certification area has an effect on the perceived ease of use for Web 2.0 technologies. Specifically, the results suggest
that those who identified with elementary education have a greater acceptance of technology than those who identified with STEM.

**Attitudes About Web 2.0 Technologies by Gender**

Participants self-identified themselves as female or male. Table 9 shows the means ($M$) and standard deviations ($SD$) for gender.

Table 9

*Demographic Statistics of the TAM by Gender of the Pre-service Teachers (N=235)*

<table>
<thead>
<tr>
<th>TAM</th>
<th>Gender</th>
<th>Female ($n = 177$)</th>
<th>Male ($n = 58$)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Average</td>
<td>M</td>
<td>SD</td>
<td>M</td>
</tr>
<tr>
<td>Attitudes toward usage</td>
<td>4.88</td>
<td>0.78</td>
<td>4.58</td>
</tr>
<tr>
<td>Perceived ease of use</td>
<td>5.02</td>
<td>0.69</td>
<td>5.00</td>
</tr>
<tr>
<td>Perceived usefulness</td>
<td>4.35</td>
<td>0.98</td>
<td>4.28</td>
</tr>
<tr>
<td>Technology complexity</td>
<td>4.79</td>
<td>0.79</td>
<td>4.55</td>
</tr>
</tbody>
</table>

The ANOVA results based upon gender are shown in Table 10.

Table 10

*ANOVA of the TAM as a Function of Gender*

<table>
<thead>
<tr>
<th>TAM</th>
<th>df</th>
<th>MS</th>
<th>F</th>
<th>p</th>
<th>$\eta^2$</th>
</tr>
</thead>
<tbody>
<tr>
<td>Average</td>
<td>1</td>
<td>1.06</td>
<td>2.68</td>
<td>0.10</td>
<td>0.01</td>
</tr>
<tr>
<td>Attitudes toward usage</td>
<td>1</td>
<td>3.86</td>
<td>5.66</td>
<td>0.02</td>
<td>0.02</td>
</tr>
<tr>
<td>Perceived ease of use</td>
<td>1</td>
<td>0.01</td>
<td>0.12</td>
<td>0.90</td>
<td>0.00</td>
</tr>
<tr>
<td>Perceived usefulness</td>
<td>1</td>
<td>0.21</td>
<td>0.19</td>
<td>0.66</td>
<td>0.00</td>
</tr>
<tr>
<td>Technology complexity</td>
<td>1</td>
<td>2.58</td>
<td>3.57</td>
<td>0.06</td>
<td>0.02</td>
</tr>
</tbody>
</table>
A one-way between subjects ANOVA was conducted to compare the Web 2.0 technology acceptance for females and males. No significant effect was seen on the overall TAM based upon gender at the $\alpha < 0.05$ level for the two conditions $F(1, 233) = 2.678, p = 0.10$. However, an effect was noted on the attitudes toward usage construct based upon gender at the $\alpha < 0.05$ level for the two conditions $F(1, 233) = 5.66, p = 0.02$. The pre-service teachers who identified as female ($M = 4.88, SD = 0.78$) significantly differed from the pre-service teachers who identified as males ($M = 4.58, SD = 0.95$). These results suggest that gender has an effect on the attitudes toward usage for Web 2.0 technologies. Specifically, the results suggest that those who identified as females tend to perceive Web 2.0 technologies as more interesting and fun than males in this study.

**Attitudes About Web 2.0 Technologies by Age Group**

The descriptive statistics for the age groups are located in Table 11. In higher education, learners are commonly categorized as traditional (18-24 years) or adult (25+ years) learners.

Table 11

*Demographic Statistics of the TAM by Age Group of the Pre-service Teachers (N=233)*

<table>
<thead>
<tr>
<th>TAM</th>
<th>Traditional (n = 201)</th>
<th></th>
<th>Adult (n = 32)</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>M</td>
<td>SD</td>
<td>M</td>
<td>SD</td>
</tr>
<tr>
<td>Average</td>
<td>4.70</td>
<td>0.61</td>
<td>4.84</td>
<td>0.77</td>
</tr>
<tr>
<td>Attitudes toward usage</td>
<td>4.78</td>
<td>0.84</td>
<td>4.90</td>
<td>0.83</td>
</tr>
<tr>
<td>Perceived ease of use</td>
<td>5.03</td>
<td>0.71</td>
<td>4.90</td>
<td>0.83</td>
</tr>
<tr>
<td>Perceived usefulness</td>
<td>4.26</td>
<td>1.04</td>
<td>4.82</td>
<td>0.98</td>
</tr>
<tr>
<td>Technology complexity</td>
<td>4.73</td>
<td>0.82</td>
<td>4.73</td>
<td>1.08</td>
</tr>
</tbody>
</table>
A one-way between subjects ANOVA was conducted to compare the Web 2.0 technology acceptance for traditional and adult learners; the results are shown in Table 12.

