Perceived Usefulness, Perceived Ease of Use, Computer Attitude, and Using Experience of Web 2.0 Applications as Predictors of Intent to Use Web 2.0 by Pre-service Teachers for Teaching

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Yu-Fang Chiou
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This dissertation titled
Perceived Usefulness, Perceived Ease of Use, Computer Attitude, and Using Experience
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for Teaching

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ABSTRACT

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Perceived Usefulness, Perceived Ease of Use, Computer Attitude, and Using Experience of Web 2.0 Applications as Predictors of Intent to use Web 2.0 by Pre-service Teachers for Teaching

Director of Dissertation: Teresa Franklin

The study aims to investigate pre-service teachers’ perceptions towards Web 2.0 applications. Although the literature reveals that technology integration is a trend in higher education and researchers and educators have increasingly shared their ideas and examples of implementations of Web 2.0 applications in educational domains, few studies have focused on understanding whether pre-service teachers perceive Web 2.0 applications as effective teaching and learning tools. This study attempts to investigate to what extent computer attitude, perceived usefulness, perceived ease of use, and using experience of Web 2.0 predict the intention to use Web 2.0 applications in future teaching among pre-service teachers.

A quantitative research method was used in the study and a paper-and-pencil questionnaire was conducted. A total of 125 participants from the teacher preparation program in a large Midwestern university were analyzed through the statistical method, multiple regression.

The multiple regression analysis rejected the null hypothesis and showed that computer attitude, perceived usefulness, perceived ease of use, and using experience of Web 2.0 are significant predictors of the dependent variable, behavioral intention to use...
Web 2.0. Approximately 71% of the variance of the behavioral intention to use Web 2.0 can be accounted for by the linear relationship of the four independent variables. Three of the independent variables, perceived usefulness, computer attitude, and using experience of Web 2.0, are statistically significant in predicting the behavioral intention to use Web 2.0.

Approved: ________________________________________________________________

Teresa Franklin

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CHAPTER ONE: INTRODUCTION

Background of Study

The rapid evolution of technology and its changes to education have made teachers think about what accommodations they have to make in order to best prepare their students in the twenty-first century (Solomon & Schrum, 2007). The technology literacy that students have to acquire in order to compete with others around the world has been re-defined in a technology-enhanced learning environment. In the twenty-first century, a multiliterate person is one who

is flexible and strategic and can understand and use literacy and literate practices with a range of texts and technologies; in socially responsible ways; in a socially, culturally, and linguistically diverse world; and to fully participate in life as an active and informed citizen. (Anstey & Bull, 2006, p. 55)

Moreover, many web-based applications have emerged and are now being considered as potential teaching and learning tools by researchers and educators. Many of these web-based applications can be categorized as a part of Web 2.0, which is one of the areas where researchers and educators have placed their focus (Anderson, 2007; Solomon & Schrum, 2007).

Web 2.0

The term ‘Web 2.0’ was coined during a team discussion session in 2004 between O’Reilly and MediaLive International (O’Reilly, 2005). In this conference, they agreed that “far from having ‘crashed’, the web was more important than ever, with exciting new
applications and sites popping up with surprising regularity” (O’Reilly, 2005, para. 2).

Web 2.0, the second generation of the Web, refers to a collection of web-based technologies, including blogs, wikis, audio-podcasting, video-podcasting, RSS feeds, social bookmarking and tagging, social networking, multimedia sharing, and so on (Anderson, 2007; O’Reilly, 2005).

The concept of the Web and its accompanying applications and services are continually being updated and changing how people communicate with each other. In comparing Web 1.0 to Web 2.0, the ways people interact with the Web have been different. For instance, in the Web 1.0 phase, a website is delivered with static text and images. Students log into the Web to search for information and use it for their school work and/or personal uses. In the Web 2.0 phase, the new Web serves as a platform and encourages users to be more collaborative, content sharing, and interactive on the Web. (Anderson, 2007; Davis, 2009; Gibbons, 2007). Students not only search for information on the Web for their personal lives and school work, but act as creators to share information and their knowledge, experiences and/or opinions with people on the Web.

As Tim O’Reilly stated in 2005, in the Web 2.0 era, the read-only feature of the Web has been replaced with read and write. Web 2.0 tools are interactive and allow users to have preferences for own instruction. The principles of the concepts underlying Web 2.0 are summarized as following:

1. In the Web 2.0 world, the Web serves as a “platform” (O’Reilly, 2005, para. 7) or base to support dynamic services delivery (Gibbons, 2007)

2. In the Web 2.0 era, the features of the Web have been transformed from “read
only” (Thompson, 2007, p. 1) to “read/write” (Thompson, 2007, p. 1) where individuals can contribute and share their ideas with each other (Richardson, 2006).

3. Web 2.0 encourages people to participate in more social networking activities on the Web (Jonassen, Howland, Marra, & Crismond, 2008).

4. Core Web 2.0 tools/services include blogs, wikis, tagging and social bookmarking, RSS, multimedia sharing (e.g. YouTube, audio- and video-podcasting, photo sharing), Google applications, and social networking sites, etc (Anderson, 2007; McLester, 2007).

21st Century Skills for Learning

In the global village that exists today, competition among students crosses national boundaries. Students must compete with others from different countries, making it necessary to develop new knowledge and skills in order to be successful and capable of coping with any difficulties they meet in the twenty-first century (Solomon & Schrum, 2007).

The North Central Regional Educational Laboratory (NCREL) (2003) has suggested that policymakers and educators consider four categories of skills within academic standards that students need to acquire: “digital-age literacy, inventive thinking, effective communication, and high productivity” (p. 12). The Partnership for 21st Century Skills, has also reported six main components to foster 21st century learning: “emphasize core subjects, emphasize learning skills, use 21st century tools to develop learning skills,
teach and learn in a 21st century context, teach and learn 21st century content, and use 21st century assessments that measure 21st century skills” (2004, p. 4).

Moreover, the report of the Partnership (2004) pointed out that “today’s education system faces irrelevance unless we bridge the gap between how students live and how they learn” (p. 5). Although students’ lives are surrounded by Web 2.0 tools, “schools must help them use the tools to acquire new skills, not just play with them” (Solomon & Schrum, 2007, p. 19).

*Pre-service Teachers in the Undergraduate Teacher Education Programs*

Prensky (2001) defined the generation born between 1982 and 1994 as “Digital Natives” (p. 1) who grew up with digital technologies, including computers, cell phones, multimedia devices, instant messaging, and the Internet, etc. There are other terms, such as the Net Generation or Generation Y (Kennedy et al., 2007) used to label this group of people. Since many currently enrolled pre-service teachers in the teacher preparation programs are categorized as Digital Natives, it seems reasonable to assume that digital technologies are part of their lives, and their immersion in technologies in their developmental years has more explanation of their learning experiences in general and attitudes toward technology use (Kennedy et. al., 2007). Nevertheless, research studies indicated that not every individual of the Net Generation is tech-savvy. Not all students have learning experience with technologies and homogeneous technology skills (Bennett, Maton, & Kervin, 2008; Kennedy, Judd, Churchward, Gray, & Krause, 2008).
Statement of the Problem

Although currently enrolled pre-service teachers are from the generation who “have spent their entire lives surrounded by and using computers, videogames, digital music players, video games, cell phones, and all the other toys and tools of the digital age” (Prensky, 2001, p. 1), it does not necessarily mean that they embrace technology in their personal lives and approaches to teaching. Due to the lack of effective technology integration training in teacher preparation programs, research studies have indicated that pre-service teachers feel hopeless about the implementation of technology in their future teaching activity (Swain, 2006; Williams & Foulger, 2006).

Web 2.0 has been the subject of much recent discussion among researchers and educators regarding ways to implement Web 2.0 tools in PK-12 and higher education. However, one may still ask if pre-service teachers use Web 2.0 tools at all? An important question therefore is, do pre-service teachers have positive attitudes towards utilizing Web 2.0 in their current learning and future teaching as K-12 educators?

Purpose of the Study

The purpose of the study is to determine pre-service teachers’ intention to use Web 2.0 applications in their future classrooms by assessing their perceptions towards Web 2.0 applications. Although Web 2.0 tools are not newly available on the market and their implementation in the educational domain has been increasingly discussed by researchers and educators, the perceptions of pre-service teachers towards Web 2.0 applications and their intention to integrate Web 2.0 applications in their future teaching activities remain unknown. This study attempts to examine pre-service teachers’ attitudes...
towards the use of Web 2.0 to predict their future intentions to integrate Web 2.0 applications in the classrooms.

The Technology Acceptance Model (TAM) is used in this study to measure pre-service teachers’ intention to use Web 2.0 applications in the future teaching approaches. This model uses two specific variables, perceived usefulness and perceived ease of use, as the fundamental determinants to predict behavioral intention to use a technology innovation (Teo, Luan & Sing, 2008). In order to understand how pre-service teachers perceive Web 2.0 applications as innovative technology-enhanced teaching and learning tools and predict their future intention to use Web 2.0 applications, two specific variables in the TAM are applied to the research method of the study.

Computer attitude has been recognized as a critical factor that can be employed to predict pre-service teachers

Research Question

The following research question is the focus of the study:

How well do the predictors (1) perceived usefulness, (2) perceived ease of use, (3) computer attitude, and (4) experience using Web 2.0 applications predict the intentions of pre-service teachers to use Web 2.0 in the future?

To answer the research question above, the perception of pre-service teachers towards Web 2.0 tools and their future intention to use Web 2.0 applications were examined using four factors: (1) perceived usefulness, (2) perceived ease of use, (3) computer attitude, and (4) experience using Web 2.0 applications. The examined population was pre-service teachers who were enrolled in a teacher preparation program,
intended to seek teaching licensure from preschool through grade 12, and took an instructional technology course as a requirement of the program of study.

Significance of the Study

The study aimed to investigate pre-service teachers’ attitudes toward Web 2.0 applications. As Web 2.0 applications have been widely discussed and promoted by educators in terms of educational implementation, this study provided insight into the utilization of Web 2.0 applications and pre-service teachers’ future intentions to use Web 2.0 applications.

Delimitations of the Study

The study was conducted in the undergraduate teacher preparation programs of a Midwestern college of education, which included the teaching fields: Early Childhood, Middle Childhood, Adolescent to Young Adult, Special Education-Intervention Specialists Program, and Multi-Age Education (P-12 Special Field).

The sample population was selected from the undergraduate students who were enrolled in the teacher education programs of a Midwestern college of education and took an instructional technology course during the period of data collection.

Two pilot studies were conducted to clarify confusing or misleading questions. The research instrument was then refined based on the results of the pilot studies and the advice from the dissertation committee.

Limitations of the Study

This study was limited to the pre-service teachers in the teacher preparation program at a Midwestern university in the United States. Although many characteristics
may be shared with other pre-service teachers in different teacher preparation programs, there are unpredictable factors (e.g. personal interests) that can influence the application of the results of the study nationwide.

The sample size in this study is 125. This is a small size and as a result drawing generalized conclusions about the full range of pre-service teachers is problematic.

Due to the research design, a questionnaire was used as an instrument for data collection. The response to each item in the questionnaire fully depended on the respondents’ honesty and ability to interpret and understand each question. The conclusions were therefore based on the assumption that the respondents answered truthfully.

Definitions of Terms

*Behavioral intention to use:* Theory of Reasoned Action (TRA) “assumed to be closely linked to actual behavior” (King & He, 2006, p. 740), and is used as a predictor to predict the actual usage (Davis, 1989; Turner et al., 2010).

*Blogs:* Web logs or chronological online personal journals that can be commented and subscribed to by other people (McLester, 2007).

*Google applications:* includes Google Docs, “an online word-processing, spreadsheet-developing, and presentation-generating tool that includes a free storage repository” (Adam, 2008, p. 98), Google Calendar, “an online multicalendar application that includes limitless color-coded calendars in which events can be scheduled indefinitely” (Adam, 2008, p. 98), and others.
Podcasts: “a syndicated audio (or video) program produced either by traditional media, such as radio and television, or by individuals, including educators, hobbyists, students, or other enthusiastic passionate about a topic” (McLester, 2007, p. 22).

Pre-service teachers: undergraduate students who are currently enrolled in teacher preparation programs and are seeking a PK-12 teacher’s license in the near future.

RSS: an abbreviation of Really Simple Syndication which is “a format for aggregating Web content in one place” (McLester, 2007, p. 22).

Social bookmarking service(s): “provide a way for users to store, categorize, and share their Internet bookmarks” (Kennedy et al., 2007, p. 518).

Social networking service(s): a website that offers users the ability to create a personal profile, connect with other users with similar interests, and become a part of new social networks (Kennedy et al., 2007).

Web 2.0: the term Web 2.0 invented in 2004 to refer to web-based applications that foster collaboration, user participation, interactivity, and content sharing; includes blogs, wikis, social networks, tagging and bookmarking, multimedia and file sharing, syndication, and podcasts (Davis, 2009).

Wikis: collaborative websites that allow users to add, remove, or edit available content (McLester, 2007).

Organization of the Study

This study is organized into five chapters.

Chapter one introduces the study, which includes the background, research questions, the purpose, delimitations and limitations of the study.
Chapter two presents a review of the related literature on Web 2.0 and its applications, Constructivism and Web 2.0, the analysis of pre-service teachers’ characteristics, technology integration in the teacher preparation programs, and the model and predictors that can be used to assess intention to use a technology innovation.

Chapter three describes the methodology used in the study, which includes research questions, research methods, target population, sampling plan, research instruments, variables, data collection procedure, and data analysis.

Chapter four presents the results and findings of the data.

Chapter five discusses the conclusions of the study and recommendations for further studies.
CHAPTER TWO: LITERATURE REVIEW

21st Century Skills: Technology Literacy

The rapid evolution of technology and its changes to education have made teachers think about what accommodations they have to make in order to best prepare students in a digital age as well as what technology literacy skills their students have to acquire in order to be successful in a heavily technology-oriented society and workplace. Most important among these changes is the “shift from traditional literacy to twenty-first century multiliteracies” (Borsheim, Merritt, & Reed, 2008, p. 87), which has begun to catch teachers’ attention (Borsheim, Merritt, & Reed, 2008).

The term multiliteracies, first introduced by the New London Group, was based on the assumption that technologies, including computers, multimedia devices, Internet and Web 2.0 applications (blogs, wikis, social networking sites, etc.) have influenced “the nature of texts” (Borsheim, Merritt, & Reed, 2008, p. 87) and the way people utilize texts to communicate with others (Borsheim, Merritt, & Reed, 2008). Anstey and Bull (2006) further defined a multiliterate person as one who “is flexible and strategic and can understand and use literacy and literate practices with a range of texts and technologies; in socially responsible ways; in a socially, culturally, and linguistically diverse world; and to fully participate in life as an active and informed citizen” (p. 55).

Teachers who use a multiliteracy approach offer students opportunities to manipulate information “from a variety of multimedia and multimodal sources” (Borsheim, Merritt, & Reed, 2008, p. 87) and encourage students to “collaborate in real
and virtual spaces to produce and publish multimedia and multimodal texts for a variety of audiences and purposes” (Borsheim, Merritt, & Reed, 2008, p. 87).

Visual literacy has been another focus of the educational revolution since visual information has become now available everywhere on the Web. In any school library or computer lab, it would not be so surprising to see that students’ learning has been affected by visual information (Jake, 2007). “Students may be asked to access the power of viral video on political elections by watching YouTube entries” (Jakes, 2007, p. 21) and “a geography teacher may be leading students in a lesson about the 1906 Earthquake using a Google Earth lesson from the United States Geological Survey” (Jakes, 2007, p. 21). These examples portray the changes that teachers make in terms of implementing new technologies in the classrooms. With the development of Web 2.0 tools, visual literacy has been acknowledged as critical by the Partnership for 21st Century Skills (2004), so it is important for educators to help students obtain the skills to browse, evaluate, and to interact with visual information (Jakes, 2007).

In addition, numerous technology standards aligned with curricula have been developed and aimed at improving and maintaining the quality of technology education as well as pushing the technology literacy into the mainstream (Pearson, 2004).

A 2000 publication entitled Standards for Technological Literacy: Content for the Study of Technology has been viewed as the critical historical turning point of technology education (Pearson, 2004). The technology content standards have defined “what students should know and be able to do in order to be technologically literate and provides standards that prescribe what the outcomes of the study of technology in grades K-12
should be” (International Technology Education Association, 2004, p. 2). The standards ensure that students acquire an effective technology education by engaging in consistent content for the study of technology (International Technology Education Association, 2004).

The National Educational Technology Standards (NETS) for students and teachers, released by the organization International Society for Technology in Education (ISTE), defined the essential “concepts, knowledge, skills and attitudes for applying technology in educational settings” (ISTE, 2000, para. 2) as well as provided educators with a pedagogical framework in terms of supporting technology-enhanced learning in the digital age (ISTE, 2008). The National Educational Technology Standards for Teachers (NETS•T) 2008 presented five key concepts, including:

1. Facilitate and inspire student learning and creativity
2. Design and develop digital-age learning experiences and assessments
3. Model digital-age work and learning
4. Promote and model digital citizenship and responsibility
5. Engage in professional growth and leadership (ISTE, 2008, para. 1).

In sum, these technology standards offer educators a clear pedagogical framework of facilitating technology-enhanced learning as well as give them an overview of what multiliterate skills their students will require to succeed in the twenty-first century.

21st Century Learning

In the United States, an increasing focus in education is the competitive assessment of American students in the global technology-driven society of the twenty-
first century. Whether the students in the United States are ready to compete with others around the world has become a concern for educators. A national organization, the Partnership for 21st Century Skills (2004), has pointed out that educational results in the United States reveal that students in the U.S. are no longer in an advantageous position. Rather, students around the world are ahead of American students on assessments that measure twenty-first century skills. In the digital age, competition is not limited to a nation’s borders, but has become worldwide. As the United States competes in a global economy that requires innovation, innovators around the world have pushed American students to obtain the required twenty-first century skills necessary to perform better and be successful in both the workplace and life.

In 2004, the Partnership for 21st Century Skills identified six elements key to fostering twenty-first century learning: “emphasize core subjects, emphasize learning skills, use 21st-century tools to develop learning skills, teach and learn in a 21st-century context, teach and learn 21st-century content, and use 21st-century assessments that measure 21st-century skills” (p. 6).

In a later 2009 report, five twenty-first century content areas, including “global awareness, financial literacy, civic literacy, health literacy and environmental literacy” (Partnership for 21st Century Skills, 2009, p. 2), were identified as essential to student success. Additionally, since “we live in a technology and media-driven environment” (Partnership for 21st Century Skills, 2009, p. 2) and access profound information everyday, the use of technology and “the ability to collaborate and make individual contributions” (Partnership for 21st Century Skills, 2009, p. 2) requires individuals to
acquire “information literacy, media literacy, ICT (information, communications and technology) literacy” (Partnership for 21st Century Skills, 2009, p. 2).

The North Central Regional Educational Laboratory (NCREL, 2003) suggested that policy makers and educators consider four categories of twenty-first century skills within academic standards that students need to acquire. They are as follows:

1. Digital-age literacy, which includes (1) basic, scientific, economic, and technological literacies (2) visual and information literacies (3) multicultural literacy and global awareness.

2. Inventive thinking, which includes (1) adaptability, managing complexity, and self-direction (2) curiosity, creativity, and risk taking (3) high-order thinking and sound reasoning.