Table 12
ANOVA Based Upon Age

<table>
<thead>
<tr>
<th>TAM</th>
<th>df</th>
<th>MS</th>
<th>F</th>
<th>p</th>
<th>$\eta^2$</th>
</tr>
</thead>
<tbody>
<tr>
<td>Average</td>
<td>1</td>
<td>0.50</td>
<td>1.25</td>
<td>0.27</td>
<td>0.01</td>
</tr>
<tr>
<td>Attitudes toward usage</td>
<td>1</td>
<td>0.39</td>
<td>0.56</td>
<td>0.45</td>
<td>0.00</td>
</tr>
<tr>
<td>Perceived ease of use</td>
<td>1</td>
<td>0.48</td>
<td>0.90</td>
<td>0.34</td>
<td>0.00</td>
</tr>
<tr>
<td>Perceived usefulness</td>
<td>1</td>
<td>8.55</td>
<td>8.09</td>
<td>0.01</td>
<td>0.03</td>
</tr>
<tr>
<td>Technology complexity</td>
<td>1</td>
<td>0.00</td>
<td>0.00</td>
<td>0.97</td>
<td>0.00</td>
</tr>
</tbody>
</table>

No significant effect was found on the overall TAM based upon the age groups at the $\alpha = 0.05$ level for the two conditions $F(1, 232) = 1.25, p = 0.27$. However, a significant effect was seen on the perceived usefulness construct based upon age groups at the $\alpha = 0.05$ level for the two conditions $F(1, 232) = 8.09, p = 0.01$. Results of the ANOVA based upon age are presented in Table 11. The pre-service teachers who identified as traditional learners ($M = 4.26, SD = 1.04$) significantly differed from the pre-service teachers who identified as adult learners ($M = 4.82, SD = 0.98$). These results suggest that the age of the pre-service teacher has an effect on the perceived usefulness of Web 2.0 technologies. Specifically, the results suggest that those who identified as adult learners view Web 2.0 technologies as more effective and useful than traditional learners.

**Conclusion**

Chapter IV presented quantitative findings based on the two research questions relating to pre-service teachers and Web 2.0 technology acceptance. The first question
examined the correlation between pre-service teachers’ mindsets and Web 2.0 technology acceptance. The main finding was a weak positive correlation between mindset and Web 2.0 technology acceptance of pre-service teachers. Other findings were that two of the four TAM sub-variables (*perceived ease of use* and *technology complexity*) demonstrated a weak positive correlation with the Mindset scale. Pre-service teachers with higher (growth) mindset scores were more likely to view Web 2.0 technologies as easier to use and not time consuming in comparison with those with lower (fixed) mindset scores.

The second question examined differences within the pre-service teachers’ acceptance of Web 2.0 technologies using the demographic variables of certification area, gender, and age. The certification areas did not reveal a significant effect on the average TAM scores for the pre-service teachers. However, those who identified as elementary education pre-service teachers were significantly different than pre-service teachers who identified as STEM for the *perceived ease of use* construct of the TAM. No significant difference existed between the future teachers who identified with the humanities certification area and the future teachers who identified as elementary education or STEM certification areas. With respect to gender, there was no significant effect on the average TAM scores. Nevertheless, an effect was seen on the *attitudes toward usage* with females scoring higher than males. Finally, no significant effect was found on the average TAM based upon age groups. A significant effect occurred on the *perceived usefulness* construct between traditional and adult learners; the adult leaners were more likely to accept Web 2.0 technologies as useful than traditional learners. Chapter V will discuss these findings, draw conclusions, and make recommendations for further study.
CHAPTER V: DISCUSSION

The main purposes of this study were (a) to determine whether a correlation existed between pre-service teachers’ perceived mindsets and perceived attitudes about Web 2.0 technologies; and (b) to identify significant demographic differences in pre-service teachers and their attitudes about Web 2.0 technologies. It was found in this sample that the correlation between pre-service teachers’ perceived mindsets and perceived attitudes about Web 2.0 were statistically significant. In addition, significant differences were found based upon certification area, gender, and age with the sample’s attitudes about Web 2.0 tools.

Discussion of Research Question 1

Research Question 1 revealed that a statistically significant ($r = 0.16$, $p = 0.05$) correlation exists between pre-service teachers’ perceived mindsets and perceived attitudes about Web 2.0 technologies. The pre-service teachers who responded in a manner indicative of a growth mindset also had more positive attitudes about Web 2.0 technologies. However, due to the low Pearson’s correlation, practical use is minimal for these results, and they should be interpreted cautiously.

A strong correlation was hypothesized to exist between the pre-service teachers’ perceived mindsets and perceived attitudes about Web 2.0 technologies. The mindset and TAM surveys used a Likert scale ranging from 1 to 6, representing a continuum between fixed/growth mindsets and non-acceptance/acceptance of Web 2.0 tools, respectively. However, the distribution of average mindset scores ($M_{mindset} = 4.71$, $SD_{mindset} = 0.27$) and average TAM scores ($M_{TAM} = 17.34$, $SD_{TAM} = 4.12$) tended to cluster with little variation. The participants’ perceived mindset average was strongly indicative of growth mindsets,
with a small standard deviation. The pre-service teachers’ perceived mindsets were clustered rather than of dispersed, which is one explanation for the low Pearson’s correlation values between perceived mindset and perceived acceptance of Web 2.0 tools. The same line of reasoning also applied for the two statistically significant sub-variables of the TAM, *perceived ease of use* and *technology complexity*, though there were weak correlations with the mindset variable.

**Contribution to Theoretical Significance of Mindset and TAM Scales**

Many models and theories attempt to explain technology acceptance by focusing on technology-related factors (Kiraz & Ozdemir, 2006). This study focused on perceived mindsets, a concept that is not directly related to technology although it could affect the participants’ attitudes about technology. To the researcher’s knowledge, this study is one of the first attempts to measure and to report a significant correlation between pre-service teachers’ perceived mindsets and attitudes about Web 2.0 technologies. This study also adds to the body of research that investigates technology acceptance from non-technology perspectives, such as expectancy theory (Meyer, Abrami, Wade, & Scherzer, 2011); theory of planned behavior (Sugar et al., 2004); and educational ideologies (Kiraz & Ozdemir, 2006). The overall positive correlation between growth mindset and positive attitudes about social media could be attributed to the way in which those exhibiting a growth mindset approach problems. Dweck (2000) explained that students with a growth mindset put forth greater effort and more persistence when faced with challenges than students with a fixed mindset. Pre-service teachers with a growth mindset toward technology might be more likely to embrace time consuming activities such as learning to use social media for instructional purposes, including those tools that can increase student
centered learning opportunities.