3. Effective communication, which includes (1) teaming, collaboration, and interpersonal skills (2) personal, social, and civic responsibility (3) interactive communication.

4. High productivity, which includes (1) prioritizing, planning, and managing for results (2) effective use of real-world tools (3) ability to produce relevant, high-quality products. (p. 5)

As the Partnership (2004) reported, “today’s education system faces irrelevance unless we bridge the gap between how students live and how they learn” (p. 5). Students’ lives are surrounded by Web 2.0 tools but “schools must help them use the tools to acquire new skills, not just play with them” (Solomon & Schrum, 2007, p. 19). Meanwhile, educators have to revamp and extend their knowledge and skills of
technology in order to “address new literacies requisite” (Alexander, 2008, p. 159) for a Web 2.0 world.

Web 2.0 and Its Application

Concepts and Principles Behind Web 2.0

As the inventor of the Web, Tim Berners-Lee, began development of the World Wide Web in 1989; his initial vision of the Web was “a read-write-web” (Ullrich et al., 2008, p. 705), where everyone could add and/or edit Web pages, making it a collaborative medium (Richardson, 2006; Ullrich et al., 2008). However, because of the immature technological support, his conception of the Web was not carried out until the emergence of Web 2.0.

Until the end of the 20th century, the Web remained primarily a place for people to read only. With the onset of the 21st century and Web 2.0, the read only feature has been replaced with read and write. Instead of a one-way, unidirectional channel of interaction with the Web, Web 2.0 not only offers more power to master and share content, but also encourages more interactivity and participation with the content on the Web (Richardson, 2006).

In order to convey the concept that the Web was “more important than ever, with exciting new applications and sites popping up with surprising regularity” (O’Reilly, 2005, p. 1), the term Web 2.0 was invented in 2004 during a discussion session among Tim O’Reilly and his team workers; however, no consensus on definition was reached. As Anderson (2007) argued, Web 2.0 may have different meanings to different people; its definition depends on whom you ask. For instance, “a Web technologist will give
quite a different answer to a marketing student or an economic professor’” (Anderson, 2007, p. 5). It is hard to give a precise definition of Web 2.0.

But in general, for many people Web 2.0 is associated with a collection of technologies, which enhance the experience of “a more socially connected Web” (Anderson, 2007, p. 4) that allows everyone to add and edit Web information. Web 2.0 does not mean a whole new Web. Rather, it is the term used to distinguish this version of the Web from the previous generation of web-based applications (Ullrich et al., 2008). In other words, it is the second generation of the Web and “a consequence of a more fully implemented Web” (Anderson, 2007, p. 6).

Alexander (2008) describes Web 2.0 with more details as:

a way of creating Web pages focusing on microcontent and social connections between people. It also exemplifies that digital content can be copied, moved, altered, remixed, and linked, based on the needs, interests, and abilities of users — quite against the grain of both traditional and recently-expanded copyright. (p. 151)

Davis (2009) added that the ideas behind Web 2.0 include fostering collaboration among users, encouraging people to have more interaction with the Web and sharing content with others on the Web.

In 2005, O’Reilly published an article to list and describe the seven principles behind the concepts of Web 2.0 design patterns, including:

1. The Web As Platform
2. Harnessing Collective Intelligence
3. Data is the Next Intel Inside
4. End of the Software Release Cycle
5. Lightweight Programming Models
6. Software Above the Level of a Single Device

Later, Anderson (2007) revised these ideas into six big concepts of what he called “the big idea behind Web 2.0” (p. 14) based on the original principles outlined by O’Reilly; they are as follows:

1. Individual Production and User Generated Content
2. Harnessing the Power of the Crowd
3. Data on an Epic Scale
4. Architecture of Participation
5. Network Effects

Based on the concept of O’Reilly (2005) and Anderson (2007), Web 2.0 principles were further refined by Ullrich et al. (2008) as follows:

*Individual Creativity.* Web 2.0 encourages users to have active participation; that is Web 2.0 applications give users permission to publish and store textual information on the Web, either by individuals (e.g. blogs) or collaboratively (e.g. wikis), and allow users to upload and share multimedia materials, like audio recordings (e.g. podcasts) or pictures, and so on. By providing easy-to-operate desktop interfaces of Web 2.0
applications, users can easily produce content and manipulate it on the Web to share with other users (Ullrich et al., 2008).

Harnessing the Power of the Crowd. Web 2.0 is characterized by the fact that its value stimulates more people to use it. Traditional static websites do not improve themselves after lots of users visit and browse Web pages. On the contrary, Web 2.0 applications, such as wikis, empower users to work collaboratively to add, edit and update the information on the websites (Ullrich et al., 2008).

Diverse Data on an Epic Scale. Data in Web 2.0 is critical and works as a function. Take the famous social bookmarking site, del.icio.us, as an example; the value of this site is users’ offering tags which link to a “massive amount of annotated resources” (Ullrich et al., 2008, p. 707). Web 2.0 applications encourage users’ contributions and participation by different measures, such as “building trust (e.g., offering users to leave with an export of their data), by explicit licenses (often open licenses such as Creative Commons), and paradoxically, by making content accessible through RSS syndication and APIs” (Ullrich et al., 2008, p. 707).

Architecture of Assembly. Users can access the data of Web 2.0 applications by navigating the websites or through APIs (Application Programming Interfaces). API enables users to add, edit and retrieve data. Besides, content can be pulled by subscribing to RSS feeds without visiting the Website itself. In particular, most of the content created in Web 2.0 applications is “micro-content” (Ullrich et al., 2008, p. 708). Alexander (2008) defined micro-content as “simply small content-small in terms of size and contributor effort” (p. 152), such as blog entries, photos, audio or other multimedia content, wikis,
etc. Additionally, micro-content can be easily “combined with other data” (Ullrich et al., 2008, p. 708) and applications. For instance, many blog applications (e.g. blogger) allow users to embed multimedia materials or put links to other applications (e.g. YouTube videos) in blog posts (Alexander, 2008).

**Independent Access to Data.** Web 2.0 applications enhance the participation of users by offering them multiple resources and access. Compared to traditional PC browsers, mobile devices, such as PDAs and mobile phones, entice more users to use Web 2.0 applications and allow data to be accessed and disseminated (Ullrich et al., 2008).

Besides device independence, the data on the Web pages has turned out to be “independent of the intended usage of the server and, as a consequence, resources located at an URL become usable in a number of ways” (Ullrich et al., 2008, p. 707).

**Leveraging the Long Tail.** It is commonly agreed that applying the long tail concept in the Web 2.0 context was first used by Anderson (2006). In 2006 *Wired* editor, Chris Anderson, wrote a book titled *The Long Tail*, which introduces the idea that “the economic and social implications of the fact that the distribution of many facets of life on the Web is unequal and follows a power law” (Anderson, 2007, p. 23).

Although the concept of the long tail was originally “used in statistics to describe distributions that decline very slowly after an initial sharp drop” (Rollett, Lux, Strohmaier, Dosinger, & Tochtermann, 2007, p. 90), as a design pattern, it means that “it is not the top sellers and the most popular topics that make up the majority of the web, but rather a
huge number of specialized topics and small communities” (Rollett, Lux, Strohmaier, Dosinger, & Tochtermann, 2007, p. 90).

*Lightweight Models.* The emphasis on high-level functionality is one of the features of Web 2.0 application development. The maturity of open source software has allowed the creation of Web 2.0 applications that focus on high-level functionality (Ullrich et al., 2008, p. 707).

**Web 2.0 Learning**

Change is a part of the field of higher education, and technological developments have played a role in effecting it. New ideas and visions are constantly adapted and adopted in education. New educational teaching methods are introduced to and evaluated by educators “to support complex learning and the development of professional competencies” (Jochems, Merrienboer, & Koper, 2004, p. 1). Engaging students in a collaborative learning environment and encouraging them to develop “higher-order skills, such as problem-solving, learning strategies, and self-regulation,” (Jochems, Merrienboer, & Koper, 2004, p. 1) are emphasized in order to achieve the goals of new educational methods.

Web 2.0 tools are constantly changing how people interact with the world as well as how they make sense of the world’s signals (Solomon & Schrum, 2007). Carmean’s study (2008) showed that networking software has changed how people learn. People need new teaching and learning strategies and tools to cope with new tasks that have been generated from the evolution of technology in the twenty-first century. Certainly, it is a challenge for teachers to familiarize themselves with these new tools and catch up with
their students’ pace in order to meet students’ individual needs. As Solomon and Schrum (2007) stated, “the world has changed; our students have changed, and traditional schools are no longer up to the task of educating young people for the future” (p. 1).

Furthermore, participation is another focus of Web 2.0 learning. Ullrich et al. (2008) pointed out that

the stimulation of active participation distinguishes Web 2.0 based learning from traditional ‘Web 1.0’ learning, which is exemplified in traditional learning management systems, where users read Web pages and solve exercises but cannot contribute and social interactions are restricted to forums. (p. 707)

Web 2.0 learning stresses the importance of engaging students in student-centered, open, and collaborative learning activities where participation is a crucial component for success in a web-based learning environment (Boulos & Wheelert, 2007).

Web 2.0 applications and practices have been incorporated into teaching and learning activities in education settings for years. Dohn (2009) listed some reasons for doing so. First of all, Web 2.0 applications are not new to young people but have been voluntarily used in their leisure time. Just like McLester (2009) claimed, using these technologies is second nature for kids. A 2007 national survey result conducted by the Pew Internet & American Life Project showed that “55 percent of all online American young people between the ages of 12 and 17 use social networking sites for communicating about everything from school-related issues to where the next party is taking place” (McLester, 2009, p. 21). Since students already have basic computer
operation skills and experience using Web 2.0 applications, utilizing these technologies in the classroom will motivate them and facilitate learning.

Secondly, from a “lifelong and life-wide perspective” (Dohn, 2009, p. 344), the user-centered focus feature of Web 2.0 activities “supports the learner in transgressing and resituating content and practices between formal and informal learning settings in which s/he participates” (Dohn, 2009, p. 344). Thirdly, the ideas behind Web 2.0 applications include fostering collaboration, participation, communication and production among learners, which seem to be ideal for engaging learners to learn actively and work collaboratively. Fourthly, many of the possible future jobs student may have will require them to have competence in the use of Web 2.0, such as browsing, communication and critical assessment (Dohn, 2009).

Web 2.0 Tools and the Implementation in Classrooms

A number of Web 2.0 tools have been used for educational purposes for years or at least students and teachers have been aware of them, and researchers and educators have shared their experiences and ideas to put Web 2.0 into practice in classrooms to enhance learning. These Web 2.0 tools can be categorized as social software, multimedia sharing, tagging and social bookmarking, RSS, Google applications, and so on (Anderson, 2007; O’Reilly 2005; Solomon & Schrum, 2007).

Social Software

The concept of social software, which covers major components of the Web 2.0 movement, can be traced back to “the 1960s and JCR Licklider’s thoughts on using networked computing to connect people in order to boost their knowledge and their
ability to learn” (Alexander, 2006, p. 33). In the past few years, a select group of Internet-based applications have been perceived as social software due to their particular “interactive collaborative” (Cochrane, 2006, p. 144) features; they are blogs, wikis, podcasting, and social networking sites, etc.

**Blogs.**

According to Anderson (2007), “the term web-log, or blog, was coined by Jorn Barger in 1997 and refers to a simple webpage consisting of brief paragraphs of opinions, information, personal diary entries, or links, called posts, arranged chronologically with the most recent first, in the style of an online journal” (p. 7). This suggests that a blog is typically formed by “time-stamped entries” posted by the primary author (Davis, 2009, p. 183).

Most blogs give visitors the right to post a comment below an entry. These posts and comments develop a blogging system for the primary author of the blog to have a conversation with the visitors who add comments. Sometimes visitors communicate with each other, thus these visitors can be treated as a group of secondary contributors to a blog (Anderson, 2007).

Typically, the newest post shows on the homepage of a blog, and it can take a while to trace a certain piece of an entry when an individual revisits the site after a period of time. Each subject of the post is usually tagged with at least one key word, which helps bloggers categorize posts when the post content gets older and makes a blog become “a standard, theme-based menu system” (Anderson, 2007, p. 7).
Linking is another main component of blogging to “deepen the conversational nature of blogosphere and its sense of immediacy” (Anderson, 2007, p. 7). Three features of blogging systems are the permalink, trackback and blogroll. The permalink means that once an entry is posted, the blogging system will generate a permanent particular URL for that post. The permalink remains the same even “if the post is renamed or if the content is changed” (Anderson, 2007, p. 7). The trackback allows a blogger (blogger A) to give another blogger (blogger B) a notice that blogger B’s post has been referenced or commented on. After receiving the notice from blogger A, a trackback will be created and a permalink of the referring post is generated automatically in blog B’s system. “The blogroll is a list of links to blogs that a blogger likes or finds useful” (Anderson, 2007, p. 8), which is similar to a blogger’s favorite list or bookmarks.

Davis (2009) suggested that an instructor can use blogs for many purposes, such as providing answers to questions, creating a forum for peer review, with students posting their drafts of papers so that other students can read and comment on them, and so on. Another example of using a blog for educational purposes is group projects. Students can be engaged in discussions and debates in a flexible learning environment that allows the incorporation of multimedia, such as photos, videos, and audios (Page & Ali, 2009). A research study showed that implementing blogs effectively in medical education contributes to engaging learners in a cyber learning environment (Boulos, Maramba, & Wheeler, 2006).
**Wikis.**

The first wiki was developed by Ward Cunningham in 1995, and the word wiki can be traced to the Hawaiian word, wikiwiki, which “means ‘quick’ or ‘hurry’” (as cited in Ebersbach, Glaser, Heigl, & Warta, 2008, p. 11). The name actually represents the programming characteristics of wiki software which allows the content to be edited quickly and easily. Anderson (2007) stated that “a wiki is a webpage or set of Web pages that can be easily edited by anyone who is allowed access” (p. 8). On a wiki page, an edit button is displayed for users to click in order to access an online editing tool which enables users to change or delete the content of the page.

Anderson (2007) noted that the popularity of Wikipedia, an online encyclopedia, is a good example representing the concept of wiki as a collaborative tool to facilitate a productive group work. Nevertheless, with Wikipedia as an example, openness, which allows full access for users to edit the content, can cause the problem of “malicious editing and vandalism” (p. 8-9); though, some people have argued that such a problem can be justified by “the self-moderation processes at work” (Anderson, 2007, p. 8-9).

Franklin and Harmelen (2007) stated that wikis can be used in class projects or students can use wikis to produce collaboratively edited materials. Instructors can use wikis to supply writing activities. Page and Ali (2009) shared another example of an educational wiki in higher education, Ask Dr. Wiki (http://www.askdrwiki.com/). This is a medical wiki dedicated to the development of a free source of medical information. Each individual can “publish clinical notes, pearls, X-ray images, angiograms and more
Anyone who has medical knowledge can edit and contribute to the medical articles using this wiki.

Parker and Chao (2007) explored a variety of wiki usages in different educational settings, and concluded that wikis can engage students in a more collaborative learning environment as there is a need to equip students with collaborative creativity to succeed in the future.

*Podcasting.*

Podcasts are audio recording files, “usually in MP3 format” (Anderson, 2007, p. 10), of interviews, audio tours, or any format of talks, that can be downloaded from the Internet to computers or handheld MP3 devices and listened to. Essentially, podcasting is a simple online radio programming that can be created and distributed by amateurs (Anderson, 2007; Jonassen et al., 2008; Richardson, 2006). The process of creating a podcast includes “creating an MP3 format audio file, uploading the file to a host server, and then broadcast this audio file to the world via RSS (Anderson, 2007).

Anderson (2007) stated that podcasts were “originally called audio blogs” (p. 10) and “have their roots in efforts to add audio streams to early blogs” (Anderson, 2007, p. 10). After setting down the standards, the fact that Apple introduced the “iPod MP3 player and its associated iTunes software” (Anderson, 2007, p. 10) to the market helped podcasting become popular. Although at first there was a misunderstanding that only iPods could play podcasts, podcasts are widely accepted by any MP3 player or PC that is equipped with the necessary software.
Learners can produce and share information and broadcast much meaningful information through podcasts. They can utilize podcasts to learn from and teach others (Page & Ali, 2009).

A project which blended blogs, wikis, and podcasts in classroom shared a result that these applications can be used to enhance learning (Chandra, & Chalmers, 2010). In this project, podcasts were used to capture group presentation digitally and shared with other group members. It provided a different way to gain knowledge.

Social networking.

Social networking sites “allow users to create and customize a personal website (aggregated within a larger website)” (Kennedy et al., 2007, p. 518). Each user creates a personal profile of interests and activities using text, pictures, videos, music and links to other profiles or websites. Users can easily locate other users with similar interests or link to them as friends. In doing so, they “create networks of people to whom they grant various types of access and updates” (Davis, 2009, p. 185). Additionally, depending on the social networking site, a user’s page may extend to include other Web 2.0 tools, such as blogs, photos, video sharing, asynchronous dialogs, etc. (Davis, 2009; Kennedy et al., 2007).

Groff and Haas (2008) stated that social networking technologies can be used to connect teachers and students and develop a strong learning community to achieve the goal of good learning and teaching. Utilizing social networking technologies can extend learning into an additional space where learners can communicate, collaborate and share learning. This space outside the classroom walls is always available to learners and
instructors. Social networking applications, such as Ning, allows the user to “create a private social network” (Groff and Haas, 2008, p. 12) for the classroom effortlessly. The teacher can “set up and manage accounts for students, and record” (Groff and Haas, 2008, p. 12) and announce class assignments and/or other information. The forum allows students to “extend their class discussions” (Groff and Haas, 2008, p. 12) and “share relevant resources” (Groff and Haas, 2008, p. 12) with each other.

**Multimedia Sharing**

Numerous websites allow users to upload, browse, annotate and share multimedia (photographs, audio and video clips) on various technology devices, such as desktop computers, laptops, MP3 players, or mobile phones. In addition, each user can “create play lists of their favorites and subscribe to others’ videos” (Davis, 2009, p. 186-187).

Anderson (2007) reported that multimedia sharing is “one of the biggest growth areas” (p. 10) among Web 2.0 services. Some popular multimedia sharing services, such as YouTube for video sharing, Flickr for photograph sharing and Odeo for podcast sharing, represent “the ‘writeable’ Web” (Anderson, 2007, p. 10) feature of Web 2.0, “where the users are not just the consumers but contribute actively to the production of Web content” (Anderson, 2007, p. 10). According to Anderson (2007), millions of people now utilize these forms of multimedia sharing or exchange by producing their own videos, photographs and podcasts.

There are many ways in which multimedia sharing sites can be used in the classroom. Teachers can “select educational videos from online repositories, post their own videos” (Davis, 2009, p. 187) and “incorporate multimedia into students’ projects
and assignments” (Davis, 2009, p. 187). Students can be asked to search videos on YouTube related to specific topics in the course readings (Davis, 2009).

**Tagging and Social Bookmarking**

A tag is defined as “a key word that is added to a digital object (e.g. a website, picture or video clip) to describe it, but not as part of a formal classification system” (Anderson, 2007, p. 9). The del.icio.us website was viewed as one of the most “large-scale applications of tagging” (Anderson, 2007, p. 9), which triggered “the ‘social bookmarking’ phenomenon” (Anderson, 2007, p. 9).

Within a social bookmarking system, users can “create lists of ‘bookmarks’ or ‘favorites’, to store these centrally on a remote service (rather than within the client browser) and to share them with other users of the system (the ‘social’ aspect)” (Anderson, 2007, p. 9). In particular, these bookmarks can be tagged with keywords and belong to different categories, which is a feature different from “folder-based categorisation used in traditional, browser-based bookmark lists” (Anderson, 2007, p. 9). Furthermore, social bookmarking services often allow users to “subscribe to feeds linked to particular tags and/or users” (Kennedy et al., 2007, p. 518).

As a matter of fact, the concept of tagging has widely spread to other Web 2.0 applications besides social bookmarking sites; for instance, multimedia sharing sites, like YouTube for video sharing, Flickr for photo sharing, and Odeo for podcasts, all allow various “digital artifacts to be socially tagged” (Anderson, 2007, p. 9).

Franklin and Harmelen (2007) listed some ideas of how to use social bookmarking in education. Teachers and learners can create collections of resources and
reading lists and use tags to structure them into different sub-categories. Groups of users with common interests can work together to use the same social bookmarking site to bookmark items of common interest. Although they may use individual accounts, identical tags can be used to identify the resources.

** RSS**

Anderson (2007) described RSS (Really Simple Syndication) as the follows:

A family of formats which allow users to find out about updates to the content of RSS-enabled websites, blogs, or podcasts without actually having to go and visit the site. Instead, information from the website (typically, a new story’s title and synopsis, along with the originating website’s name) is collected within a feed (which uses the RSS format) and ‘piped’ to the user in a process known as syndication. (p. 10-11)

Before using a feed, users have to install software known as an aggregator or feed reader onto their computers. Once the aggregator has been installed, users then decide which RSS feeds they would like to receive and subscribe to them. “RSS-enabled websites generate a feed of Extensible Markup Language (XML) data summarizing the content of the site” (Lee, Miller, & Newnham, 2008, p. 312), which can include news headlines, abstracts of new postings, etc. The aggregator (feed reader) will check periodically for updates to the RSS feed and keep the user informed of any changes (Anderson, 2007; Lee, Miller, & Newnham, 2008).

In particular, in the earliest stage, RSS was defined as Rich Site Summary. For historical reasons, there are different formats of RSS, like “RSS 0.91, RSS 0.92, RSS 1.0,
RSS 2.0” (Anderson, 2007, p. 11), and incompatibility has become an issue. Anderson (2007) noted that RSS 2.0 is not the second generation of RSS 1.0; rather, they are different formats. After being largely used for “blog content syndication” (Anderson, 2007, p. 11), the later version of RSS became acknowledged as “Really Simply Syndication” (Anderson, 2007, p. 11).

Lee, Miller, and Newnham (2008) argued that the affordance of RSS and content syndication can be used to provide learners rich, active and social learning experiences. RSS can be used to personal learning, which enhances learner choice and provides flexibility of learning. For instance, a university can offer a feed that distributes university-wide information.

Nevertheless, Lee, Miller, and Newnham (2008) indicated that implementing RSS in higher education has certain barriers because students have habitual ways to access the Internet and browse the Web. Most of them used to browse websites manually to search for information they need, and hesitate to use RSS.

**Google Applications**

Several Google applications are counted as Web 2.0 tools, including Google Docs, Google Calendar, etc. (Devereaux, 2007; Adams, 2008). Google Docs is “an online word-processing, spreadsheet developing, presentation-generating” (Adams, 2008, p. 98) and survey-creating tool that includes free storage space (Adams, 2008). For users who do not have access to Microsoft Office applications or who are not allowed to install open source software on their computers, Google Docs can be used for free from any computer with Internet access. Google Calendar is an online multiuser calendar application in
which “events can be scheduled indefinitely” and the “calendar can be shared in read or read and write mode, and owners can invite other users to events” (Adams, 2008, p. 98).

The share feature in Google Docs “encourages collaboration, peer editing” (Adams, 2008, p. 99) and teachers can grade inside the application. Teachers can use Google Calendar to share the class schedule with students. Another idea of how to use Google Calendar is that collaborators can share in read and write mode so co-teachers, for instance, can change and browse the calendar at any time (Adams, 2008).

Theoretical Framework

Cochrane (2006) pointed out that “teaching and learning are best implemented when informed by learning theory” (p. 144). As Web 2.0 applications have the great potential to engage and involve learners with technology in learner-centered and collaborative learning environments and encourage the active participation of learners, the theoretical framework for implementing Web 2.0 tools for educational purposes can be developed by drawing on concepts from constructivism. The use of Web 2.0 applications can promote constructivist learning. Constructivism, as a learning theory, properly fits the use of Web 2.0 applications in education settings because “constructivism as a learning framework can be served immensely by using the tools and affordances presented by the Web 2.0 applications” (Page & Ali, 2009, p. 148).

Constructivism

What is constructivism? Canava (2009) pointed out that there is a certain difficulty in clarifying the idea of constructivism and giving it a definition because it depends on what people consider constructivism to be—whether they see it as “a theory,
an approach, or a perspective” (p. 2). Nevertheless, many researches and educators still try to define constructivism from different perspectives.

Smith and Ragan (2005) stated that constructivism is an instructional philosophy that falls into a larger category termed rationalism. A rationalist believes that “reason is the primary source of knowledge and that reality is constructed rather than discovered” (p. 19). A single reality does not exist somewhere to be discovered as many rationalists would propose, but they would argue that each individual has the ability to construct their personal reality.

Smith and Ragan (2005) argued that constructivism “is a current incarnation of a rationalist philosophy” (p. 19), and the roots of constructivism can be traced to Jean Piaget. In Driscoll’s study (2005), Jean Piaget “also called his view constructivism, because he firmly believed that knowledge acquisition is a process of continuous self-construction” (p. 191). From Piaget’s point of view, knowledge is “not out there, external to the child and waiting to be discovered” (Driscoll, 2005, p. 191). Rather, it is “invented and reinvented as the child develops and interacts with the world surrounding her” (Driscoll, 2005, p. 191).

Constructivism considers learning to be a process where learners actively construct new knowledge based on what they already know and what they are continually experiencing (Smith & Ragan, 2005; Solomon & Schrum, 2007). A radical element of constructivism is action. It assumes that learners construct knowledge by themselves, and “each learner individually constructs meaning as he or she learns” (Mason & Rennie, 2006, p. 31). “Knowledge is constructed by learners as they attempt to make sense of
their experiences” (Driscoll, 2005, p. 387). In the learning process, learners do not act passively as an empty vessel waiting to be filled; rather, they seek meaning actively (Canava, 2009; Driscoll, 2005).

Additionally, from a constructivist’s perspective, learning in context is the focus as learning goals are identified. For instance, in a study by Brown et al., they “argued that knowledge that learners can usually deploy should be developed” (as cited in Driscoll, 2005, p. 390), and this can only be achieved by engaging learners in the context of meaningful activities. It is inadequate and insufficient to have learners obtain concepts or routines which they never have a chance to use to solve problems that they confront in real life. Knowledge needs to be constructed and continues to change with the learners’ activities. Learning is an endless, life-long process resulting from the actions that people take in situations (Driscoll, 2005).

Allowing learners to identify and pursue personal learning goals is another concern for constructivists. For instance, if instructors have clear learning objectives in mind but offer certain freedom for learners to look for their personal interests, this can possibly enhance learning and lead to better learning performance. This condition of learning promotes self-regulation in learning, which is “desirable to constructivist educators” (Driscoll, 2005, p. 391).

Nevertheless, not all students fit into an open-ended learning style. Learners at an entry level can have difficulty in completing an independent project and need more attention from instructors. To avoid this difficulty, it is vital for instructors and curriculum designers to operate an instructional analysis in order to understand what prior
knowledge and skills learners must have before starting instruction because learners will not be able to learn without those skills and knowledge (Driscoll, 2005).

On the other hand, Perkins (1992) noted that constructivist instruction often asks learners to deal with complex situations, such as “conflict-faced” (p. 162). Conflict-faced refers to a situation in which “learners are asked to compare and contrast an entrenched but barely articulated model with a newly sketched model (by themselves or the teacher) with which they have very little working familiarity” (Perkins, 1992, p. 162). When constructivist instruction leads learners to confront situations that are contrary to learners’ native learning models, it can create a difficult situation for learners to deal with.

Cavana (2009) indicated that as both the roles of teacher and learner are redefined and new roles are learned through the adoption of a new learning model like constructivism, it can cause “a significant amount of insecurity, anxiety and resistance” (p. 7) can result. From the student’s perspective, it is much easier to be a traditional passive receiver and to obtain what books or teachers say in class than to be an active learner and construct new knowledge, reflect on his/her own experiences, and collaborate with others and be responsible for his/her own learning. It is not easy to drag learners from their comfort zone. On the other hand, it is challenging for teachers because they have to “renounce their comfortable, secure and efficient authority position and to develop a very different—much more egalitarian—relationship to the students, more as a facilitator than a teacher” (Cavana, 2009, p. 7). Even educational institutions themselves may have questions as they are requested to make some changes, such as adopting a new
assessment of learning, implementing different learning methods or even changing courses to engage students in flexible learning tasks or encourage collaborative learning.

In addition to these challenges, constructivist instruction typically requires learners to be responsible for achieving learning goals in terms of cognitive demands and makes learners “play more of the task management role than in conventional instruction” (Perkins, 1992, p. 163). This is because in the traditional, teacher-centered setting, learners “get little experience managing their interactions with the content themselves” (Perkins, 1992, p. 163) where constructivist instruction aims to inspire learners to “become autonomous thinkers and learner” (Perkins, 1992, p. 163) by giving them opportunities to manage their own learning. Still, it is vital for the constructivist teacher to provide adequate help and guidance, but not too much, as learners are “in their ‘zone of proximal development’ ” stage (p. 163).

Ullrich et al. (2008) concluded that “constructivism is based on the premise that knowledge cannot be transmitted but has to be constructed by the individual” (p. 706). “Learning is an active process” (Ullrich et al., 2008, p. 706) where learners integrate information with “pre-existing experiences” (Ullrich et al., 2008, p. 706). “In constructivism, the control over the learning process shifts from teacher to student” (Ullrich et al., 2008, p. 706); that is, students play an energetic role in the learning process. Learning occurs in context and in collaborative group activities and offers opportunities to solve practical and meaningful problems (Ullrich et al., 2008).

Aside from these fundamental tenets, there are some further divisions of constructivism, termed cognitive constructivism, social constructivism, and radical
constructivism (Lim & Sudweeks, 2009; Mayer, 2003; Smith & Ragan, 2005). These approaches “acknowledge that learning involves interaction and individual cognitive activity but they differ in the emphasis placed on primacy of each element’s contribution to the learning process” (Lim & Sudweeks, 2009, p. 233). Cognitive constructivism forms a basis for the theory “learning-as-knowledge construction” (Mayer, 2003, p. 144) and can be divided into two versions based on the concept of how knowledge is constructed: “individually mediated cognitive constructivism” (Mayer, 2003, p. 145) and “social-culturally mediated cognitive constructivism” (Mayer, 2003, p. 145). Individually mediated cognitive constructivism focuses on the way an individual constructs knowledge in an individual context, such as reading a book whereas social-culturally mediated cognitive constructivism emphasizes knowledge construction occurring in a social context, such as through a group discussion.

Social constructivism, an emerging alternative to cognitive constructivism, is based on the assumption that “constructed knowledge is stored within social/cultural groups so learning is essentially a sociocultural event” (Mayer, 2003, p. 145). The dimension dividing cognitive constructivism and social constructivism derives from a concern over where the knowledge is stored. The former is concerned with the ways “individuals come to possess individual knowledge” and the latter is concerned with the way “social groups create public knowledge” (Mayer, 2003, p. 145).

Radical constructivism cuts across cognitive constructivism and social constructivism. That is, for example, a radical constructivist within social constructivism believes that “a group’s shared knowledge is constructed entirely out of social
negotiation,” (Mayer, 2003, p. 146) and a non-radical constructivist believes that “a
discipline’s knowledge reflects a consensus of how to interpret agreed on observations
about the world” (Mayer, 2003, p. 146). A radical constructivist within cognitive
constructivism believes that “an individual’s knowledge is completely invented by the
learner” (Mayer, 2003, p. 146) and a non-radical constructivist holds the assumption that
the learning outcome “depends on the creative interaction of both what is presented and
what the learner already knows” (Mayer, 2003, p. 146).

Phillips (1998) argued that radical constructivism “can be criticized for its
relativistic view that all knowledge representations are equally valid, instruction is
impossible because instructional communications mean entirely different things to
different people, and teachers can never determine what their students know” (as cited in
Mayer, 2003, p. 146). Radical constructivism does not seem to be able to offer useful
educational implications for teaching or assessment (Mayer, 2003, p. 146).

As socially mediated cognitive constructivist and social constructivist approaches
have a central concept that knowledge is constructed by learners “in the context of and as
a result of social interaction” (Franklin & Harmelen, 2007, p. 20), these two
constructivist approaches are “particularly aided by Web 2.0 tools” (Franklin &
of students may collaborate and construct an artifact in a wiki and the teacher can act as a
facilitator “who provides scaffolding in the same wiki” (p. 20).

Additionally, researchers noted that Web 2.0 applications in educational settings
can be used to engage students in collaborative social learning activities to enhance
academic achievement (Brown & Adler, 2008; Ekberg et al. 2010). Brown and Adler (2008) describe social learning concept as follows:

Social learning is based on the premise that our understanding of content is socially constructed through conversations about that content and through grounded interactions, especially with others, around problems or actions. The focus is not so much on what we are learning but on how we are learning. (p. 3)

The social learning concept can be associated with social-culturally mediated cognitive constructivism and social constructivism because all these theories emphasize that learners construct their knowledge in a social context.

Integrating Technology in the Teacher Preparation Program

To achieve educational reformation by seeking and integrating technology effectively in the curriculum, the embarrassing situation where pre-service teachers lack effective technology integration experiences has to be remedied. In order to improve this awkward situation, most teacher preparation programs offer at least one instructional technology course and aim to provide models showing how to integrate technology in the classrooms.

Nevertheless, Wentworth, Waddoups and Earle (2004) argued that in early teacher preparation programs, pre-service teachers often took one computer literacy class or even a workshop that was separated from content methods classes and were “rarely engaged in real collaboration on how school teachers could integrate technology into authentic learning experiences” (p. 2). Since the focus of many technology training
classes was basic computer operation, it seemed that technology training class failed by not teaching pre-service teachers how to effectively use a variety of technological tools. “What teachers need to know most is how to teach content more effectively” (p. 2); however, what pre-service teachers learned from the technology training class was basic computer operation. Tapp, Kumar, and Hansen (2006) pointed out that this isolated technology course was not adequate to prepare teachers to use technology for their teaching.

A federal grant program Preparing Tomorrow’s Teachers to Use Technology (PT3) supported numerous projects to address these concerns by developing the models to integrate technology into teacher education programs and K-12 curriculum to enhance learning achievements (Christensen & Knezek, 2006; Wentworth, Waddoups, & Earle, 2004). The goal of the PT3 program was to “affect 600,000 teachers through 441 grants during the four year of the program, which ended in June 2003” (Brown & Warschauer, 2006, p. 600-601).

Despite PT3 grantees established “goals, models, and tools that supported this national initiative” (Brown & Warschauer, 2006, p. 601), many emerging research findings related to the PT3 revealed some needs that have to be improved, including the need for college faculty to “upgrade their technological expertise, to model technology” (Brown & Warschauer, 2006, p. 601) integration into classrooms, and to offer students a relaxed and happy learning environment for technology implementation. Meanwhile, offering pre-service teachers a technologically rich and supportive learning environment is necessary to achieve these goals (Brown & Warschauer, 2006).
The current pre-service teachers in teacher preparation programs are a new generation of learners who have been familiar with and have relied on information and communication technology (ICT) all their lives (Bennett, Maton, & Kervin, 2008; Prensky, 2001) and whose learning styles and habits are affected by their experiences with technology (Haskell & Polland, 2008). This group of learners uses ICT in significantly different ways from the previous generations in many aspects, so they have been labeled Generation Y (Strauss & Howe, 1991), the Net Generation (Tapscott, 1998, p. 3), or Digital Natives (Prensky, 2001).

Generation Y, or the Millennial Generation, was the term coined by Strauss and Howe (1991) to distinguish individuals born from 1982-2000 from Generation X, people born from 1965-1985. Due to the social impact of economic, cultural, and political differences, each generation has particular characteristics. Strauss and Howe described Generation Y as: “(a) open-minded and inclusive of culture, race, and sexual preference; (b) collaborative with team-minded work habits; and (c) civically minded as guided by active involvement in community service and politics” (Steinbrecher, 2008, p. 2244).

Tapscott (1998) further referred to Generation Y as the “Net Generation” (p. 3) to characterize their learning styles and interactions, which were inseparably connected to and enormously affected by the Internet and digital technologies since this age group was raised with these technologies surrounding them all their lives. Some key interactive learning styles in this generation are highlighted as follows:

1. Non-linear thinking. Net Generation learners access information in more
interactive and non-sequential ways because they have grown up browsing the Web for information (Tapscott, 1998). However, researchers commented that this multi-task learning style may cause the problem of having relatively “short attention span” (Barnes, Marateo, & Ferris, 2007, para. 9).

2. Construct knowledge with creativity. Instead of obtaining knowledge passively from teachers, Net Generation learners tend to work collaboratively to construct their knowledge in a student-centered learning approach (Tapscott, 1998).

3. Teachers as facilitators. For Net Generation learners, the teacher plays a role as a facilitator of information and helps to determine what information is important to learn (Tapscott, 1998).

The term Digital Natives, first used by Marc Prensky (2001), describes individuals born around 1982 and during the latter period of Generation X since they experienced the increasing presence of personal computers as a cultural phenomenon in their childhood (Bennett, Maton, & Kervin, 2008). Digital Natives grew up with and were immersed in digital technologies, such as computers, cell phones, multimedia devices, text messaging and the Internet.

Other than digital natives is the rest of the population called “digital Immigrants”. The term Digital Immigrants refers to those people “who were not born into the digital world but have, at some point in our lives, become fascinated by and adopted many or most aspects of the new technology” (Prensky, 2001, p. 1-2). In contrast to Digital Natives, Digital Immigrants “retain, to some degree, their accent” (Prensky, 2001, p. 2);
for instance, printing out emails, printing out documents in order to edit them instead of doing it on the screen, or making a “Did you get my email?” phone call (Prensky, 2001, p. 2).

Pre-service Teachers and Technology Integration Models

Haskell and Pollard (2008) described the characteristics of the students who are entering teacher preparation programs and who will be teachers in the near future as follows: “Students graduating from high schools across the country are using technology in their daily lives, but they have limited experiences in using technology in the schools, and have not been exposed to teaching models that integrate technology” (p. 82).