**Practical Significance of the Mindset and TAM Scales**

The finding of a significant correlation between mindset and technology acceptance has an implication for practice within education. Although teachers develop their attitudes toward technology through experiences (McCombs, 2012), the way in which teachers interact or approach technology integration might influence how they incorporate technology for student learning. Research has shown that it is possible to redirect mindsets and raise achievement (e.g., demonstrate that students spent more time solving problems or obtained a higher grade point average) in the context of randomized experiments (Aronson et al., 2002; Blackwell et al., 2007; Kamins & Dweck, 1999; Mueller & Dweck, 1998). Administrators of pre-service teacher education programs may consider using Dweck’s mindset theory to help teachers integrate technology using a growth mindset for themselves and for their students. Dweck (2000) has shown that when students read and learn about the brain, including the means by which it changes and grows in response to a challenge, they were more likely to persevere when challenged. When the students learned that struggling was part of making their brains stronger, they were less likely to give up than those who had not learned that lesson. By purposely forming a culture of “growth mindset” toward technology, teacher education programs and school systems might start to meaningfully integrate Web 2.0 technologies into students’ educational lives.

The attitudes of pre-service teachers toward technology have been shown by various studies to affect the use and the integration of technology in teaching and learning (Sadaf, Newby, & Ertmer, 2013; Teo, 2009a: Teo, Chai, Hung, & Lee, 2008). Shapka
and Ferrari (2003) pointed out that students are aware of teachers’ “subtle attitudes and actions” (p. 333) about technology. Teo, Lee, and Chai (2008) reported that teachers who are more positive about technology tend to use more efficient technology integration strategies than those with a less positive attitude. In order to improve teachers’ likelihood of integrating technology for student learning, researchers have called for ongoing technology training (Christensen, 2002); using constructivist practices (Judson, 2006); presenting theory and research in a compelling manner (Meyer et al., 2011); as well as the modeling of technology by pre-service teacher faculty (Bansavich, 2006).

**Discussion of Research Question 2**

Research Question 2 examined differences in attitudes about Web 2.0 technologies based upon certification area, gender, and age group. The attitudes about Web 2.0 technologies were measured using four variables (*attitudes toward usage, perceived ease of use, perceived usefulness, and technology complexity*) of the TAM (Teo, 2010a, p. 71). Significant findings occurred in all of the demographic areas analyzed. In the area of pre-service teacher certification, the *perceived ease of use* variable was significant between the elementary education pre-service teachers and STEM pre-service teachers. The humanities group was not significantly different from the elementary education or STEM groups. Interestingly, a significant result occurred on the effect of *attitudes toward usage* variable, with women scoring higher than men. Finally, based upon age groups, a significant effect was found on the *perceived usefulness* variable with adult learners (25 years and older), who reported more positive attitudes about Web 2.0 tools in the *perceived usefulness* variable than traditional learners.
Attitudes about Web 2.0 Technologies by Certification Area

Özdamlı, Hürsen, and Özçinar (2009) noted that research is limited in the field of technology acceptance and teacher certification. Thus, the significant difference in attitudes about technology based upon certification areas adds clarity to limited findings. Shapka and Ferrari (2003) found that secondary pre-service teachers had greater computer efficacy than elementary pre-service teachers; they hypothesized that primary pre-service teachers placed more value on reading and writing skills rather than computer skills. Teo (2008) reported that primary pre-service participants had more positive attitudes about computers than the content specific (e.g., science, humanities) pre-service teachers. He speculated that the difference was due to vocational expectations, and stated that the use of technology by those in the content specific areas might require greater specification and complexity than those in the primary content area. Özdamlı et al. (2009) found no significant differences in certification areas (e.g., computer education and instructional design, physical education, languages). In the current study, there was a significant difference was noted in attitudes (i.e., perceived ease of use) between pre-service teachers in the elementary education area and those in the STEM certification area. Future elementary education teachers thought using Web 2.0 technologies would be easier to use than future STEM teachers.

The difference in elementary education and STEM pre-service teachers may be due to the applications of Web 2.0 in their certification areas. One possible explanation is the manner in which the Web 2.0 technologies are marketed. In mathematics, Web 2.0 mathematics programs or applications exist for K-12. Many mathematics programs at the elementary level are classified as game-based learning while at the secondary level the
programs are classified as calculator-based, math manipulatives, study aids, worksheets, and interactive simulations. The pre-service elementary education teachers might have been introduced to more Web 2.0 technologies that are designed to be fun and engaging to users than the STEM pre-service teachers.

**Attitudes About Web 2.0 Technologies by Gender**

According to King, Bond, and Blandford (2002); Bain and Rice (2006); and Özdamlı et al. (2009), gender gaps in the educational sector are disappearing and might have no practical importance in the future. Recent research suggested no significant gender related differences for technology use or perceptions (Bain & Rice, 2006; Birgin, Çoker, & Çatlıoğlu, 2010; Shapka & Ferrari, 2003; Teo, 2008; Teo et al., 2008). The current study generally supports these findings. No significant gender related findings existed on attitudes about Web 2.0 tools for the *perceived ease of use, perceived usefulness*, and *technology complexity* variables, which is consistent with research about the changing attitudes of women toward technology and the declining of the technological gender gap.