The truth is that the current population of pre-service teachers is equipped with more technology skills than ever as they enter teacher preparation programs, but most of their mentor teachers in the field are unable to “capitalize on technology’s value due to lack of vision or limited understanding of the benefits that technology can offer to teachers in training” (Williams & Foulger, 2006). Even though the National Technology Standards for Teachers (NETS-T) and the National Technology Standards for Students (NETS-S), along with state and local technology integration standards were established to show the intention of guiding instructional design, not every pre-service teacher has mentor teachers in the field that follow the standards and provide adequate information regarding technology use for teaching and learning. For these pre-service teachers, “the future implementation of their visions for technology integration feels hopeless” (Williams & Foulger, 2006, p. 1).
Swain’s study (2006) echoed William and Foulger’s report in terms of the pre-service teacher’s intention to integrate technology in the classrooms. The former study indicated that pre-service teachers believe that they have the ability to use educational technologies and have reached the stage of technology integration. But surprisingly, after attempting to understand pre-service teachers’ intentions for future teaching, the report reveals that many of them do not think it is worthwhile to integrate technology into the curriculum. They can talk about the advantages of using technology for teaching and learning, but are not ready to put the ideas into practice.

Other research cases show that faculties in teacher preparation programs have not demonstrated a good model in terms of effective technology integration in methods courses (Adamy & Boulmetis, 2005); neither have they exposed pre-service teachers into a successful technology learning environment in a technology course (Brown & Warschauer, 2006).

Indeed, determining whether the effective technology integration models have been infused in the teacher preparation programs successfully or not can be an indicator to determine whether pre-service teachers are likely to integrate technology into their future classroom teaching (Brown & Warschauer, 2006; Vrasida & McIssac, 2001). For pre-service teachers, “lack of modeling can deter the likelihood of their eventual use of these critical teaching tools” (Lambert, Gong, & Cuper, 2008, p. 386).

In addition, assessing the variety of technology integration strategies used in teacher preparation programs is another issue that is worth discussing. Kay (2006) reviewed 68 studies from different teacher preparation programs and found that at least
10 different strategies have been used to teach instructional technology to pre-service teachers. Unfortunately, there are still no teaching strategies that have been proven effective for integrating technology into a teacher preparation program.

This study uses the Technology Acceptance Model (TAM) to measure intent to implement Web 2.0 applications in the technology course in the teacher preparation programs and to assess pre-service teachers’ attitudes about the utilization of Web 2.0 applications as learning and teaching tools. The model is reviewed in the following section of this chapter.

Technology Acceptance Model (TAM)

The Technology Acceptance Model (TAM), proposed by Davis (1989), is a widely applied model that is used as an instrument to predict the potential users’ behavioral intention to use a technology innovation (King & He, 2006; Teo, Luan & Sing, 2008; Turner, Kitchenham, Brereton, Charters, & Budgen, 2010; Venkatesh & Davis, 2000) under different settings with different control variables and different subjects (Liu, 2010; Teo, Luan & Sing, 2008). TAM was adapted “from Ajzen and Fishbein’s (1980) Theory of Reasoned Action (TRA)” (Teo, Luan & Sing, 2008, p. 266), a psychological theory that hypothesizes that “beliefs and attitudes are related to individuals’ intentions to perform” (Teo, Luan & Sing, 2008, p.266).

The Technology Acceptance Model uses two specific internal variables, perceived ease of use (PEU) and perceived usefulness (PU), as the fundamental determinants to predict behavioral intention to use (BI). Perceived usefulness (PU) is defined as “the extent to which a person believes that using the system will enhance his or her job
performance” (Venkatesh & Davis, 2000, p. 187), and perceived ease of use (PEU) is defined as “the extent to which a person believes that using the system will be free of effort” (Venkatesh & Davis, 2000, p. 187). Behavioral intention to use (BI), “which TRA assumed to be closely linked to actual behavior” (King & He, 2006, p. 740), was identified as “a better predictor of actual usage than either PU or PEU” (Turner et al., 2010, p. 470) after the analysis of 79 related empirical studies in 73 articles.

The hypothesis of the Technology Acceptance Model is that “technology acceptance and use can be explained in terms of a user’s internal beliefs, attitudes and intentions” (Turner et al., 2010, p. 464). It is “possible to predict future technology use by applying the TAM” (Turner et al., 2010, p. 464) as a technology innovation is introduced.

The original Technology Acceptance Model measured “the impact of four internal variables upon the actual usage of the technology” (Turner et al., 2010, p. 464); they are “perceived ease of use (PEU), perceived usefulness (PU), attitude toward using (A) and behavioral intention to use (BI)” (Turner et al., 2010, p. 464). The original TAM used behavioral intention (BI) as both a predictor and a dependent variable. BI was “used as a dependent variable to test the validity” (Turner et al., 2010, p. 464) of two predictors PEU and PU, and as a predictor to predict the actual usage (Davis, 1989; Turner et al., 2010). Figure 1 shows the theoretical model.
Although the Technology Acceptance Model has proven to have high validity in many empirical studies, the model consistently explains only a portion of the variance in technology usage intentions and behavior (Liu, 2010). McFarland and Hamilton (2006) reported that the percent variance explained varied between 4% and 45% (as cited in Liu, 2010, p. 53) and Venkatesh and Davis (2000) found it typically to be around 40%. In order to improve the model to increase the percentage of the explained variance, a revised TAM, referred to as TAM2, was proposed by Venkatesh and Davis (2000). It removed attitude toward using but incorporated additional “external variables of perceived usefulness and perceived ease of use” (Liu, 2010, p. 54). Social influence, such as “subjective norm, voluntariness, and image” (Venkatesh & Davis, 2000, p. 187), and cognitive instruments, such as “job relevance, output quality, result demonstrability, and
perceived ease of use” (Venkatesh & Davis, 2000, p. 187) were identified as external variables (Liu, 2010; Venkatesh & Davis, 2000). Although TAM2 is a revised model, it is worth noticing that the primary idea of the model has remained unchanged (Turner et al., 2010; Venkatesh & Davis, 2000).

The implementation of Web 2.0 applications in the teacher preparation programs can be considered as technology innovation for pre-service teachers. As the potential benefits of using Web 2.0 applications to encourage collaborative technology-enhanced learning are discussed and the implementation of Web 2.0 in K-12 and higher education are shared by educators and researchers, Web 2.0 applications may be utilized to motivate pre-service teachers to engage in a meaningful learning with technology and to elicit use of technology in their future teaching. In this way, pre-service teachers will be prepared to help their future students cope with tasks and competition in the twenty-first century.

In order to understand how pre-service teachers perceive Web 2.0 applications as innovative technology-enhanced teaching and learning tools and predict their future intention to integrate Web 2.0 in the curricula, two specific internal predictors in the Technology Acceptance Model will be applied to the research method of the study.

Computer Attitude

Computer attitude has been identified as a critical factor that can be used to predict a teacher’s future intention to use technology (Teo, Luan, & Sing, 2008). Attitude guides behavior, and Ajzen & Fishbein (2005) defined attitude as “the way an individual respond to and is disposed towards an object” (as cited in Teo, Luan, & Sing, 2008, p.
The feeling and attitude can be positive or negative. Attitude, as Teo, Luan and Sing (2008) found, determines “how teachers respond to the technology” (p. 268) in educational settings and learning environments. A teacher’s attitude towards technology will in turn affect the way students perceive the role of technology in learning and have an impact on current and future computer usage (Teo, 2006). Huang and Liaw (2005) further stressed that no matter how powerful and sophisticated the technology is, the extent to which it is employed in the classroom depends on the teacher’s attitude towards it.

Bahr, Shaha, Farnsworth, Lewis and Benson (2004) commented that it is important for teachers to understand the approaches in which technology can support in instruction and have a positive attitude towards infusing technology into instruction. If teachers and pre-service teachers do not have positive attitudes towards the usefulness of incorporating technology into instruction and towards actually using technology for teaching, “then even the best systems and methodologies will remain unused” (p. 89).

Research studies have emphasized the need to assess teachers’ computer attitudes since this can affect teachers’ acceptance of computers and the future intention to use (Woodrow, 1991). A teachers’ computer attitude then becomes a predictor for future computer use (Myers & Halphin, 2002; Teo, Luan, & Sing, 2008).

Challenges and Concerns

Goldman, Lawless, Pellegrino and Plants (2006) reported survey results targeting public school teachers which found that eighty-three percent of these teachers used computers on a daily basis for productivity tasks, teaching, or both, and about forty-two
percent of first-year teachers felt that they were ready to integrate technology into their teaching.

A report published by the National Education Association (2008) indicated that “although all educators and students in public schools have some access to computers and the Internet, we have few assurances that they are able to use technology effectively for teaching and learning” (p. 1). The study revealed that the number of computers in public school classrooms was inadequate, but “about one-third of educators required their students to use computers at least few times a week” (Haskell & Pollard, 2008, p. 82). Besides, many teachers, according to the report, showed that they were not ready to use technology for educational purposes (Haskell & Pollard, 2008). Research has shown that lack of adequate training and experience is one of the main factors why teachers do not employ technology in their teaching (Tapp, Kumar, & Hanse, 2006).

Still, while some studies have shown that the application of Web 2.0 tools can be successfully implemented for technology-enhanced learning, “in-depth analyses of the relationship between Web 2.0 tools on one hand and teaching and learning on the other hand are still rare” (Ullrich et al., 2008, p. 705). Davis (2009) argued that it is too soon for researchers to reach the conclusion that Web 2.0 applications do improve student learning, even though common sense suggests that online collaborative activities will stimulate motivation and learning for many students.

Additionally, there are some challenges posed by Web 2.0 that should be considered. First of all, time is a concern. The speed at which new technologies emerge is much faster than the speed at which teachers can adopt and integrate technology into their
classrooms. Secondly, there are certain difficulties with identifying the ownership of content and whether the materials are up-to-date, accurate and reliable. Thirdly, students may struggle when using the new media and applications for educational purposes rather than for entertainment.

Summary

Change is a constant movement in higher education, and technological developments have played their part in effecting it. New ideas and new visions regarding the use of web-based technologies are constantly adapted and adopted in education. It is important to engage pre-service teachers in a collaborative learning environment and prepare them to integrate technology in the classrooms in the future in order to achieve the goal of technology-enhanced learning.

In this chapter, multiliteracies and other twenty-first century skills have been stressed. The components of twenty-first century learning were also identified. An overview of core Web 2.0 applications and the concepts and ideas behind Web 2.0 were discussed in this chapter. Constructivism was reviewed to provide the theoretical framework of Web 2.0 implementations in education.

The reviewed literature revealed that even though the currently enrolled pre-service teachers in the teacher preparation programs belong to the Net Generation or so-called Digital Natives, it does not mean that they know how to effectively integrate technology into the classrooms. Rather, research studies have shown that pre-service teachers are not well prepared to properly utilize technology for their future teaching
because they have not experienced effective technology integration models in the teacher preparation programs.

As the educational implementation of Web 2.0 applications emerge and are increasingly discussed by researchers and educators, it is necessary to investigate pre-service teachers’ perception of Web 2.0 learning and include their opinions in the improvement of teacher preparation programs. Pre-service teachers’ intention to use Web 2.0 applications in their future classrooms is likely to be affected by some key factors, such as perceptions of Web 2.0 applications and the attitude towards the adoption of Web 2.0 applications in the curriculum.

Parts of the Technology Acceptance Model (TAM) were used in the study to assess pre-service teachers’ intention to use Web 2.0 application in the future teaching.
CHAPTER THREE: METHODOLOGY

Research Design

Conceptual Framework

As predicaments of technology integration in teacher preparation programs have been recognized and Web 2.0 applications have been increasingly used for educational implementations, little has been explored to determine whether pre-service teachers perceive Web 2.0 applications as effective teaching and learning tools and whether they intend to integrate Web 2.0 applications in their future classrooms. A review of the literature has revealed that Web 2.0 can be used to foster collaborative learning and enhance technology-learning. This study examined the extent to which perceived usefulness, perceived ease of use, computer attitude, and experience using Web 2.0 applications predict pre-service teachers’ intention to use Web 2.0 applications in future teaching.

Research Questions

The research question addressed by this study was:

How well do the predictors (1) perceived usefulness, (2) perceived ease of use, (3) computer attitude, and (4) experience using Web 2.0 applications predict the intentions of pre-service teachers to use Web 2.0 in the future?

Method

A quantitative research method was used in this study, and a questionnaire was conducted to investigate the perceptions of pre-service teachers towards integrating Web 2.0 applications in their future teaching. The research question would be answered
through the use of the statistical method, multiple regression. Additional information was provided through descriptive statistics.

This chapter will review independent and dependent variables and research approaches chosen to answer the research question. The following components are provided: (1) target population and the sample used for the study, (2) a description of the research instrument, (3) rationale for the identification of the independent and dependent variables, and (4) a statement of the statistical hypothesis.

**Target Population**

The target population of this study consisted of pre-service teachers who were enrolled in one of the teacher preparation programs in the Midwestern United States which prepared them to become PK-12 teachers in different content areas and were taking a technology course in the teacher preparation programs in the 2009-2010 and 2010-2011 academic years. The course description stated that this class would introduce at least one Web 2.0 application to pre-service teachers as a learning and teaching tool.

This group of pre-service teachers was seeking teaching licensure from preschool (age 3) through grade 12 in the Midwest and was interested in teaching subjects, including science, mathematics, social studies, arts, music, physical education, and modern language or was interested in teaching other content areas, such as early childhood or special education.

For the purpose of feasibility, this study collected data from a Midwestern college of education. At the time this study was conducted, the teacher preparation programs prepared students to be PK-12 teachers in different content areas and required students to
take an introductory technology course in order to obtain licensure in their program of study.

In terms of exclusion criteria, pre-service teachers who had not taken any technology course in the teacher preparation programs were excluded.

Sampling Plan

Sample Sizes

Tuckman (1999) stated that “sample size depends on three factors: alpha level, power, and effect size” (p. 286). The alpha level, the probability of making a Type I error, which is rejecting the null hypothesis when the statement is true, was set at .05. The power of a statistical test of a null hypothesis is the probability of rejecting it when the statement is false. In other words, the power is the probability of obtaining a statistically significant result. The effect size is the effect of the study findings. In other words, the ‘magnitude’ of a finding is the effect size. Due to the lack of previous research in this area, a medium effect size ($f^2 = .15$) was chosen (Cohen, 1988). The total number of the sample size was indicated to be at least 85. This number was determined through the use of a general power analysis program, G*Power 3.1.2. where predictors were set to be four, the statistical power of the study was expected to be .80 and a medium effect size $f^2 = .15$ at $\alpha=.05$ significant level was chosen.

Sampling

The sample was selected from the defined target population. The selection of the sample in this study used a convenient sample from an introductory technology course in a Midwestern college of education. During the 2009-2010 and 2010-2011 academic years,
at least two to five sections of an introductory technology course were offered per quarter. Each quarter lasted for eleven weeks. Pre-service teachers in the teacher preparation programs at this university were required to take this technology course as a requirement of the program of study. Each pre-service teacher chose a section of the course which fit his/ her schedule. Each section of this introductory technology course used the same textbook and syllabus, followed the same class policies, and had the same requirements for completion. The Department of Teacher Education at this Midwestern university offered a wide range of teacher preparation programs at the undergraduate level. Table 1 provides information about these teacher preparation programs.

After gaining permission from the instructors of the different sections of the technology course to conduct a survey and meeting with the students face-to-face in the classes, researcher made an introduction and invited students who were pre-service teachers to participate in the study. Students from other programs outside of the Department of Teacher Education taking this technology course during the period of time of data collection were not invited to participate in the study. They did not answer the survey. Only pre-service teachers who agreed to participate in the study were invited in the study.
Table 1

<table>
<thead>
<tr>
<th>Licensure level</th>
<th>Age Group</th>
<th>Content Concentration Area(s)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Early Childhood</td>
<td>Preschool (age 3) through grade 3</td>
<td>All content areas</td>
</tr>
<tr>
<td>Middle Childhood</td>
<td>Grades 4 through 9</td>
<td>Mathematics</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Science</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Social Studies</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Language Arts</td>
</tr>
<tr>
<td></td>
<td></td>
<td>(Students are required to choose two content areas)</td>
</tr>
<tr>
<td>Adolescent to Young Adult (AYA)</td>
<td>Grades 7 through 12</td>
<td>Mathematics</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Science</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Social Studies</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Language Arts</td>
</tr>
<tr>
<td>Special Education</td>
<td>Kindergarten through 12</td>
<td>All content areas</td>
</tr>
<tr>
<td>Multi-age</td>
<td>Grades preschool (age 3) through 12</td>
<td>Art</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Music</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Physical education</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Modern languages</td>
</tr>
</tbody>
</table>
The First Pilot Study

The first pilot study was conducted in February 2010 with a convenience sample (N=24) from one section of an introductory educational technology course in the Midwestern university. At the time the study was conducted, this technology course was a requirement course for all pre-service teachers who sought licensure in PK-12 levels, and was typically offered two to five sections per quarter. Each pre-service teacher chose a section of the course which fit his/ her schedule. The sample of the initial pilot study had similar characteristics to the target population of the study. The purpose of the initial pilot study was to examine the individual items and the reliability of the survey instrument.

Results of the First Pilot Study

The initial paper-and-pencil questionnaires (Appendix A) were distributed to 24 pre-service teachers (8 males and 16 females) who were enrolled in the Midwestern College of Education. Among the 24 participants, thirteen were sophomores, nine were juniors, and two were seniors.

The survey included four sections: (1) demographic information, (2) length of time spent on Web 2.0 applications, (3) perceptions towards Web 2.0 applications, and (4) attitude scale. The Demographic Information included 4 items: (1) age, (2) gender, (3) year of college, and (4) licensure level. In the Length of Time Spent on Web 2.0 Applications section, 17 items in a five-point Likert-scale (Strongly agree = 5, agree = 4, neutral = 3, disagree =2, and strongly disagree =1) and three open-ended questions were
used to assess pre-service teachers’ use of Web 2.0 applications. In the Perceptions towards Web 2.0 Applications section, four open-ended questions were asked to find pre-service teachers’ perceptions towards Web 2.0 applications. The final section, Attitude Scale, consisted of 23 items in a five-point Likert-scale to assess pre-service teachers’ attitude toward Web 2.0 applications (Appendix A).

Some incidents of missing data occurred in the questions of the second section (Length of Time Spent on Web 2.0 Applications) and the fourth section (Attitude Scale). The cases with incomplete data were included in analysis due to their small proportion to the whole.

To determine the reliability of the two measures, the Length of Time Spent on Web 2.0 Applications and the Attitude Scale, SPSS 14.0 was used to analyze the data from the first pilot study.

Table 2

<table>
<thead>
<tr>
<th>Internal Reliability of the Initial Instrument</th>
<th>Cronbach’s Alpha</th>
</tr>
</thead>
<tbody>
<tr>
<td>Length of Time Spent on Web 2.0 Applications</td>
<td>.72</td>
</tr>
<tr>
<td>Attitude Scale</td>
<td>-.06</td>
</tr>
</tbody>
</table>

In the Length of Time Spent on Web 2.0 Applications section of the initial questionnaire, items (2), (6), and (9) with low or negative correlations were removed. Items (11) and (15) were removed because they were not identified as core Web 2.0
applications by Anderson (2007). Items (12), (13), (14), and (16) were combined to be just one item— Google applications.

Items (4) and (5) were combined to be just one item— podcasts. Items (10) and (17) were combined to be just one item— multimedia sharing sites. Another Web 2.0 application, tagging and social bookmarking, was added in the revised questionnaire since it was identified to be a core Web 2.0 application by Anderson (2007).

Table 3

Removed Items in Length of Time Spent on Web 2.0 Applications Section

<table>
<thead>
<tr>
<th>Item Description</th>
<th>Correlation</th>
</tr>
</thead>
<tbody>
<tr>
<td>(2) How many months have you owned a Weblog(s) (e.g. Google Blog, Blogger, Edublogs)?</td>
<td>.08</td>
</tr>
<tr>
<td>(6) How many months have you used discussion boards?</td>
<td>.30</td>
</tr>
<tr>
<td>(9) How many months have you used microblogs (e.g. twitter, Plurk)?</td>
<td>-.09</td>
</tr>
</tbody>
</table>

Table 4

Removed Items in Length of Time Spent on Web 2.0 Applications Section

<table>
<thead>
<tr>
<th>Item Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>(11) How many months have you used instant messaging (e.g. Yahoo! Messenger, AOL, MSN Messenger, AIM, Skype)?</td>
</tr>
<tr>
<td>(15) How many months have you used web-based mapping tools (e.g. Google Maps, MapQuest, Yahoo!Local)?</td>
</tr>
</tbody>
</table>
Table 5

*Items in Length of Time Spent on Web 2.0 Applications Section that Were Combined to Be Google Applications*

<table>
<thead>
<tr>
<th>Item Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>(2) How many months have you used Google?</td>
</tr>
<tr>
<td>(13) How many months have you used Gmail?</td>
</tr>
<tr>
<td>(14) How many months have you used Google Docs (Documents)?</td>
</tr>
<tr>
<td>(16) How many months have you used web-based calendar (e.g. Google Calendar, WebCalendar)?</td>
</tr>
</tbody>
</table>

Table 6

*Items in Length of Time Spent on Web 2.0 Applications Section that Were Combined to Be Podcasts*

<table>
<thead>
<tr>
<th>Item Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>(4) How many months have you used audio-podcasts (e.g. PodOmatic)?</td>
</tr>
<tr>
<td>(5) How many months have you used video-podcasts?</td>
</tr>
</tbody>
</table>

Table 7

*Items in Length of Time Spent on Web 2.0 Applications Section that Were Combined to Be Multimedia Sharing Sites*

<table>
<thead>
<tr>
<th>Item Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>(10) How many months have you used photo sharing sites (e.g. Flickr, Picasa, iPhoto)?</td>
</tr>
<tr>
<td>(17) How many months have you used video sharing sites (e.g. YouTube)?</td>
</tr>
</tbody>
</table>
The dissertation committee suggested that the third question in the third section (Perceptions towards Web 2.0 Tools) be removed because it would be hard to know the reason why the participants did not check the box. The question was *Which of the following have you used but would NOT consider using in your future K-12 classrooms?* followed by a list of Web 2.0 applications to be chosen as the answer to the question. However, without further follow-up questions under each option, it would have been hard to conclude whether an individual did not check the box because they had used the applications but they would not consider using them in the future, or they had not used the tools so they would not consider using them. Similarly, three other items in the third section were suggested by the committee to be reworded or replaced by other items because it would be hard to conclude whether an individual did not check the box because it reflected their answer or it was a missing data.

The third section of the initial questionnaire, *Perceptions towards Web 2.0 Applications*, was replaced after obtaining suggestions from the dissertation committee by another scale (Usage Intensity of Web 2.0 Applications) to measure the usage intensity of Web 2.0 applications by pre-service teachers. This newly added section (Appendix B, Part III) functioned as a follow-up to the second section.

Items (3), (7), and (18) in the fourth section, *Attitude Scale*, were replaced by other items that were adapted from Selwyn (1997) to have more items to measure the predictor, perceived ease of use (PEU). Table 8 presents the modification of the items in the Attitude Scale. Table 9 shows the corresponding items that measured the independent
and dependent variables. Table 10 shows the sources that items in the Attitude Scale were adapted from.

Table 8

*The Modification of the Items in the Attitude Scale*

<table>
<thead>
<tr>
<th>Old Item</th>
<th>New Item</th>
</tr>
</thead>
<tbody>
<tr>
<td>(3)  I hesitate to use a Web 2.0 tool</td>
<td>(3)  If I have problems using Web 2.0 tools, I can usually solve them one way or other</td>
</tr>
<tr>
<td>because I might look stupid.</td>
<td></td>
</tr>
<tr>
<td>(7)  Web 2.0 tools make me feel uncomfortable.</td>
<td>(7)  I do not need someone to tell me the best way to use Web 2.0 tools.</td>
</tr>
<tr>
<td>(18) Using a Web 2.0 tool does not scare me at all.</td>
<td>(18) Interacting with Web 2.0 tools is easy.</td>
</tr>
</tbody>
</table>

Table 9

*List of Corresponding Items after Modification*

<table>
<thead>
<tr>
<th>Variables</th>
<th>Item</th>
</tr>
</thead>
<tbody>
<tr>
<td>Perceived Usefulness (PU)</td>
<td>1, 4, 9, 13, 16, 19</td>
</tr>
<tr>
<td>Perceived Ease of Use (PEU)</td>
<td>2, 3, 7, 12, 18, 22</td>
</tr>
<tr>
<td>Computer Attitude (CA)</td>
<td>8, 10, 11, 15, 17</td>
</tr>
<tr>
<td>Behavioral Intention to Use (BI)</td>
<td>5, 6, 14, 20, 21, 23</td>
</tr>
</tbody>
</table>
Table 10

Lists of Items and Sources after Modification

<table>
<thead>
<tr>
<th>Source</th>
<th>Item</th>
</tr>
</thead>
<tbody>
<tr>
<td>Selwyn (1997)</td>
<td>3, 4, 6, 7, 13, 14, 20, 21, 22</td>
</tr>
<tr>
<td>Teo, Luan and Sing (2008)</td>
<td>1, 2, 5, 8, 9, 10, 11, 12, 15, 16, 17, 18, 19, 23</td>
</tr>
</tbody>
</table>

The Second Pilot Study

The second pilot study using the revised questionnaire (Appendix B) was conducted in May 2010 with a convenience sample (N= 25) from one section of an introductory educational technology course in the Midwestern College of Education with similar characteristics to the target population. At the time the study was conducted, this technology course was a requirement course for all pre-service teachers who sought licensure in PK-12 levels, and was typically offered in two to five sections per quarter. Each pre-service teacher chose a section of the course which fit his/her schedule. The purpose of the second pilot study was to examine the individual items and the reliability of the survey instrument.

Reliability Issues

Reliability, in the context of this study, means that a test provides consistent measurements (Light, Singer, & Willett, 1990; Tuckman, 1999). By measuring the consistency of the responses, the internal consistency can be estimated. In other words, the estimate of internal consistency reliability is to examine the consistency of participants’ responses to different items on the same instrument at the same time (Light
et al., 1990). This study utilized Cronbach’s alpha to create a coefficient of internal consistency. In order to decide the internal reliability of the survey instrument, SPSS 14.0 was used to analyze the data from the pilot study. Table 11 summarizes the value of the Cronbach’s alpha of the instrument, which contained 39 items total. With the alpha values, the instrument was considered to be reliable.

Table 11

<table>
<thead>
<tr>
<th>Categories</th>
<th>Number of Items</th>
<th>Cronbach’s Alpha</th>
</tr>
</thead>
<tbody>
<tr>
<td>Length of Time</td>
<td>8</td>
<td>.75</td>
</tr>
<tr>
<td>Usage Intensity of Web 2.0</td>
<td>8</td>
<td>.66</td>
</tr>
<tr>
<td>Applications</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Attitude Scale</td>
<td>23</td>
<td>.95</td>
</tr>
</tbody>
</table>

Validity Issues

The content validity of the instrument has been addressed in two studies. The measure, Attitude Scale, was a modified form of two instruments in two studies, Selwyn (1997) and Teo et al. (2008) respectively, used to assess pre-service teachers’ attitudes towards Web 2.0 using the variables, perceived usefulness, perceived ease of use, behavioral intention, and computer attitude. The measures, Length of Time Spent on Web 2.0 Applications and Usage Intensity of Web 2.0 Applications, were constructed by the researcher based on literature review and used to represent pre-service teachers’ experience of using Web 2.0 applications.
Selwyn reported an overall Pearson’s test-retest reliability coefficient of $r = .93$ of the scale in his study. The reliability of all the constructs in Teo et al.’s study was between .73 and .88. The construct of corresponding items of each variable and Cronbach’s alpha for each construct were reported.

The reliability of the measures, *Length of Time Spent on Web 2.0 Applications*, *Usage Intensity of Web 2.0 Applications*, and *Attitude Scale*, were .75, .66, and .95 respectively.

The first and second pilot studies were conducted with 24 and 25 participants, respectively, from a Midwestern university. The data were used to examine the content validity of the questionnaire. The reliability of all the revised scales was between .66 and .95.

*Selection and Development of the Instruments*

The development of the survey instrument occurred in the following stages. First, according to the review of the literature and researcher’s scholarly interests, the researcher identified the purpose of the study, research question, and the study framework. Second, the related research studies and well-made survey instruments in previous studies were located. Third, due to the lack of previous related research studies in a specific area, the researcher chose appropriate existing instruments and added a self-constructed instrument for the purpose of the study based on the advice of the dissertation committee. Fourth, the researcher obtained permission from the original authors of the survey instruments through emails (Appendix D). Fifth, the researcher modified the existing instrument. Sixth, the first pilot study was conducted to test the reliability and validity of
the instrument. Seventh, based on the results of the pilot study and suggestions from the dissertation committee, some items in section two and four were removed, and new items were added to section four. The third section was replaced by a new scale as follow-up to the section two. Eighth, a second pilot study was conducted.

*The Questionnaire (Appendix A)*

A questionnaire was used in the study to collect data. The questionnaire consisted of four sections: Demographic Information, Length of Time Spent on Web 2.0 Applications, Perceptions towards Web 2.0 Applications, and Attitude Scale. The Length of Time Spent on Web 2.0 Applications and Perceptions towards Web 2.0 Applications sections were constructed by the researcher based on the suggestions of the dissertation committee. The Attitude Scale was adapted from Selwyn (1997) and Teo, Luan and Sing (2008).

Section one: Demographic Information. This section included age, gender, educational level and the licensure level. The licensure level covered a range of teacher preparation programs at the Midwestern University, including early childhood, middle childhood, AYA, special education, and multi-age.

Section two: Length of Time Spent on Web 2.0 Applications. This section consisted of seventeen items with three open-ended questions to identify the length of time that Web 2.0 applications had been used. The items used months as the measuring unit in order to obtain more precise answers since some Web 2.0 applications may still have been new.
Section three: Perceptions towards Web 2.0 Applications. This section included four items. The first three items determined the perceptions towards Web 2.0 applications and future intention to use these applications. The fourth item sought to understand Web 2.0 applications in the teacher preparation programs.

Section four: Attitude Scale. This instrument was adapted from two studies, Selwyn (1997) and Teo et al. (2008). Both studies evaluated students’ attitudes toward technology by adopting the Technology Acceptance Model (TAM) as the theoretical framework. Permissions to adapt the instruments were obtained through emails (Appendix D). The instruments were selected because of their detailed process of study, good reliability and validity, and the capability of assessing various perceptions towards technology innovation. Due to the differences between the research subjects of the authors and the study, the original items in the scales of the two studies were selected and modified. Fourteen items were selected and adapted from Teo, Luan and Sing (2008). Nine items were from Selwyn (1997). Because of the similarities between these two studies, not all items in Selwyn’s computer attitude scale were included in the instrument.

The instrument in the Attitude Scale included twenty-three items in a five-point Likert scale: Strongly Agree= SA (5), Agree= A (4), Neutral= N (3), Disagree= D (2), and Strongly Disagree= SD (1). The scale measures four components: three predictors and one dependent variable. The three predictors are perceived usefulness (PU), ease of use (PEU), and computer attitudes (CA). The one dependent variable was behavioral intention to use Web 2.0 applications (BI).
Table 12

<table>
<thead>
<tr>
<th>List of Corresponding Items</th>
</tr>
</thead>
<tbody>
<tr>
<td>Variables</td>
</tr>
<tr>
<td>Perceived Usefulness (PU)</td>
</tr>
<tr>
<td>Perceived Ease of Use (PEU)</td>
</tr>
<tr>
<td>Computer Attitude (CA)</td>
</tr>
<tr>
<td>Behavioral Intention to Use Web 2.0 Applications(BI)</td>
</tr>
</tbody>
</table>

**Variables**

According to the research questions and the literature, this study included four predictors and one dependent variable.

**Dependent Variable**

The behavioral intention to use Web 2.0 in the future among pre-service teachers was the dependent variable.

**Independent Variables**

The independent variables were (1) perceived usefulness and (2) perceived ease of use of Web 2.0 applications, (3) computer attitude toward Web 2.0 applications, and (4) experience using Web 2.0 applications.

**Data Collection Procedures**

The steps of the data collection procedures were as follows. The first step was to collect the list of technology course offerings in the 2009-2010 and 2010-2011 academic years in the Midwestern College of Education. Second, the e-mails of the instructors on the list were collected. Third, the researcher sent an e-mail to seek permission from the
instructors on the list. Fourth, instructors positively responded and gave their permission. Fifth, the instructors who gave their permission arranged the date and time that was appropriate for the researcher to collect data in classes and sent the researcher an e-mail notice. Sixth, the research met the instructors and students in classes, made an introduction, and presented a consent form. Only pre-service teachers were invited in the study. Students from other programs outside of the Department of Teacher Education taking in this technology course were not invited to participate in the study. If students who were pre-service teachers agreed to participate in the study, they were required to sign an informed consent and date on page two of the consent form. Seventh, the researcher passed the questionnaire to the participants. After finishing the questionnaire, participants returned it to the researcher.

Data Analysis Procedures

The data were analyzed according to the research question of the study. The research question addressed by this study was:

How well do the predictors (1) perceived usefulness, (2) perceived ease of use, (3) computer attitude, and (4) experience using Web 2.0 applications predict the intentions of pre-service teachers to use Web 2.0 in the future?

The research hypothesis for research question was stated as:

\[
H_0: R^2 = 0
\]

\[
H_A: R^2 \neq 0 \text{ whereas}
\]
R² represents the variance in behavioral intention (BI) to use Web 2.0 applications that can be predicted from PU, PEU, CA, and EUWA combined.

PU represents perceived usefulness of Web 2.0 applications
PEU represents perceived ease of use of Web 2.0 applications
CA represents computer attitude
EUWA represents experience using Web 2.0 applications
BI represents behavioral intention to use Web 2.0 applications

H₀: The independent variables, perceived usefulness, perceived ease of use of Web 2.0, computer attitude, and experience using Web 2.0 applications are not significant predictors of the dependent variable, behavioral intention to use Web 2.0 applications.

Hₐ: The independent variables, perceived usefulness, perceived ease of use, computer attitude, and experience using Web 2.0 applications are significant predictors of the dependent variable, behavioral intention to use Web 2.0 applications.

Three of four independent variables, perceived usefulness, perceived ease of use, computer attitude and the dependent variable, behavioral intention to use Web 2.0 applications, were measured in the final section, the Attitude Scale (Appendix C, Part IV). The independent variable, experience using Web 2.0 applications, was calculated by collecting data in two separate scales (Appendix C, Part II and III) and running syntax in
SPSS to obtain a score which represented a total usage number denoting how much time each participant had spent on each application in their life.

This two scale method was used instead of asking participants directly how many times they had used on each application in their life because it could be difficult for the participants to accurately remember the specific number of times they had used a particular application. Participants reported how many months they had spent using each application in the Length of Time Spent on Web 2.0 Applications scale of the questionnaire (Appendix C, Part II). Each participant received a score for each item in this scale, which represents usage frequency of each application.

Participants then reported the usage intensity of each application in the Usage Intensity of Web 2.0 Applications scale of the questionnaire (Appendix C, Part III). The answer everyday for each item was replaced with the score 30, which represents that it had been used 30 times per month. At least once a week was replaced with the score 4, which represents that it had been used 4 times per month. At least once a month was replaced with the score 1, which represents that it had been used 1 time per month. At least once a year was replaced with the score 1/12, which represents that it had been used 1/12 time per month. Never was replaced with the score 0 (zero), which represents that it had never been used.

By multiplying the scores gained from these two scales (Appendix C, Part II and III), which reflected usage frequency and intensity of Web 2.0 applications, each participant received a score which represents a total usage number for time spent on each application. For instance, if a participant spent 5 months using blogs and used it everyday,
this individual will receive a score that is calculated as 5x 30=150. This score, 150, represents the participant’s experience using that Web 2.0 application and tells that this individual has used that Web application 150 times in his/her life.

The simultaneous entry method was used in the study to compute multiple regression. Relationships were examined between the predictors and the dependent variable as well as among the predictors themselves. The significance of the relationships and pre-service teachers’ perceptions towards Web 2.0 applications will be discussed in Chapter Four.
CHAPTER FOUR: RESULTS

Introduction

This study was conducted to investigate pre-service teachers’ intention to use Web 2.0 applications in their future teaching approaches. This chapter starts with the instrumentation and presents an analysis of data collected from one hundred twenty-five pre-service teachers. The aim of this chapter is to answer the following research question:

How well do the predictors (1) perceived usefulness, (2) perceived ease of use, (3) computer attitude, and (4) experience using Web 2.0 applications predict the intentions of pre-service teachers to use Web 2.0 in the future?

To answer the research question above, the following hypothesis was tested:

\[ H_0: R^2 = 0 \]
\[ H_A: R^2 \neq 0 \]

\( H_0 \): The independent variables, perceived usefulness of Web 2.0 applications, perceived ease of use of Web 2.0 applications, computer attitude and experience using Web 2.0 applications are not significant predictors of the dependent variable, the behavioral intention to use Web 2.0 applications.

\( H_A \): The independent variables, perceived usefulness of Web 2.0 applications, perceived ease of use of Web 2.0 applications, computer attitude and experience using Web 2.0 applications are significant predictors of the dependent variable, the behavioral intention to use Web 2.0 applications.
The purpose of the study was achieved by employing multiple regression analysis to investigate the extent to which the four variables, perceived usefulness of Web 2.0 applications, perceived ease of use of Web 2.0 applications, computer attitude and experience using Web 2.0 applications, predicted pre-service teachers’ intention to use Web 2.0 in the future.

The results of the study were based on the analysis of the data collected from pre-service teachers who took a technology course and were enrolled in a teacher preparation program during the summer quarter in the 2009-2010 academic year and the fall quarter in 2010-2011 academic year in a Midwestern college of education. The period of data collection lasted from June, 2010 to September, 2010. The researcher met with the participants face-to-face in class during the first class meeting of that technology course. Only pre-service teachers were invited to participate in the study. Student who took this technology course but were from other programs outside of the Department of Teacher Education were not invited to participate in the study. One hundred and twenty-five pre-service teachers voluntarily participated in the study. Thirty-three pre-service teachers who participated in the study were recruited in the summer quarter, and ninety-two were recruited in the fall quarter.

Based on the research design of the study, the researcher met with the study participants face-to-face in classes during the data collection, and the researcher orally reminded the participants to carefully check to make sure that each item in the questionnaire had been answered before returning it. After each participant returned the questionnaire to the researcher, the researcher skimmed through the questionnaire to
make sure each item had been answered. If an item was not answered, the researcher returned the questionnaire to the pre-service teachers and requested that the participant answer the items.