Researchers have examined the technology-related gender gap for decades. During the 1990s, males were found to be more experienced and more positive about computers than females, although the gap was slowly decreasing (Durndell & Thomson, 1997; Whitely, 1997). Researchers found significant differences based on the effect of gender on the use of technology (Campbell, 1990; Whitley, 1997), with men using technology more than women. Significant gender differences in attitudes toward computers persisted into this millennium (Fisher & Margolis, 2002; Markauskaite, 2006).
Interestingly, a significant effect was noted on the *attitudes toward usage* of Web 2.0 tools; female pre-service teachers perceived Web 2.0 technologies as more interesting and fun than males. One significant finding of the present study is that females reported more positive *attitudes toward usage* of technology than do males. Shapka and Ferrari (2003) indicated their research suggests that “gender effects among well-educated college-age students may be becoming a rarity” (p. 330). Compton, Burkett, and Burkett (2003) reported no difference in perceived competence of computer use based on gender. Hargittai and Shafer (2006) suggested that gender does not significantly affect online abilities (although women's self-assessed skill is significantly lower than that of men) of adult Internet users. Tsai and Tsai (2010) reported that the traditional gender gap in computer self-efficacy no longer existed in their sample of junior high students, and females had higher online Internet self-efficacy than males. In a study focusing on 21st century skills for pre-service teachers, Lambert and Gong (2010) reported no significant difference in terms of gender. The significant finding of the present study is that females have more positive attitudes about social media than males, a finding which adds to the growing body of literature that indicates the gender gap is closing.

Numerous hypotheses exist about gender effects on technology acceptance. Exposure to technology has lowered female pre-service teachers’ apprehension of technology (Khine, 2001). Shapka and Ferrari (2003) argued that computers are similar to previous technologies (e.g., driving, using a CD player), and that there is no inherent cause for one gender to outperform the other. Teo (2008) suggested that the socialization of females with technology might be a factor. Black and Spitz-Oener (2010) reported that technology might provide a more gender-neutral work environment, and in fields with
technological advances, women experienced “large relative increases” in nonroutine
interactive tasks (e.g., negotiating, training, presenting) and nonroutine-analytical tasks
(e.g., researching, designing, using and interpreting rules). Some experts suggest females
are “better suited” than males for the Web 2.0 world due to its emphasis on
communication and interpersonal skills (Cheung & Halpern, 2010).

Web 2.0 technologies are literally at the fingertips of females and males via their
smartphones or digital devices. In the STEM fields, some researchers call for diversity
training to inform females and males of their gender biases (Handelsman & Moss-
Racusin, 2013). Raymond (2013) suggested mentoring and other support programs for
women to reduce the gender gap of women in STEM fields. Programs such as Girls Who
Code encourage and teach females how to code, arguably one of the most powerful
skillsets in a technology-driven environment (Abdul-Matin, 2014). Social media tools
(e.g., Twitter, Google+) are empowering women to share their voices and experiences,
and even mentor others virtually. Caterina Fake (founder of the websites Flickr, Hunch,
and Findery); Simone Brummelhuis (founder of business magazine The Next Woman);
Jennifer Pahlka (founder of the organization Code for America); and Rashmi Sinha
(founder of the online application Slideshare) are all entrepreneurs in the technology
sphere. Each has harnessed the power of social media to operate their businesses and are
living examples of women as business leaders. Generation Z (the generation after the
Millennial Generation) might come to maturity unaware that gender discrepancies once
occurred in the technology realm — that concept might seem as antiquated to them as
attaching phones to walls.
Attitudes About Web 2.0 Technologies by Age Group

Oblerger (2003) discussed that students in higher education today come from a wider range of generations (e.g., Generation X, Millennial) and, thus, have different perceptions about the role of technology and expectations from faculty and staff of higher education institutions. The members of the Millennial Generation do not think of the Internet or smartphones as special technology — for many owning them is a way of life similar to having electricity and running water.

Web 2.0 technologies have been a consistent part of the Millennials’ education experience. On the contrary, some Generation X students might remember being introduced to the Internet during college. In the present study, participants were divided into traditional and adult learners based upon age. However, other characteristics can be used to describe adult learners, including delayed enrollment, “continual” part-time enrollment, financially independent, caretakers for children or family, single parents, employed full time (Oblinger, 2003, 2005). Knowledge of the attitudes about Web 2.0 technologies by age group might influence how teacher educators design their courses.

In the present study, a significant effect occurred in the perceived usefulness construct of the TAM. Adult learners tended to view Web 2.0 technologies as more effective and useful than traditional learners. Nellen (2003) stated that adult learners have “more preconceived notions about the importance of using technology to enhance their learning skills” (p. 290). They are seeking higher education for advancement in their jobs or to change careers with the expectation of increased income (Ntiri, 2001). Time might be the most valued commodity in an adult learner’s life. Nellen anecdotally observed that the adult learners are more motivated than traditional learners and willingly use
technology that empowers them to meet the demands of higher education. Adult learners could be more willing to commit the necessary time and energy to learn new technology skills if they feel it will help them work more efficiently, earn a higher grade, or graduate more quickly than traditional learners.

Traditional learners are digital natives and as such, might not perceive the usefulness of Web 2.0 tools, as it is all they have ever known. The traditional learner might lack experiences in communicating using traditional postal services or verbally communicating using the phone. Some traditional learners might perceive writings on papyrus and files saved to a flash drive as essentially the same — antiquated methods used long ago to save work and of little relevance in current society. The adult learners’ more positive attitudes about the perceived usefulness of Web 2.0 tools might be more related to generational experiences than attitudes about social media.