Nevertheless, for case 34 there were missing data in items 2 and 6 regarding the length of time spent on Web 2.0 applications scale. Due to the small portion of missing data, the case was still included in the statistical analysis. A total number of 125 valid responses were entered into the statistical software, SPSS version 14, for analysis. The instrument and the results and findings of the data are presented.

Instrumentation

Section one of the instrument was demographic information, which consisted of 4 items related to age, gender, educational level, and licensure of the participants. Section two consisted of eight items, which were proposed to examine the length of time that each Web 2.0 application had been used by the participants. Section three consisted of eight items, which were proposed to examine the usage intensity of each Web 2.0 application by the participants. Data collected from sections two and three were calculated to obtain a score which represented the pre-service teacher’s experience using Web 2.0 applications. The scoring method used to measure this variable can be referred back to in the data analysis procedure section in Chapter Three. Section four consisted of twenty-five items using a five-point Likert-scale (5= Strongly agree, 4= agree, 3= neutral, 2= disagree, and 1= strongly disagree) and one open-ended question, which investigated the participants’ attitudes towards perceived usefulness, perceived ease of use of Web 2.0 applications, computer attitude, and the behavioral intention to use Web 2.0 in the future.
The open-ended question in section four was used to assess the participants’ attitudes regarding how much classroom time they felt should be devoted to Web 2.0 activity in their future teaching.

Demographic Findings

The study participants consisted of 32 males (25.6%) and 93 females (74.4%), and their ages ranged from 19 to 49 with a mean score of 20.84 (years old). Of the 125 participants who responded to the survey, there were 23 sophomores (18.4%), 60 juniors (48%), 41 seniors (32.8%), and 1 graduate student (.8%) (Table 13).

Table 13

<table>
<thead>
<tr>
<th>Variable</th>
<th>Number</th>
<th>%</th>
<th>M</th>
<th>SD</th>
<th>Range</th>
</tr>
</thead>
<tbody>
<tr>
<td>Gender</td>
<td>125</td>
<td>100</td>
<td>_</td>
<td>_</td>
<td>_</td>
</tr>
<tr>
<td></td>
<td>Male</td>
<td>32</td>
<td>25.6</td>
<td>_</td>
<td>_</td>
</tr>
<tr>
<td></td>
<td>Female</td>
<td>93</td>
<td>74.4</td>
<td>_</td>
<td>_</td>
</tr>
<tr>
<td>Age</td>
<td>125</td>
<td>100</td>
<td>20.84</td>
<td>3.33</td>
<td>19-49</td>
</tr>
<tr>
<td>Educational Level</td>
<td>Sophomore</td>
<td>23</td>
<td>18.4</td>
<td>_</td>
<td>_</td>
</tr>
<tr>
<td></td>
<td>Junior</td>
<td>60</td>
<td>48.0</td>
<td>_</td>
<td>_</td>
</tr>
<tr>
<td></td>
<td>Senior</td>
<td>41</td>
<td>32.8</td>
<td>_</td>
<td>_</td>
</tr>
<tr>
<td></td>
<td>Graduate</td>
<td>1</td>
<td>.80</td>
<td>_</td>
<td>_</td>
</tr>
</tbody>
</table>
One hundred and twenty-five participants responded to the question about which teaching license were pursuing. Of the participants, 27 (21.6%) participants were Early Childhood, 27 (21.6%) were Middle Childhood, 30 (24.0%) were Adolescent-to-Young Adult (AYA), 18 (14.4%) were Special Education, and 23(18.4%) were Multi-age.

Among the 27 participants who were pursuing the Middle Childhood teaching license, 4 had concentrations in social studies and language arts, 6 had concentrations in math and science, 4 had concentrations in science and social studies, 4 had concentrations in math and language arts, 7 had concentrations in math and social studies, and 2 had concentrations in science and language arts. Among the 30 participants who were pursuing the AYA teaching license, 6 had concentrations in math, 6 had concentrations in science, 7 had concentrations in social studies, and 11 had concentrations in language arts. Among the 23 participants who were pursuing the Multi-age teaching license, 11 had a concentration in physical education, 10 had a concentration in modern language, and 1 had a concentration in math (Table 14).
Table 14

*Participants’ License Level*

<table>
<thead>
<tr>
<th>Variable</th>
<th>Number</th>
<th>%</th>
</tr>
</thead>
<tbody>
<tr>
<td>License Level</td>
<td>125</td>
<td>100</td>
</tr>
<tr>
<td>Early Childhood</td>
<td>27</td>
<td>21.60</td>
</tr>
<tr>
<td>Middle Childhood</td>
<td>27</td>
<td>21.60</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Social studies, language arts</td>
<td>4</td>
<td>3.20</td>
</tr>
<tr>
<td>Math, science</td>
<td>6</td>
<td>4.80</td>
</tr>
<tr>
<td>Science, social studies</td>
<td>4</td>
<td>3.20</td>
</tr>
<tr>
<td>Math, language arts</td>
<td>4</td>
<td>3.20</td>
</tr>
<tr>
<td>Math, social studies</td>
<td>7</td>
<td>5.60</td>
</tr>
<tr>
<td>Science, language arts</td>
<td>2</td>
<td>1.60</td>
</tr>
<tr>
<td>Adolescent-to-Young</td>
<td>30</td>
<td>24.00</td>
</tr>
<tr>
<td>Adult (AYA)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Math</td>
<td>6</td>
<td>4.80</td>
</tr>
<tr>
<td>Science</td>
<td>6</td>
<td>4.80</td>
</tr>
<tr>
<td>Social studies</td>
<td>7</td>
<td>5.60</td>
</tr>
<tr>
<td>Language arts</td>
<td>11</td>
<td>.80</td>
</tr>
<tr>
<td>Special Education</td>
<td>18</td>
<td>14.40</td>
</tr>
<tr>
<td>Multi-age</td>
<td>23</td>
<td>18.40</td>
</tr>
<tr>
<td>Physical education</td>
<td>11</td>
<td>8.80</td>
</tr>
<tr>
<td>Modern language</td>
<td>10</td>
<td>8.00</td>
</tr>
<tr>
<td>Math</td>
<td>1</td>
<td>.80</td>
</tr>
</tbody>
</table>
Statistical Analysis

The Statistical Package for Social Science (SPSS) program, version 14.0 was used to analyze the data. Both descriptive and influential statistics were employed. Descriptive statistics “describe the samples of subjects in terms of variables or combinations of variables” (Tabachnick & Fidell, 1996, p. 9). Influential statistics were computed to test the hypothesis.

A multiple regression equation was conducted to answer the research question. It attempted to determine whether the four independent variables: (1) perceived usefulness, (2) perceived ease of use, (3) computer attitude, and (4) experience using Web 2.0 applications were powerful predictors on the measure of the dependent variable, behavioral intention to use Web 2.0. The independent variable, experience using Web 2.0 applications, was calculated using two scales (Appendix C, section II, III); each scale consisted of eight items. By running syntax in the statistical software, SPSS version 14.0, each participant obtained a score which represented experience using each Web 2.0 application and reflected how many times each participant had spent on each application. The details of the scoring method can be referred back to in the data analysis procedure in Chapter Three.

Table 15 shows the mean score and standard deviations (SD) of the length of time that pre-service teachers spent on each Web 2.0 application. Considering that some applications were new to the pre-service teachers, the measuring unit used was months. This provided a more accurate view of the pre-service teachers’ use of these applications. Social networking sites, the application that was used for the longest time, were used for
about forty-two months on average by pre-service teachers. The application of RSS feeds was recorded as having been used for the shortest time on average, which was less than one month (score = .51).

Table 15

Means and Standard Deviations of Length of Time Spent in Months on Web 2.0 Applications

<table>
<thead>
<tr>
<th>Web 2.0 Application</th>
<th>Mean</th>
<th>SD</th>
</tr>
</thead>
<tbody>
<tr>
<td>Blogs</td>
<td>9.22</td>
<td>21.84</td>
</tr>
<tr>
<td>Google applications</td>
<td>14.29</td>
<td>24.54</td>
</tr>
<tr>
<td>Multimedia sharing sites</td>
<td>28.05</td>
<td>25.41</td>
</tr>
<tr>
<td>Podcasts</td>
<td>1.50</td>
<td>6.63</td>
</tr>
<tr>
<td>RSS feeds</td>
<td>.51</td>
<td>3.45</td>
</tr>
<tr>
<td>Social networking sites</td>
<td>42.20</td>
<td>24.27</td>
</tr>
<tr>
<td>Tagging and social bookmarking sites</td>
<td>1.83</td>
<td>7.83</td>
</tr>
<tr>
<td>Wikis</td>
<td>28.32</td>
<td>29.34</td>
</tr>
</tbody>
</table>

Comparing male and female pre-service teachers revealed that blogs, wikis, podcasts, Google applications and multimedia sharing sites were used more by males than females. Social networking sites, tagging and social bookmarking and RSS feeds were used more by females than males. Table16 shows the means and standard deviations for males and females in terms of the length of time spent in months on each Web 2.0 application on average.
Table 16

*Means and Standard Deviations for Males and Females of the Length of Time Spent in Months on Web 2.0 Applications*

<table>
<thead>
<tr>
<th>Web 2.0 Application</th>
<th>Males</th>
<th></th>
<th>Females</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Mean</td>
<td>SD</td>
<td>Mean</td>
<td>SD</td>
</tr>
<tr>
<td>Blogs</td>
<td>15.78</td>
<td>31.79</td>
<td>6.97</td>
<td>16.88</td>
</tr>
<tr>
<td>Google applications</td>
<td>15.41</td>
<td>25.42</td>
<td>13.90</td>
<td>24.45</td>
</tr>
<tr>
<td>Multimedia sharing sites</td>
<td>31.75</td>
<td>27.07</td>
<td>26.77</td>
<td>24.86</td>
</tr>
<tr>
<td>Podcasts</td>
<td>3.56</td>
<td>9.65</td>
<td>.80</td>
<td>5.12</td>
</tr>
<tr>
<td>RSS feeds</td>
<td>.19</td>
<td>1.06</td>
<td>.62</td>
<td>3.95</td>
</tr>
<tr>
<td>Social networking sites</td>
<td>41.63</td>
<td>26.07</td>
<td>42.40</td>
<td>23.82</td>
</tr>
<tr>
<td>Tagging and social bookmarking</td>
<td>1.59</td>
<td>4.82</td>
<td>1.91</td>
<td>8.69</td>
</tr>
<tr>
<td>sites</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Wikis</td>
<td>33.81</td>
<td>25.82</td>
<td>26.41</td>
<td>30.37</td>
</tr>
</tbody>
</table>

Among the eight Web 2.0 applications that were discussed in the study, the social networking sites application had the highest percentage of everyday usage (84%). Blogs, podcasts, RSS feeds, and tagging and social bookmarking sites were the four applications that had never been used by the majority of the 125 participants (over 50%). 60.8% of the 125 participants reported that they had never used blogs, 32.8% for Google applications, 84% for podcasts, 93.6% for RSS feeds, 67.2% for tagging and social bookmarking, and 38.4% for wikis. Google applications, multimedia sharing sites, and wikis had more evenly distributed usage intensity (Table 17).
Table 17

**Percentage of the Usage of Each Web 2.0 Application**

<table>
<thead>
<tr>
<th>Web 2.0 Application</th>
<th>Everyday</th>
<th>At least once a week</th>
<th>At least once a month</th>
<th>At least once a year</th>
<th>Never</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>Blogs</td>
<td>4.00</td>
<td>9.60</td>
<td>8.80</td>
<td>16.80</td>
<td>60.80</td>
<td>100</td>
</tr>
<tr>
<td>Google applications</td>
<td>22.40</td>
<td>18.40</td>
<td>16.80</td>
<td>9.60</td>
<td>32.80</td>
<td>100</td>
</tr>
<tr>
<td>Multimedia</td>
<td>15.20</td>
<td>32.00</td>
<td>22.40</td>
<td>8.00</td>
<td>22.40</td>
<td>100</td>
</tr>
<tr>
<td>Podcasts</td>
<td>.80</td>
<td>2.40</td>
<td>4.00</td>
<td>8.80</td>
<td>84.00</td>
<td>100</td>
</tr>
<tr>
<td>RSS feeds</td>
<td>0</td>
<td>.80</td>
<td>1.60</td>
<td>4.00</td>
<td>93.60</td>
<td>100</td>
</tr>
<tr>
<td>Social networking sites</td>
<td>84.00</td>
<td>12.00</td>
<td>.80</td>
<td>0</td>
<td>3.20</td>
<td>100</td>
</tr>
<tr>
<td>Tagging and social bookmarking</td>
<td>3.20</td>
<td>8.00</td>
<td>12.80</td>
<td>8.80</td>
<td>67.20</td>
<td>100</td>
</tr>
<tr>
<td>Wikis</td>
<td>.80</td>
<td>17.60</td>
<td>32.80</td>
<td>10.40</td>
<td>38.40</td>
<td>100</td>
</tr>
</tbody>
</table>

After running syntax in SPSS to calculate the data collected from the scales (Appendix C, Part II and III), each participant obtained a score to represent their experience using each Web 2.0 application and approximate how many times they had used that application in their lifetime. Table 18 presents the mean scores and standard
deviations of the number of times the 125 participants had used Web 2.0 applications. Social networking sites had the highest mean score, 1172.70, which tells that this application had been used on average that many times by each of the 125 participants. RSS feeds had the lowest mean score, 1.22, which tells that this application had been used on average one time by this group of people on average.

Table 18

<table>
<thead>
<tr>
<th>Web 2.0 Application</th>
<th>Mean</th>
<th>SD</th>
</tr>
</thead>
<tbody>
<tr>
<td>Blogs</td>
<td>53.77</td>
<td>282.11</td>
</tr>
<tr>
<td>Google applications</td>
<td>248.65</td>
<td>659.92</td>
</tr>
<tr>
<td>Multimedia sharing sites</td>
<td>246.69</td>
<td>511.87</td>
</tr>
<tr>
<td>Podcasts</td>
<td>6.07</td>
<td>34.93</td>
</tr>
<tr>
<td>RSS feeds</td>
<td>1.22</td>
<td>12.94</td>
</tr>
<tr>
<td>Social networking sites</td>
<td>1172.70</td>
<td>799.02</td>
</tr>
<tr>
<td>Tagging and social bookmarking</td>
<td>17.10</td>
<td>131.79</td>
</tr>
<tr>
<td>Wikis</td>
<td>55.28</td>
<td>113.57</td>
</tr>
</tbody>
</table>

In Part IV of the questionnaire, item 24 asked respondents about their attitude toward the participatory component of Web 2.0 activities in the classroom. The one hundred twenty-five respondents received a mean score of 3.5 on this question; this score fell between neutral and agree with the statement. It showed that this group of people was
more likely to agree with the statement that they believe every Web 2.0 activity in the classroom should have a large participatory component.

In the open-ended question regarding what percentage of their classroom time should be devoted to Web 2.0 activities, the one hundred twenty-five respondents received a mean score of 49.64(%), using a scale of 1 to 100%. This score showed that this group reported that Web 2.0 activities should take up close to half of the classroom time. Figure 2 shows what percentage of classroom time should be devoted to Web 2.0 activities according to the 125 participants’ responses.
Figure 2. Histogram of Percentage.

Mean = 49.64
Std. Dev. = 20.232
N = 125
Regression Analysis

A multiple regression analysis was conducted to examine how well perceived usefulness, perceived ease of use, computer attitude, and experience using Web 2.0 applications predicted the intentions of per-service teachers to use Web 2.0 in the future. The simultaneous entry method was used. The ANOVA table showed that the model was significant, $F(4, 120) = 76.983, p < .001$ (Table 19).

The standardized beta values ($\beta$) were measured in standard deviation units and are easily comparable. The standardized beta value for perceived usefulness was .43, for perceived ease of use was -.03, for computer attitude was .47, and experience using Web 2.0 applications was .138. This suggests that perceived usefulness and computer attitude had more impact on the regression model.

The adjusted $R$ square indicated that approximately 71% of the variance in the dependent variable (future intention to use Web 2.0 applications) could be predicted by perceived usefulness of Web 2.0, perceived ease of use of Web 2.0, computer attitude, and experience using Web 2.0 applications.

The significant levels of the regression coefficients, which were assessed through t statistics, showed that three of the independent variables, perceived usefulness, computer attitude, and experience using Web 2.0 applications, contributed significantly to the regression with t value of 5.37, 5.76, and 2.78 respectively. The independent variable, perceived ease of use, did not contribute significantly to the regression model in the study. The prediction model is illustrated by a scatterplot of the predicted values.
ZPRED against the residual ZRESID (Figure 3). This was used to check the assumption that the predictors and residual are uncorrelated.

Table 19

**ANOVA**

<table>
<thead>
<tr>
<th>Model</th>
<th>Sum of Squares</th>
<th>df</th>
<th>Mean Square</th>
<th>F</th>
<th>Sig.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Regression</td>
<td>38.324</td>
<td>4</td>
<td>9.581</td>
<td>76.983</td>
<td>.000  (a)</td>
</tr>
<tr>
<td>Residual</td>
<td>14.935</td>
<td>120</td>
<td>.124</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Total</td>
<td>53.259</td>
<td>124</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

a. Predictors: (Constant), Perceived usefulness, Perceived Ease of Use, Computer Attitude, Experience Using Web 2.0 Applications

b. Dependent Variable: Behavioral Intention
Figure 3. Scatterplot.
The $R^2$ value represents the percentage of variance accounted for in the dependent variable by the set of independent variables. The adjusted $R^2$ value also represents the percentage of variance accounted for in the dependent variable by the set of independent variables. However, the adjusted $R^2$ value is always slightly lower than the $R^2$ value because the adjusted $R^2$ tends to be conservative. The adjusted $R^2$ is a better estimate of the proportion of the variance in the dependent variable that can be predicted from the independent variables. The adjusted $R^2$ for the regression model was .71.

Table 20

<table>
<thead>
<tr>
<th>Model</th>
<th>R</th>
<th>R Square</th>
<th>Adjusted R Square</th>
<th>Std. Error of the Estimate</th>
<th>Change Statistics</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>.848</td>
<td>.720</td>
<td>.710</td>
<td>.35279</td>
<td>4</td>
</tr>
</tbody>
</table>

a. Predictors: (Constant), Perceived usefulness, Perceived Ease of Use, Computer Attitude, Experience Using Web 2.0 Applications
b. Dependent Variable: Behavioral Intention
The multiple regression raw score equation showed the raw score equation for simple linear regression as follows:

$$\hat{Y} = a + b_1X_{PU} + b_2X_{PEU} + b_3X_{CA} + b_4X_{UE}$$

$$\hat{Y}(BI) = .352 + (.440)(PU\ score) + (-.045)(PEU\ score) + (.468)(CA\ score) + (.001)(EUWA\ score)$$

$\hat{Y}$ represents the predicted value of the dependent variable, behavioral intention.

$a$ represents the $\hat{Y}$ intercept (constant).

$b_1$ represents the coefficient of the predictor, perceived usefulness ($X_{PU}$).

$b_2$ represents the coefficient of the predictor, perceived ease of use ($X_{PEU}$).

$b_3$ represents the coefficient of the predictor, computer attitude ($X_{CA}$).

$b_4$ represents the coefficient of the predictor, experience using Web 2.0 applications ($X_{EUWA}$).

$X_{PU}$ represents the predictor variable, perceived usefulness.

$X_{PEU}$ represents the predictor variable, perceived ease of use.

$X_{CA}$ represents the predictor variable, computer attitude.

$X_{EUWA}$ represents the predictor variable, experience using Web 2.0 applications.

$Y(BI) = .352 + (.440)(PU\ score) + (-.045)(PEU\ score) + (.468)(CA\ score) + (.001)(EUWA\ score)$

Exploratory Data Analysis

Data were examined by running statistical analysis to determine possible errors that were caused by coding, recoding, missing information, or influential outliers. In multiple regression, cases are examined for univariate extremeness of the variables using
standardized scores of the variables (Tabachnick & Fidell, 1996). Cases 4, 41 and 105 had very large standardized scores, z scores on five variables, which were larger than 3 or less than -3. Table 20 demonstrates the cases with the extreme values for variables that were identified as the outliers. (See the values in italics in Table 20). A residual analysis was conducted to identify outliers (Figure 3).

Table 21

<table>
<thead>
<tr>
<th>Outliers</th>
<th>ZEUWA</th>
<th>ZPU</th>
<th>ZPEU</th>
<th>ZCA</th>
<th>ZBI</th>
</tr>
</thead>
<tbody>
<tr>
<td>Case</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>4</td>
<td>-0.89</td>
<td>-3.37</td>
<td>-0.78</td>
<td>-4.05</td>
<td>-3.15</td>
</tr>
<tr>
<td>41</td>
<td>0.81</td>
<td>-3.11</td>
<td>-0.42</td>
<td>-3.14</td>
<td>-2.13</td>
</tr>
<tr>
<td>105</td>
<td>4.22</td>
<td>0.01</td>
<td>1.37</td>
<td>0.79</td>
<td>0.41</td>
</tr>
</tbody>
</table>

ZEUWA, Z score of experience using Web 2.0 applications
ZPU, Z score of perceived usefulness
ZPEU, Z score of perceived ease of use
ZCA, Z score of computer attitude
ZBI, Z score of behavioral intention to use Web 2.0

Case 65 answered neutral on all items of the attitude scale. Sixteen cases left a comment on the last page of the questionnaire. In all these cases, the comments reported that the respondents did not know about Web 2.0 and suggested that the researcher should conduct the survey at the end of the quarter instead of doing it during the first class meeting, so they would have a better understanding of Web 2.0.

There were missing data in items 2 and 6 of the length of time scale of case 34. Because of the small portion of missing data, the case was included in the regression analysis. The mean scores were used to replace the missing data.
After examining the three extreme cases (case 4, 41, and 105) by checking the data for the cases individually to make sure they were accurately entered in the data file, the next step that the researcher took was to look at the model table with the adjusted $R^2$ values. With these three extreme cases (cases 4, 41, and 105), the adjusted $R^2$ was .71. After their removal, the value of the adjusted $R^2$ dropped down to .68. Thus, these three cases did not have a great impact on the explained variance of the dependent variable in the regression equation. Hence, these three cases were retained in the regression analysis.

Reliability of the Instrument

Cronbach’s Alpha ($\alpha$) was reported to examine the reliability of the items in the scales. For the length of time scale, the value of Cronbach’s Alpha was .57. For the usage intensity of Web 2.0 applications scale, it was .52. For the attitude scale, it was .92.

Table 22

<table>
<thead>
<tr>
<th>Scales</th>
<th>Number of Items</th>
<th>Cronbach’s Alpha</th>
</tr>
</thead>
<tbody>
<tr>
<td>Length of Time Spent on Web 2.0 Applications</td>
<td>8</td>
<td>.57</td>
</tr>
<tr>
<td>Usage Intensity of Web 2.0 Applications</td>
<td>8</td>
<td>.52</td>
</tr>
<tr>
<td>Attitude Scale</td>
<td>24</td>
<td>.92</td>
</tr>
</tbody>
</table>

Reliability of the five variables was examined. The value of Cronbach’s Alpha of perceived usefulness (PU) was .916, perceived ease of use (PEU) was .251, computer
attitude (CA) was .868, experience using Web 2.0 applications (EUWA) was .341, and behavioral intention to use Web 2.0 (BI) was .868 (Table 23).

Table 23

<table>
<thead>
<tr>
<th>Variable</th>
<th>Measure</th>
<th>Cronbach’s Alpha</th>
</tr>
</thead>
<tbody>
<tr>
<td>Perceived usefulness (PU)</td>
<td>Part IV, items 1, 4, 9, 13, 16, 19</td>
<td>.916</td>
</tr>
<tr>
<td>Perceived ease of use (PEU)</td>
<td>Part IV, items 2, 7, 12, 22</td>
<td>.251</td>
</tr>
<tr>
<td>Computer attitude (CA)</td>
<td>Part IV, items 8, 10, 11, 15, 17</td>
<td>.868</td>
</tr>
<tr>
<td>Experience using Web 2.0 applications (EUWA)</td>
<td>Part II, III</td>
<td>.341</td>
</tr>
<tr>
<td>Behavioral intention to use Web 2.0 (BI)</td>
<td>Part IV, items 5, 6, 14, 20, 21, 23</td>
<td>.868</td>
</tr>
</tbody>
</table>

Meyers, Gamst, and Guarino (2006) explained that multicollinearity is a condition that exists if more than two predictors have strong correlations. It can be detected by examining the values of tolerance or VIF. Stevens (2002) suggested a VIF of greater than 10 as criterion indicating multicollinearity (as cited in Myers, Gamst, & Guarino, 2006).

Leech, Barrett and Morgan (2008) used a different standard as criterion indicating multicollinearity. They pointed out that “if the tolerance value is low (\( < 1 - R^2 \)), then there is probably a problem with multicollinearity” (p. 99). From the coefficients table, all VIF values were less than 10, and all tolerance values were not lower than .29 (1 − .71). By using both standards, no multicollinearity was identified in the analysis.
In addition, the partial correlation in the coefficient table has shown the values of the three variables, perceived usefulness, perceived ease of use, and computer attitudes dropped down when put the variables and controlled the other variables in the regression model. The value of variable, experience using Web 2.0 applications was increased after controlled the other four variables.

Table 24

*Multiple Regression Coefficients*

<table>
<thead>
<tr>
<th>Model</th>
<th>B</th>
<th>Std. Error</th>
<th>β</th>
<th>t</th>
<th>Sig.</th>
<th>Tolerance</th>
<th>VIF</th>
</tr>
</thead>
<tbody>
<tr>
<td>(Constant)</td>
<td>.352</td>
<td>.270</td>
<td></td>
<td>1.302</td>
<td>.195</td>
<td></td>
<td></td>
</tr>
<tr>
<td>PU</td>
<td>.440</td>
<td>.082</td>
<td>.430</td>
<td>5.370</td>
<td>.000</td>
<td>.364</td>
<td>2.749</td>
</tr>
<tr>
<td>PEU</td>
<td>-.045</td>
<td>.072</td>
<td>-.032</td>
<td>-.616</td>
<td>.539</td>
<td>.884</td>
<td>1.132</td>
</tr>
<tr>
<td>CA</td>
<td>.468</td>
<td>.081</td>
<td>.472</td>
<td>5.762</td>
<td>.000</td>
<td>.348</td>
<td>2.871</td>
</tr>
<tr>
<td>EUWA</td>
<td>.001</td>
<td>.000</td>
<td>.138</td>
<td>2.779</td>
<td>.006</td>
<td>.951</td>
<td>1.051</td>
</tr>
</tbody>
</table>

PU= Perceived usefulness
PEU= Perceived ease of use
CA= Computer attitude
EUWA= Experience using Web 2.0 applications
Table 25

*Multiple Regression Correlation Coefficients*

<table>
<thead>
<tr>
<th>Model</th>
<th>Correlations</th>
<th>Zero-order</th>
<th>Partial</th>
</tr>
</thead>
<tbody>
<tr>
<td>(Constant)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>PU</td>
<td></td>
<td>.785</td>
<td>.440</td>
</tr>
<tr>
<td>PEU</td>
<td></td>
<td>.194</td>
<td>-.056</td>
</tr>
<tr>
<td>CA</td>
<td></td>
<td>.800</td>
<td>.465</td>
</tr>
<tr>
<td>EUWA</td>
<td></td>
<td>.075</td>
<td>.246</td>
</tr>
</tbody>
</table>

PU= Perceived usefulness
PEU= Perceived ease of use
CA= Computer attitude
EUWA= Experience using Web 2.0 applications
Figure 4. Histogram of Behavioral Intention to use Web 2.0 Applications.
Assumption Testing for Multiple Regression Analysis

There are various assumptions related to multiple regression analysis that have to be taken into consideration (Tabachnick & Fidell, 1996) before drawing a conclusion about the population based analysis done on a sample (Field, 2005). For the purpose of this study, normality, linearity, homoscedasticity, and independent errors were considered. The assumption of normality is the assumption that the residuals (the errors of predictions) are normally distributed around each predicted value. The residual scatterplot and histograms were used to review the assumption of normality. Skewness (symmetry of the distribution) and kurtosis (peakedness of the distribution) of the data were examined. There was no pattern in the scatterplot, and there was no skewness or kurtosis in the histograms. The normality assumption was not violated.

The assumption of linearity is the assumption that the mean values of the predictor for each increment of the predictor lie along a straight line. The normal P-P plot of regression standardized residual was used to test the linearity assumption. No violation was identified.

The assumption of homoscedasticity is that the residuals at each level of predictors should have the same variance. When this assumption is violated (i.e. the variances are very unequal), then this model has a heteroscedasticity problem (Field, 2005; Tabachnick & Fidell, 1996). The residual scatterplot was used to test the assumption of homoscedasticity. Since there was no skewness or kurtosis, there was no violation of the assumption of homoscedasticity.
Another assumption associated with regression is independent errors; this assumption “is violated as a function of something associated with the order of case. Often, ‘something’ is time or distance” (Tabachnick & Fidell, 1996, p. 139). This assumption can be tested by using the Durbin-Watson test. The closer to 2 that Durbin-Watson is, the better it is. The value in this case was 1.78. Thus, there was no violation of the assumption of independent errors.
CHAPTER FIVE: DISCUSSION, SUMMARY, CONCLUSIONS, AND RECOMMENDATIONS

Introduction

This chapter is intended to restate the purpose of the study and the procedures that were executed in this study. The results are presented and discussed. Limitations, recommendations and conclusions of the researcher follow.

Purpose and Design

The purpose of the study was to examine to what extent perceived usefulness, perceived ease of use, computer attitude and experience using Web 2.0 applications predicted pre-service teachers’ intention to use Web 2.0 in their future teaching approaches. The study attempted to explore the perception of pre-service teachers with regards to the use of Web 2.0 by looking at four different dimensions of attitude towards using Web 2.0 applications. The study intended to examine which of the predictors, perceived usefulness, perceived ease of use, computer attitude, and experience using Web 2.0 applications was a more powerful predictor in predicting behavioral intention of pre-service teachers to use Web 2.0 in the future.

Data were collected from a technology course of different sessions in a Midwestern college of education from June to September, 2010. This course was a requirement for all pre-service teachers who sought a teaching license at different grade levels of PK-12. After meeting face-to-face with the participants during the first class meeting of different sessions and distributing 125 copies of the questionnaire to them, all 125 copies were returned back to the researcher.
The instrument consisted of four sections: demographic information, length of time spent on Web 2.0 applications, usage intensity of Web 2.0 applications, and attitude scale. The first section, demographic information, provided the researcher with information to describe the study participants. The second section, the scale of the length of time spent on Web 2.0 applications, was designed to determine how many months pre-service teachers spent on Web 2.0 applications. This scale was constructed by the researcher based on the advice of the dissertation committee and a review of the literature.

The third section, usage intensity of Web 2.0 applications, was designed to assess the intensity of Web 2.0 applications usage by pre-service teachers. This scale was used as a follow-up instrument to better estimate pre-service teachers’ experience using Web 2.0. After combining and calculating the information gained from the second and third sections, each participant received a score that represented a total usage number denoting how many times each study participant had used each Web 2.0 application.

The fourth section, the attitude scale, assessed pre-service teachers’ perceptions towards Web 2.0 by examining the four dimensions/variables, perceived usefulness, perceived ease of use, computer attitude, and behavioral intention. The scale consisted of twenty-four items using a 5-point Likert scale along with one open-ended question and was created by combining and adopting two scales from two studies. Each study participant was given an average score on each of the four variables.

The population of this study consisted of all pre-service teachers in the teacher preparation programs in the United States. The convenience sample was drawn from pre-service teachers who were taking a technology course in the teacher preparation programs
of a large Midwestern university. This sample population would be seeking teaching licensure in the future.

Research Question and Hypothesis

The study was led by the following research question:

How well do the predictors (1) perceived usefulness, (2) perceived ease of use, (3) computer attitude, and (4) experience using Web 2.0 applications predict the intentions of pre-service teachers to use Web 2.0 in the future?

The research hypothesis based on the research question above was stated as follows:

\[ H_0: R^2 = 0 \]

\[ H_A: R^2 \neq 0 \]

\( H_0 \): The independent variables, perceived usefulness of Web 2.0 applications, perceived ease of use of Web 2.0 applications, computer attitude and experience using Web 2.0 applications are not significant predictors of the dependent variable, behavioral intention to use Web 2.0 applications.

\( H_A \): The independent variables, perceived usefulness of Web 2.0 applications, perceived ease of use of Web 2.0 applications, computer attitude and experience using Web 2.0 applications are significant predictors of the dependent variable, behavioral intention to use Web 2.0 applications.
Discussion of the Findings

The multiple regression analysis rejected the null hypothesis that the independent variables, perceived usefulness, perceived ease of use, computer attitude, and experience using Web 2.0 are not significant predictors of the dependent variable, behavioral intention. The results showed that perceived usefulness, perceived ease of use, computer attitude, and experience using Web 2.0 applications were significant predictors of the dependent variable, behavioral intention. Approximately 71% of the variance of the behavioral intention could be accounted for by the linear relationship of the four independent variables: perceived usefulness, perceived ease of use, computer attitude, and experience using Web 2.0 applications. Three of the predictors, perceived usefulness ($t(125) = 5.37, p < .001$), computer attitude ($t(125) = 5.76, p < .001$), and experience using Web 2.0 applications ($t(125) = 2.78, p < .01$) were statistically significant in predicting the behavioral intention.

The literature revealed that perceived usefulness and perceived ease of use are two specific determinants that predict behavioral intention to use technology (King & He, 2006; Teo, Luan & Sing, 2008; Turner, Kitchenham, Brereton, Charters, & Budgen, 2010; Venkatesh & Davis, 2000). Findings from this study support the conclusion that perceived usefulness is a significant predictor in predicting pre-service teachers’ intention to use Web 2.0 in their future teaching approaches, but perceived ease of use does not significantly contribute to this equation model. This could be the result of several possible factors. First, the data was collected during the first meeting of a technology course, and the pre-service teachers might or might not have known what the Web 2.0
applications were because they might not have received adequate training in terms of using these applications for educational purposes before taking this technology course. Based on the feedback they left on the questionnaire, seventeen pre-service teachers reported that they did not know about Web 2.0 and suggested the researcher should wait until the end of the quarter when they had gained knowledge of Web 2.0 in the course to conduct the survey. Thus, it is possible that the pre-service teachers did not perceive Web 2.0 applications to be easy to use since they did not know what they are.

Second, four out of eight Web 2.0 applications (wikis for 28.32 months, social networking sites for 42.30 months, Google application for 14.29 months, and multimedia sharing sites for 28.05 months) that were discussed in this study had been used for over one year on average by the study participants, while blogs had been used for about 9.2 months. Only three applications had been used for relatively short periods of time; these are podcasts (1.5 months), tagging and social bookmarking (1.83 months), and RSS feeds (.51 month). Hence, from these average usage reports, it can be inferred that all Web 2.0 applications discussed in the study had been used, but the study participants might or might not have agreed that these applications were easy to use. They might have used them, but did not think they were easy to use.

The findings support the conclusion that computer attitude and experience using Web 2.0 applications are significant predictors of behavioral intention of pre-service teachers to use Web 2.0 in the future. Teo, Luan, and Sing (2008) pointed out that computer attitude is a critical factor that can be used to predict a teacher’s future intention to use technology.
Other than the information about the predictors, the demographic information of the participants provided additional data about these Web 2.0 applications. The study participants consisted of thirty-two males and ninety-three females. This is because the participants were educational majors, and most education classes have more females than males. So relatively more females than males were in the sample. Interestingly, not all Web 2.0 applications were used by males more than females on average considering the length of time they spent on the applications. Social networking sites, tagging and social bookmarking, and RSS feeds were three applications that were used by females more than males.

The finding has shown that pre-service teachers had used Web 2.0 applications in their life though not every application had been used for over a year. Social networking sites were the application that had been used for the longest time on average. It is worthwhile for program designers of teacher preparation programs considering adopting social networking sites to be a learning tool for pre-service teachers since this application has been used by them. Besides social networking sites, Google applications, multimedia sharing sites, and wikis had been used for over a year on average by this group of people in the study. Since these are the applications that pre-service teachers are familiar with for a period of time and they has perceived these applications as a useful learning tool in the study, instructors of teacher preparation programs can deploy these applications in classroom to stimulate pre-service teachers’ learning interests.

Limitations of the Study

The limitations of the study were as follows:
1. A questionnaire was used as a research instrument for data collection. By using the questionnaire method to collect data, the responses relied solely on the respondent’s honest and personal interpretation and understanding of the questions. Other factors that were not considered in the study might have influenced respondents’ answers to the questions.

2. No follow-up face-to-face interviews were included as part of the research design. The data collection relied on the questionnaire. Without interviews, no further thoughts from the respondents regarding the research topic were revealed.

3. Sample size. The study used a convenient sample from a large Midwestern university and had one hundred twenty-five pre-service teachers to participate in the study. Compared to the large number of pre-service teachers in the United States, the sample population is not considered large enough to generalize the results to the whole population in the country.

Implementations and Recommendations for Future Research

As many researchers and educators mentioned in the literature, Web 2.0 applications and practices have been introduced into teaching and learning activities in the past decade, and Web 2.0 learning can engage learners in a collaborative learning environment. This study aimed at investigating the intention of pre-service teachers to use Web 2.0 in their future approaches. Among the implementations and recommendations supported by the study are:
1. Introducing Web 2.0 applications to the pre-service teachers in teacher preparation programs is recommended as they perceived Web 2.0 applications as useful tools for teaching.

2. It may be beneficial to widen the scope of the study. Increasing the sample population will make sure that the results can be generalized to a larger population.

3. The results in the study showed that perceived ease of use is not a significant variable to predict pre-service teachers’ intention to use Web 2.0 in the future. However, previous research studies showed that it was supposed to be an important fundamental determinant. Future studies can explore this variable more to create a better understanding of its impact on the prediction of future intention to use Web 2.0 from pre-service teachers’ perspectives.

4. Further qualitative research should be conducted in order to gain an in-depth understanding of pre-service teachers’ intention to use Web 2.0 for educational purposes.