**Practical Significance of the Study**

In Research Question 1, arguably, the most practical finding involves what not to do. In the literature, no examples were found of the Mindset and TAM instruments being used for correlational studies. The Mindset instrument often is used to evaluate one’s mindset before and after a treatment, while the TAM is used in predictive studies to measure the likelihood of one using a technology. When used in the correlational study, the instruments revealed a (weak) statistically significant correlation between the future teachers’ mindsets and perceived attitudes about Web 2.0 tools. However, the practical significance was low. Thus, the results of the present study support the idea that the Mindset and TAM instruments may be inadequately in correlational studies.
The attitudes about Web 2.0 technologies of future teachers were examined based upon area, gender, and age group in Research Question 2. Although there were statistically significant findings existed in each category, the greater significance might be for teacher educators to avoid making assumptions or categorizing pre-service teachers based on demographic characteristics. Based on the results of this study, the average TAM results revealed no significant differences among the demographic groups (i.e., certification area, gender, and age group).

With respect to technology, the results from this study suggest that the differences are not overwhelming statistically significant based on certification area, gender, or age group. Teacher educators may make themselves more cognizant of biases that could be projected onto pre-service teachers as related to technology. Stereotypes concerning attitudes about Web 2.0 tools were not supported in this study — the STEM pre-service teachers had no greater affinity toward Web 2.0 tools than other certification areas, men were not more accepting of Web 2.0 technologies than women, and age was not a deciding factor in pre-service teachers’ attitudes about Web 2.0. The implication for teacher educators is to remember that pre-service teachers share more similarities than differences in their attitudes about social media.

**Limitations and Future Research Directions**

This study has many limitations. Pre-service teachers, many in their first education course, served as the participants. It is unknown how many of the participants will become teachers, how their perceptions will change if they become in-service teachers, and whether their responses reflect the attitudes of current in-service teachers. In theory, the pre-service teachers might plan to integrate Web 2.0 tools in their practice.
The reality might be that the pre-service teachers (even with the most positive attitudes about Web 2.0) could work in environments where technology resources are limited (e.g., the computer laboratory does not have enough working computers for the number of students, the computers lack consistent Internet access, or the school lacks the appropriate number of access codes for content-specific software). Thus, one limitation is that participants might exhibit a different mindset belief or acceptance of Web 2.0 tools from the research situation and in-service teaching environment.

Teo et al. (2009) discussed that pre-service and in-service teachers use technology differently; pre-service teachers do somewhat voluntarily, while in-service teachers might be required to use specific technology. For example, some Kentucky in-service teachers are now required to upload lesson plans to a statewide system. In theory, teachers could collaborate on their lesson plans if teaching the same content. At least five Kentucky in-service teachers have commented that it is another layer of documentation that does little, if anything, to enhance student learning. Yet, it is a job requirement that affects their attitudes about Web 2.0 technologies at work. Essentially, the pre-service teachers are unable to predict accurately the demands and stresses of integrating technology in a school setting. The results presented in this study are not generalizable to the population of all elementary education, humanities, and STEM pre-service teachers, as the sample was limited to Kentucky, which has a predominately rural population.

Other limitations relate to the survey instruments used in the study. Both the Mindset and TAM instruments have been extensively validated (Dweck, 2000; Teo, 2010a, 2010b). If one imagines pre-service teachers as mosaics, the two instruments provide only a few tiles of the entire picture surrounding the way in which they learn to
believe in a specific mindset or accept Web 2.0 tools. The pre-service teachers’ experiences inside and outside of academia, as well as cultural and socioeconomic factors, also might contribute to the larger mosaic of future teachers perceptions of their mindsets and accept technology. The use of surveys to collect data also presented challenges.

Due to common method variance and social desirability bias, surveys often generate inaccurate estimates. The common method variance is a situation where the true associations between variables are inflated; the result could be inaccurate inferences (Miranda & Russell, 2012; Teo, 2010a). Social desirability bias is another explanation of inflated scores related to data collected from surveys. Krumpal (2013) stated, “Due to self-presentation concerns, survey respondents under-report socially undesirable activities and over-report socially desirable ones” (p. 2025). Although the survey was anonymous, the participants, who were future teachers, might be tempted to select the “right” answer rather than the response that they tend to believe. In the Mindset survey, one prompt stated, “No matter who you are, you can significantly change your intelligence level.” One of the TAM prompts read, “Using Web 2.0 will increase my productivity.” As a future teacher, presumably someone who is skillful at taking tests and quizzes, the “right” answers are those that positively agree with the statements (regardless of what that person might truly believe). The future research suggestions section outlines possibilities to strengthen findings related to mindset and technology acceptance. Future research holds promise for examining pre-service educators’ mindsets and attitudes about Web 2.0 technologies. If this study was to be replicated, additional methods of data collection (e.g., collecting artifacts, interviewing, observing) also might improve the validity of the
data. Designing and conducting a mixed methods approach using the Mindset and TAM instruments on pre-service teachers might be useful. Future research also could include a longitudinal design to examine pre-service teachers’ perceived mindsets and attitudes about Web 2.0 technologies over time. The researcher might be able to identify changes (e.g., mindset and attitudes about technology) experienced by the pre-service teachers as they become practicing in-service teachers.

**Summary of the Study**

In summary, two research questions were examined. One focused on the perceived mindset and attitudes about Web 2.0 technologies of pre-service teachers. The second question examined how a significant correlation was found to exist between pre-service teachers’ perceived mindsets and perceived attitudes about Web 2.0 tools. However, due to the low Pearson’s $r$ value, the practical significance may be that the Mindset and TAM instruments are better suited for experimental rather than correlational research designs. Statistically significant demographic differences in pre-service teachers and their attitudes about Web 2.0 technologies were discovered for different variables of the TAM. The *perceived ease of use* variable was significant between the elementary education pre-service teachers and STEM pre-service teachers in the area of pre-service teacher certification. Based upon gender, a significant result existed on the effect of *attitudes toward usage* variable, with women reporting more positive views than men. Differentiating based upon age groups, a significant effect occurred in the *perceived usefulness* variable with adult learners, those 25 years and older, reporting more positive attitudes about Web 2.0 tools than traditional learners. Higher education faculties influence the practice of future teachers (Benson et al., 2004). Teacher educators should
model best practices for teaching and learning, which may include the incorporation of growth mindset and 21st century skills. Both growth mindset and 21st century skills are relevant to pre-service teachers, regardless of content area, gender, or age.
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APPENDIX A

The script that the administrator of survey read to participants is shown, as well as the survey.

I am asking you to complete a survey to help WKU instructor Lee Ann Smith with a research project. The survey was designed to measure pre-service teachers’ attitudes about Web 2.0 and opinions about intelligence. The survey will take about 15 minutes. By completing the survey, you give the researcher “implied consent” to use your information in her project.

The first part of the survey is about your attitudes toward Web 2.0 tools Facebook, Flickr, Google Apps, LinkedIn, Pinterest, and YouTube. Categories of Web 2.0 tools include blogging, collaborating, media sharing, social networking, and contributing to wikis. The second portion of the survey is about intelligence. The survey concludes with demographic information.

The survey contains 32 multiple-choice questions. Fill in the circle that best describes your opinion. Give only one answer to each question. If you change an answer, be sure that the previous mark is erased completely. When you complete the survey, raise your hand, and I will collect the survey from you.

Thank you for participating in the survey.
### Web 2.0

**Examples:** blogging, bookmarking/organizing, collaborating, concept mapping, media sharing, microblogging, polling, social networking, video-conferencing, creating web pages, contributing to wikis

This portion of the survey has been designed to investigate ideas about Web 2.0. There are no right or wrong answers. Please fill in the circle that corresponds to your opinion for each statement.

<table>
<thead>
<tr>
<th>Web 2.0</th>
<th>Strongly disagree</th>
<th>Disagree</th>
<th>Slightly disagree</th>
<th>Slightly agree</th>
<th>Agree</th>
<th>Strongly agree</th>
</tr>
</thead>
<tbody>
<tr>
<td>Using Web 2.0 will improve my work.</td>
<td>○</td>
<td>○</td>
<td>○</td>
<td>○</td>
<td>○</td>
<td>○</td>
</tr>
<tr>
<td>Using Web 2.0 will enhance my effectiveness.</td>
<td>○</td>
<td>○</td>
<td>○</td>
<td>○</td>
<td>○</td>
<td>○</td>
</tr>
<tr>
<td>Using Web 2.0 will increase my productivity.</td>
<td>○</td>
<td>○</td>
<td>○</td>
<td>○</td>
<td>○</td>
<td>○</td>
</tr>
<tr>
<td>I find Web 2.0 useful in my work.</td>
<td>○</td>
<td>○</td>
<td>○</td>
<td>○</td>
<td>○</td>
<td>○</td>
</tr>
<tr>
<td>My interaction with Web 2.0 is clear and understandable.</td>
<td>○</td>
<td>○</td>
<td>○</td>
<td>○</td>
<td>○</td>
<td>○</td>
</tr>
<tr>
<td>I find it easy to get Web 2.0 to do what I want it to do.</td>
<td>○</td>
<td>○</td>
<td>○</td>
<td>○</td>
<td>○</td>
<td>○</td>
</tr>
<tr>
<td>I find Web 2.0 easy to use.</td>
<td>○</td>
<td>○</td>
<td>○</td>
<td>○</td>
<td>○</td>
<td>○</td>
</tr>
<tr>
<td>Learning to use Web 2.0 takes up too much of my time.</td>
<td>○</td>
<td>○</td>
<td>○</td>
<td>○</td>
<td>○</td>
<td>○</td>
</tr>
<tr>
<td>Using Web 2.0 is so complicated that it is difficult to know what is going on.</td>
<td>○</td>
<td>○</td>
<td>○</td>
<td>○</td>
<td>○</td>
<td>○</td>
</tr>
<tr>
<td>Using Web 2.0 involves too much time.</td>
<td>○</td>
<td>○</td>
<td>○</td>
<td>○</td>
<td>○</td>
<td>○</td>
</tr>
<tr>
<td>It takes too long to learn how to use Web 2.0.</td>
<td>○</td>
<td>○</td>
<td>○</td>
<td>○</td>
<td>○</td>
<td>○</td>
</tr>
<tr>
<td>Web 2.0 makes work more interesting.</td>
<td>○</td>
<td>○</td>
<td>○</td>
<td>○</td>
<td>○</td>
<td>○</td>
</tr>
<tr>
<td>Working with Web 2.0 is fun.</td>
<td>○</td>
<td>○</td>
<td>○</td>
<td>○</td>
<td>○</td>
<td>○</td>
</tr>
<tr>
<td>I like using Web 2.0.</td>
<td>○</td>
<td>○</td>
<td>○</td>
<td>○</td>
<td>○</td>
<td>○</td>
</tr>
<tr>
<td>I look forward to those aspects of my job that require me to use Web 2.0.</td>
<td>○</td>
<td>○</td>
<td>○</td>
<td>○</td>
<td>○</td>
<td>○</td>
</tr>
</tbody>
</table>

---

**Survey adapted with permission from work by Dr. Timothy Teo examining pre-service teachers’ attitudes toward technology.**

### Technology Background

<table>
<thead>
<tr>
<th>Question</th>
<th>No</th>
<th>Personal Use</th>
<th>For School</th>
<th>For Work</th>
</tr>
</thead>
<tbody>
<tr>
<td>Do you own a smartphone?</td>
<td>○</td>
<td>No</td>
<td>○</td>
<td>○</td>
</tr>
<tr>
<td>Do you have internet service at your home?</td>
<td>○</td>
<td>No</td>
<td>○</td>
<td>○</td>
</tr>
<tr>
<td>How are you mainly exposed to Web 2.0?</td>
<td>○</td>
<td>Personal Use</td>
<td>○</td>
<td>○</td>
</tr>
</tbody>
</table>

**How do you describe your overall Web 2.0 skills?**

<table>
<thead>
<tr>
<th>Level</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>No experience</td>
<td>Competent - can perform the task with limited help</td>
</tr>
<tr>
<td>Beginner</td>
<td>Proficient - can use and create/customize many applications on my own, or can perform the task on my own</td>
</tr>
<tr>
<td>Capable</td>
<td>Export - could teach others how to use and create/customize many applications, or can teach others how the perform the task</td>
</tr>
</tbody>
</table>
This portion of the survey has been designed to investigate ideas about intelligence. There are no right or wrong answers. Please fill in the circle that corresponds to your opinion for each statement.

<table>
<thead>
<tr>
<th>Intelligence</th>
<th>Strongly disagree</th>
<th>Disagree</th>
<th>Slightly disagree</th>
<th>Slightly agree</th>
<th>Agree</th>
<th>Strongly agree</th>
</tr>
</thead>
<tbody>
<tr>
<td>You have a certain amount of intelligence, and you can't really do much to change it.</td>
<td>✘</td>
<td>✘</td>
<td>✘</td>
<td>✘</td>
<td>✘</td>
<td>✘</td>
</tr>
<tr>
<td>Your intelligence is something about you that you can't change very much.</td>
<td>✘</td>
<td>✘</td>
<td>✘</td>
<td>✘</td>
<td>✘</td>
<td>✘</td>
</tr>
<tr>
<td>No matter who you are, you can significantly change your intelligence level.</td>
<td>✘</td>
<td>✘</td>
<td>✘</td>
<td>✘</td>
<td>✘</td>
<td>✘</td>
</tr>
<tr>
<td>To be honest, you can't really change how intelligent you are.</td>
<td>✘</td>
<td>✘</td>
<td>✘</td>
<td>✘</td>
<td>✘</td>
<td>✘</td>
</tr>
<tr>
<td>You can always substantially change how intelligent you are.</td>
<td>✘</td>
<td>✘</td>
<td>✘</td>
<td>✘</td>
<td>✘</td>
<td>✘</td>
</tr>
<tr>
<td>You can learn new things, but you can't really change your basic intelligence.</td>
<td>✘</td>
<td>✘</td>
<td>✘</td>
<td>✘</td>
<td>✘</td>
<td>✘</td>
</tr>
<tr>
<td>No matter how much intelligence you have, you can always change it quite a bit.</td>
<td>✘</td>
<td>✘</td>
<td>✘</td>
<td>✘</td>
<td>✘</td>
<td>✘</td>
</tr>
<tr>
<td>You can change even your basic intelligence level considerably.</td>
<td>✘</td>
<td>✘</td>
<td>✘</td>
<td>✘</td>
<td>✘</td>
<td>✘</td>
</tr>
</tbody>
</table>

Permission granted by Dr. Carol Dweck to give “Theories of Intelligence” survey.

### Background Information

<table>
<thead>
<tr>
<th>Gender</th>
<th>Female</th>
<th>Male</th>
</tr>
</thead>
<tbody>
<tr>
<td>Campus</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Bowling Green</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Regional</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Both</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Age (circle)</td>
<td></td>
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### Certification Area

- Agriculture Education, 5-12
- Art Education
- Biological Science, 8-12
- Business and Marketing Education, 5-12
- Chemistry, 8-12
- Earth and Space Science, 8-12
- Elementary Education P-5
- English/Language Arts, 8-12
- Family and Consumer Sciences Education, 5-12
- Industrial (Vocational, Career, and Technical) Education, 5-12
- Mathematics, 8-12
- Middle Level Education in Social Studies and Language Arts
- Middle School Mathematics, 5-9
- Middle School Science, 5-9
- Modern Languages Education (French, German, Spanish), 8-12
- Music Education, P-12
- Physical Education, P-12
- Physics, 8-12
- Social Studies, 8-12
- Technology Education, 5-12

### Ethnic Background

- American Indian/Alaskan Native
- Asian/Pacific Islander
- Black/African American
- Filipino
- Mexican American/Chicano
- Puerto Rican/Cuban/Other Hispanic
- White/Caucasian
- Other
- Prefer not to respond

Thank you for participating in the survey.
APPENDIX B

The researcher received permission to use the Theories of Intelligence Scale form.

Lee Ann Smith

Monday, July 23, 2012 10:54:45 AM CT

Subject: Re: Self---Theories and pre---service teachers; permission requested
Date: Wednesday, June 27, 2012 11:59:53 AM CT
From: Maureen Sullivan
To: Smith, Lee Ann

Dear Lee Ann,

Please excuse the delayed response to your request. Yes, you may use the Theories of Intelligence Scale form. Best wishes in your work Lee Ann.

Mauree Sullivan Psychology
Department Stanford University
50 Serra Mall, Bldg 420
Stanford, CA 94305
(650) 725-2421
APPENDIX C

The researcher received permission to use the TAM form.

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**Lee Ann Smith**

Friday, July 27, 2012 11:26:16 AM CT

- **Subject:** RE: Permission requested: Adapt survey items
- **Date:** Monday, July 23, 2012 3:37:36 PM CT
- **From:** Timothy Teo
- **To:** Smith, Lee Ann

Dear Lee Ann,

Thank you for your interest in my work. Yes, you are free to use the items in my said paper. Since then, I have developed an instrument to measure technology acceptance among pre-service teachers. I attach this in case you are interested.

All the best to your research. If you do not mind, I would love to read your results when they are ready.

Regards,

Timothy
APPENDIX D

The researcher received permission to use the TAM illustration.

Dear Lee Ann Smith,

Your permissions request was forwarded to me for reply.

Permission is granted to use the following material in your dissertation at no charge:


Please use the following credit line:

“Reprinted by permission, (author), (title of article), (title of journal), volume (#), number (#), (month, year). Copyright (year), the Institute for Operations Research and the Management Sciences, 5521 Research Park Drive, Suite 200, Catonsville, Maryland 21228 USA.”

Sincerely,
Kara

Kara Tucker - Production Editor
INFORMS

INFORMS MOVED to 5521 Research Park Drive, Ste. 200, Catonsville, MD 21228
APPENDIX E

The stamped documents and approval letter from the Internal Review Board of WKU are shown.

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PARTICIPANT IMPLIED CONSENT DOCUMENT

Pre-Service Teachers: A Study of Self-Theories of Intelligence and Attitudes about Web 2.0

Lee Ann Smith, Investigator
WKU Educational Leadership Doctoral Program
270.261.1247

Martha Day, Advisor
WKU School of Teacher Education
270.745.4411

You are being asked to participate in a project conducted through Western Kentucky University. The University requires that you give your signed agreement to participate in this project.

Below you can read in detail the purpose of the project, the procedures to be used, and the potential benefits and possible risks of participation. You may ask the administrator any questions about the project.

If you decide to participate in the project, you give your “implied consent” for the information to be used by the researcher. A copy of the survey is available upon request.

1. Nature and Purpose of the Project Much research on educational technology focuses on the preparation and attitude of pre-service teachers. However, little research has been conducted regarding what future teachers think about Web 2.0 (e.g., blogging, bookmarking, media sharing, videoconferencing, creating web pages) and how they perceive their own intelligence. The proposed study includes a survey to be administered to pre-service teachers in the introductory education courses (EDU 250, SMED 101, SMED 102, and SMED 301). The proposed research results could potentially provide insight on how to better prepare potential pre-service teachers to meet technology standards in teaching.

2. Explanation of Procedures The pre-service teachers will take the survey in paper-pencil format during Fall 2012. The Investigator or course instructor will administer the survey. Participants may opt-out of the survey by not signing the consent form.

3. Discomfort and Risks No discomfort or risks are involved.

4. Benefits By taking the survey, the participants may become more aware of self-theories of intelligence and attitudes about Web 2.0 that might be useful in teaching.

Pre-service instructors will receive a summary of results that might help guide instructional decisions regarding the use of and support of technology.

5. Confidentiality All survey results will remain confidential. The surveys will not have names attached to them. They will be stored securely at the Office of Institutional Research. No personal identifying information will be linked to the survey.

6. Refusal/Withdrawal Refusal to participate in this study will have no effect on any future services you may be entitled to from the University. Anyone who agrees to participate in the study is free to withdraw from the study at anytime with no penalty.

Your continued cooperation with the following research implies your consent.

THE DATED APPROVAL ON THIS CONSENT FORM INDICATES THAT
THIS PROJECT HAS BEEN REVIEWED AND APPROVED BY
THE WESTERN KENTUCKY UNIVERSITY INSTITUTIONAL REVIEW BOARD
Paul Mooney, Human Protections Administrator
TELEPHONE: (270) 745-5793

WKU
APPROVED

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DATE: August 17, 2012

TO: Lee Ann Smith, M.A.
FROM: Western Kentucky University (WKU) IRB

PROJECT TITLE: [358193-1] Pre-Service Teachers: A Study of Self-Theories of Intelligence and Web 2.0 Skills
REFERENCE #: IRB13-017
SUBMISSION TYPE: New Project

ACTION: APPROVED
APPROVAL DATE: August 17, 2012
REVIEW TYPE: Exempt from Full Board Review

Thank you for your submission of New Project materials for this project. The Western Kentucky University (WKU) IRB has APPROVED your submission. This approval is based on an appropriate risk/benefit ratio and a project design wherein the risks have been minimized. All research must be conducted in accordance with this approved submission.

This submission has received Exempt from Full Board Review based on the applicable federal regulation.

Please remember that informed consent is a process beginning with a description of the project and insurance of participant understanding followed by an implied consent form. Informed consent must continue throughout the project via a dialogue between the researcher and research participant. Federal regulations require each participant receive a copy of the consent document.

Please note that any revision to previously approved materials must be approved by this office prior to initiation. Please use the appropriate revision forms for this procedure.

All UNANTICIPATED PROBLEMS involving risks to subjects or others and SERIOUS and UNEXPECTED adverse events must be reported promptly to this office. Please use the appropriate reporting forms for this procedure. All FDA and sponsor reporting requirements should also be followed.

All NON-COMPLIANCE issues or COMPLAINTS regarding this project must be reported promptly to this office.

This project has been determined to be a Minimal Risk project.

Please note that all research records must be retained for a minimum of three years after the completion of the project.
If you have any questions, please contact Paul Mooney at (270) 745-2129 or paul.mooney@wku.edu. Please include your project title and reference number in all correspondence with this committee.

This letter has been electronically signed in accordance with all applicable regulations, and a copy is retained within Western Kentucky University (WKU) IRB’s records.