Conclusion

The purpose of the study was to examine whether perceived usefulness, perceived ease of use, computer attitude, and experience using Web 2.0 applications, reliably predict behavioral intention of pre-service teachers to use Web 2.0 in the future. Investigating which of the four variables (perceived usefulness, perceived ease of use, computer attitudes, and experience using Web 2.0 applications) are important predictors in the model was another focus of the study. The findings from the null hypothesis and regression analysis presented a statistically significant relationship between the predictors and behavior intention. Perceived usefulness, computer attitude, and experience using
Web 2.0 applications were found to be significant predictors of behavioral intention. This research could provide administrators, program designers and instructors insight into the perception of pre-service teachers in teacher preparation programs towards Web 2.0 use in their future teaching approaches.
REFERENCES


Brown, D., & Warschauer, M. (2006). From the university to the elementary classroom:


Part I.

1. Please write down your age.

   Age: [_________] years old

2. Gender:

   Male [ ]    Female [ ]

3. Educational level:

   [ ] Freshman    [ ] Sophomore    [ ] Junior    [ ] Senior    [ ] Graduate

4. What is your licensure level?

   [ ] Early Childhood, and

   What is (are) your Content Concentration Area(s) within Early Childhood?

   Mathematics [ ]
   Science [ ]
   Social studies [ ]
   Language Arts [ ]
   Other(s) ________________________________________________
   all content areas [ ]

   [ ] Middle Childhood, and

   What is (are) your Content Concentration Area(s) within Middle Childhood?

   Mathematics [ ]
   Science [ ]
   Social studies [ ]
   Language Arts [ ]
   Other(s) ________________________________________________
   all content areas [ ]
AYA, and

What is your Content Concentration Area within AYA?

- Mathematics
- Science
- Social studies
- Language Arts

Other (s)_______________________________________________

all content areas

Special Education, and

What is your Content Concentration Area within Special Education?

- Mathematics
- Science
- Social studies
- Language Arts

Other (s)_______________________________________________

all content areas

Multi-age, and

What is (are) your Content Concentration Area(s) within Multi-age?

- Arts
- Music
- Physical Education
- Modern Language

Other (s)_______________________________________________

all content areas
Part II. Please write down the number of months in the blank that best reflects your use in each of the following tools.

If you never use that tool, please write down “0” (zero). Thank you very much.

1. How many months have you used/read Weblogs (e.g. Google Blog, Blogger, Edublogs)?
   
   ________ months

2. How many months have you owned a Weblog(s) (e.g. Google Blog, Blogger, Edublogs)?
   
   ________ months

3. How many months have you used wikis (e.g. Wikispaces, Wikipedia)?
   
   ________ months

4. How many months have you used audio-podcasts (e.g. PodOmatic)?
   
   ________ months

5. How many months have you used video-podcasts?
   
   ________ months

6. How many months have you used discussion boards?
   
   ________ months

7. How many months have you used RSS feeds?
   
   ________ months

8. How many months have you used social networking sites (e.g. Facebook, MySpace)?
   
   ________ months

   And which social networking site(s) do you use? Please specify.
   
   ________________________________________________________________

9. How many months have you used microblogs (e.g. twitter, Plurk)?
   
   ________ months
10. How many months have you used photo sharing sites (e.g. Flickr, Picasa, iPhoto)?
   
11. How many months have you used instant messaging (e.g. Yahoo! Messenger, AOL, MSN Messenger, AIM, Skype)?
   
And which instant messaging(s) do you use? Please specify.

12. How many months have you used Google?
   
13. How many months have you used Gmail?
   
14. How many months have you used Google Docs (Documents)?
   
15. How many months have you used web-based mapping tools (e.g. Google Maps, MapQuest, Yahoo! Local)?
   
And which mapping tool(s) do you use? Please specify.

16. How many months have you used web-based calendar (e.g. Google Calendar, WebCalendar)?
   
17. How many months have you used video sharing sites (e.g. YouTube)?
   
Please Turn To Next Page
Part III.

1. Which of the following Web 2.0 tools do you like to use? Please mark all the options that apply.

- [ ] Weblogs
- [ ] wikis
- [ ] audio-podcasts
- [ ] video-podcasts
- [ ] discussion boards
- [ ] RSS feeds
- [ ] microblogs
- [ ] photo sharing sites
- [ ] social networking sites
- [ ] social bookmarking managers
- [ ] instant messaging
- [ ] Google
- [ ] Gmail
- [ ] Google Docs
- [ ] web-based mapping tools
- [ ] web-based calendar
- [ ] video sharing sites

2. Which of the following Web 2.0 tools would you consider using in your future K-12 classroom? Please mark all the options that apply.

- [ ] Weblogs
- [ ] wikis
- [ ] audio-podcasts
- [ ] video-podcasts
- [ ] discussion boards
- [ ] RSS feeds
- [ ] microblogs
- [ ] photo sharing sites
- [ ] social networking sites
- [ ] social bookmarking managers
- [ ] instant messaging
- [ ] Google
- [ ] Gmail
- [ ] Google Docs
- [ ] web-based mapping tools
- [ ] web-based calendar
- [ ] video sharing sites

Please Turn To Next Page
3. Which of the following have you used but would NOT consider using in your future K-12 classrooms? Please mark all the options that apply.

- Weblogs
- Wikis
- Audio-podcasts
- Video-podcasts
- Discussion boards
- RSS feeds
- Microblogs
- Photo sharing sites
- Social networking sites
- Social bookmarking managers
- Instant messaging
- Google
- Gmail
- Google Docs
- Web-based mapping tools
- Web-based calendar
- Video sharing sites

Why would you NOT consider using the tools that you have identified not using in the classrooms?
4. Which of the following Web 2.0 tools were introduced to you by instructors other than your technology methods course instructor in your teacher preparation program? Please mark all the options that apply.

- [ ] Weblogs
- [ ] wikis
- [ ] audio-podcasts
- [ ] video-podcasts
- [ ] discussion boards
- [ ] RSS feeds
- [ ] microblogs
- [ ] photo sharing sites
- [ ] social networking sites
- [ ] social bookmarking managers
- [ ] instant messaging
- [ ] Google
- [ ] Gmail
- [ ] Google Docs
- [ ] web-based mapping tools
- [ ] web-based calendar
- [ ] video sharing sites

Which course(s) were they (Web 2.0 tools) introduced? Please mark all the options that apply.

- [ ] Science Methods Course
- [ ] Math Methods Course
- [ ] Language Arts Methods Course
- [ ] Technology Methods Course
- [ ] Social Studies Methods Course
Part IV. Please indicate whether you agree or disagree with each statement. Please tick one answer for each statement.

Strongly Agree = SA
Agree = A
Neutral = N
Disagree = D
Strongly Disagree = SD

|   |   |
|---|---|---|---|---|---|
| 1 | Using Web 2.0 tools will improve my learning. | SA | A | N | D | SD |
| 2 | I find Web 2.0 tools easy to use. |   |   |   |   |   |
| 3 | I hesitate to use a Web 2.0 tool because I might look stupid. |   |   |   |   |   |
| 4 | Using Web 2.0 tools makes me more creative. |   |   |   |   |   |
| 5 | I plan to use Web 2.0 tools often. |   |   |   |   |   |
| 6 | I only use Web 2.0 tools at college/school when told to. |   |   |   |   |   |
| 7 | Web 2.0 tools make me feel uncomfortable. |   |   |   |   |   |
| 8 | I look forward to those aspects of my teaching career that require me to use Web 2.0 tools. |   |   |   |   |   |
| 9 | Using Web 2.0 tools will enhance my effectiveness in learning. |   |   |   |   |   |
| 10 | I look forward to using Web 2.0 tools to enhance the effectiveness of my teaching career in the future. |   |   |   |   |   |
| 11 | Web 2.0 tools make learning more interesting. |   |   |   |   |   |
| 12 | Interacting with Web 2.0 tools requires a lot of attention. |   |   |   |   |   |
| 13 | Web 2.0 tools make it possible to work more productively. |   |   |   |   |   |
| 14 | I avoid using Web 2.0 tools in college/school. |   |   |   |   |   |
| 15 | I like using Web 2.0 tools for learning. |   |   |   |   |   |
| 16 | Using Web 2.0 tools will increase my productivity in learning. |   |   |   |   |   |
| 17 | Working with Web 2.0 tools is not fun at all. |   |   |   |   |   |
| 18 | Using a Web 2.0 tool does not scare me at all. |   |   |   |   |   |
| 19 | I find Web 2.0 tools a useful tool in my work. |   |   |   |   |   |
| 20 | I would avoid taking a teaching career if I knew it involved working with Web 2.0 tools. |   |   |   |   |   |
| 21 | I will use Web 2.0 tools regularly throughout college/school. |   |   |   |   |   |
| 22 | I need an experienced person nearby when I use a Web 2.0 tool. |   |   |   |   |   |
| 23 | I will not use Web 2.0 tools in the future. |   |   |   |   |   |

Thank you very much for your time and patience to answer this survey.

I really appreciate it!!
APPENDIX B: THE REVISED QUESTIONNAIRE
**Part I.**

1. Please write down your age.

   Age: ___________________ years old

2. Gender:

   Male □       Female □

3. Educational level:

   □ Freshman  □ Sophomore □ Junior □ Senior □ Graduate

4. What is your licensure level?

   □ Early Childhood, and

   What is (are) your Content Concentration Area(s) within Early Childhood?

   Mathematics □

   Science □

   Social studies □

   Language Arts □

   Other(s) __________________________________________

   all content areas □

   □ Middle Childhood, and

   What is (are) your Content Concentration Area(s) within Middle Childhood?

   Mathematics □

   Science □

   Social studies □

   Language Arts □

   Other(s) __________________________________________

   all content areas □
AYA, and

What is your Content Concentration Area within AYA?

- Mathematics
- Science
- Social studies
- Language Arts
- Other (s) ____________________________________________
- all content areas

Special Education, and

What is your Content Concentration Area within Special Education?

- Mathematics
- Science
- Social studies
- Language Arts
- Other (s) ____________________________________________
- all content areas

Multi-age, and

What is (are) your Content Concentration Area(s) within Multi-age?

- Arts
- Music
- Physical Education
- Modern Language
- Other (s) ____________________________________________
- all content areas
Part II. Please write down the number of months in the blank that best reflects your use in each of the following tools.

If you never use that tool, please write down “0” (zero). Thank you very much.

1. How many months have you used/read Weblogs (e.g. Google Blog, Blogger, Edublogs) for learning?
   __________ months

2. How many months have you used wikis (e.g. Wikispaces, Wikipedia) for learning?
   __________ months

3. How many months have you used podcasts (e.g. PodOmatic) for learning?
   __________ months

4. How many months have you used networking sites (e.g. Facebook, MySpace) for learning?
   __________ months

5. How many months have you used tagging and social bookmarking (e.g. del.icio.us) for learning?
   __________ months

6. How many months have you used RSS feeds for learning?
   __________ months

7. How many months have you used Google applications (e.g. Google Docs, Google Calendar) for learning?
   __________ months

8. How many months have you used multimedia sharing sites (e.g. photo sharing like Flickr, Picasa, iPhoto; video sharing like YouTube) for learning?
   __________ months

Please Turn To Next Page
Part III. Please check one answer that best reflects your use in each of the following tools.

<table>
<thead>
<tr>
<th>Tool</th>
<th>everyday</th>
<th>at least once a week</th>
<th>at least once a month</th>
<th>at least once a year</th>
<th>never</th>
</tr>
</thead>
<tbody>
<tr>
<td>I use Weblogs for learning</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>I use wikis for learning</td>
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<td></td>
<td></td>
</tr>
<tr>
<td>I use podcasts for learning</td>
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<tr>
<td>I use social networking sites for learning</td>
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<tr>
<td>I use tagging and social bookmarking sites for learning</td>
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<tr>
<td>I use RSS feeds for learning</td>
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<tr>
<td>I use Google applications for learning</td>
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<tr>
<td>I use multimedia sharing sites for learning</td>
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<td></td>
</tr>
</tbody>
</table>
Part IV. Please indicate whether you agree or disagree with each statement. Please tick one answer for each statement.

Strongly Agree = SA  
Agree = A  
Neutral = N  
Disagree = D  
Strongly Disagree = SD

<table>
<thead>
<tr>
<th></th>
<th>Statement</th>
<th>SA</th>
<th>A</th>
<th>N</th>
<th>D</th>
<th>SD</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Using Web 2.0 tools will improve my learning.</td>
<td></td>
<td></td>
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<tr>
<td>2</td>
<td>I find Web 2.0 tools easy to use.</td>
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<tr>
<td>3</td>
<td>If I have problems using Web 2.0 tools, I can usually solve them one way or other.</td>
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</tr>
<tr>
<td>4</td>
<td>Using Web 2.0 tools makes me more creative.</td>
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</tr>
<tr>
<td>5</td>
<td>I plan to use Web 2.0 tools often.</td>
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<tr>
<td>6</td>
<td>I only use Web 2.0 tools at college/school when told to.</td>
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<tr>
<td>7</td>
<td>I do not need someone to tell me the best way to use Web 2.0 tools.</td>
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<tr>
<td>8</td>
<td>I look forward to those aspects of my teaching career that require me to use Web 2.0 tools.</td>
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</tr>
<tr>
<td>9</td>
<td>Using Web 2.0 tools will enhance my effectiveness in learning.</td>
<td></td>
<td></td>
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<tr>
<td>10</td>
<td>I look forward to using Web 2.0 tools to enhance the effectiveness of my teaching career in the future.</td>
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</tr>
<tr>
<td>11</td>
<td>Web 2.0 tools make learning more interesting.</td>
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</tr>
<tr>
<td>12</td>
<td>Interacting with Web 2.0 tools requires a lot of attention.</td>
<td></td>
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<tr>
<td>13</td>
<td>Web 2.0 tools make it possible to work more productively.</td>
<td></td>
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</tr>
<tr>
<td>14</td>
<td>I avoid using Web 2.0 tools in college/school.</td>
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<td></td>
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</tr>
<tr>
<td>15</td>
<td>I like using Web 2.0 tools for learning.</td>
<td></td>
<td></td>
<td></td>
<td></td>
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</tr>
<tr>
<td>16</td>
<td>Using Web 2.0 tools will increase my productivity in learning.</td>
<td></td>
<td></td>
<td></td>
<td></td>
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</tr>
<tr>
<td>17</td>
<td>Working with Web 2.0 tools is not fun at all.</td>
<td></td>
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</tr>
<tr>
<td>18</td>
<td>Interacting with Web 2.0 tools is easy.</td>
<td></td>
<td></td>
<td></td>
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</tr>
<tr>
<td>19</td>
<td>I find Web 2.0 tools a useful tool in my work.</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>20</td>
<td>I would avoid taking a teaching career if I knew it required working with Web 2.0 tools.</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>21</td>
<td>I will use Web 2.0 tools regularly throughout</td>
<td></td>
<td></td>
<td></td>
<td></td>
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</tr>
</tbody>
</table>
I need an experienced person nearby when I use a Web 2.0 tool.

I will not use Web 2.0 tools in the future.

Thank you very much for your time and patience to answer this survey. Please do not hesitate to give me feedback.

Any feedback???
APPENDIX C: THE FINALIZED QUESTIONNAIRE
Part I. Demographic Information

1. I am ____ years old

2. Gender:
   - [ ] Male
   - [ ] Female

3. Educational level:
   - [ ] Freshman
   - [ ] Sophomore
   - [ ] Junior
   - [ ] Senior
   - [ ] Graduate

4. What is your licensure level?
   - [ ] Early Childhood, and
     What is (are) your Content Concentration Area(s) within Early Childhood?
     - Mathematics
     - Science
     - Social studies
     - Language Arts
     - Other(s) _______________________________________________
     - all content areas
   - [ ] Middle Childhood, and
     What is (are) your Content Concentration Area(s) within Middle Childhood?
     - Mathematics
     - Science
     - Social studies
     - Language Arts
     - Other (s)_______________________________________________
     - all content areas
AYA, and
What is your Content Concentration Area within AYA?
Mathematics
Science
Social studies
Language Arts
Other (s) ____________________________________________
all content areas

Special Education, and
What is your Content Concentration Area within Special Education?
Mathematics
Science
Social studies
Language Arts
Other (s) ____________________________________________
all content areas

Multi-age, and
What is (are) your Content Concentration Area(s) within Multi-age?
Arts
Music
Physical Education
Modern Language
Other (s) ____________________________________________
all content areas
Part II. Length of Time Spent on Web 2.0 Applications

Please write down the number of months in the blank that best reflects your use in each of the following applications.

If you never use that application, please write down “0” (zero). Thank you very much.

1. How many months have you used/read blogs (e.g. Google Blog, Blogger, Edublogs)?

   months

2. How many months have you used wikis (e.g. Wikispaces, Wikipedia)?

   months

3. How many months have you used podcasts (e.g. PodOmatic)?

   months

4. How many months have you used social networking sites (e.g. Facebook, MySpace)?

   months

5. How many months have you used tagging and social bookmarking (e.g. del.icio.us)?

   months

6. How many months have you used RSS feeds?

   months

7. How many months have you used Google applications (e.g. Google Docs, Google Calendar)?

   months

8. How many months have you used multimedia sharing sites (e.g. photo sharing like Flickr, Picasa, iPhoto; video sharing like YouTube)?

   months

Please Turn To Next Page
Part III. Usage Intensity of Web 2.0 Applications

Please check one answer that on average best reflects your level of use in each of the following applications.

<table>
<thead>
<tr>
<th></th>
<th>everyday</th>
<th>at least once a week</th>
<th>at least once a month</th>
<th>at least once a year</th>
<th>never</th>
</tr>
</thead>
<tbody>
<tr>
<td>I use blogs</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>I use wikis</td>
<td></td>
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<td></td>
<td></td>
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<tr>
<td>I use podcasts</td>
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<tr>
<td>I use social networking sites</td>
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<td></td>
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<tr>
<td>I use tagging and social bookmarking sites</td>
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<td></td>
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<tr>
<td>I use RSS feeds</td>
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<tr>
<td>I use Google applications</td>
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<td></td>
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<tr>
<td>I use multimedia sharing sites</td>
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</tbody>
</table>
Part IV. Attitude Scale

Please indicate whether you agree or disagree with each statement. Please check one answer for each statement.

Strongly Agree = SA
Agree = A
Neutral = N
Disagree = D
Strongly Disagree = SD

<table>
<thead>
<tr>
<th></th>
<th>Statement</th>
<th>SA</th>
<th>A</th>
<th>N</th>
<th>D</th>
<th>SD</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>I believe using Web 2.0 applications will improve my teaching.</td>
<td></td>
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<tr>
<td>2</td>
<td>I believe Web 2.0 applications will be easy to use in my teaching.</td>
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<tr>
<td>3</td>
<td>If I have problems using Web 2.0 applications in my teaching, I believe I can usually solve them one way or other.</td>
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<tr>
<td>4</td>
<td>I believe using Web 2.0 applications can make me more creative in my teaching.</td>
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<tr>
<td>5</td>
<td>I plan to use Web 2.0 applications often in my teaching.</td>
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<tr>
<td>6</td>
<td>I believe I will only use Web 2.0 applications in my teaching when told to.</td>
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<tr>
<td>7</td>
<td>I believe I do not need someone to tell me the best way to use Web 2.0 applications in my teaching.</td>
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<td>8</td>
<td>I look forward to those aspects of my teaching career that require me to use Web 2.0 applications.</td>
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<td>9</td>
<td>I believe using Web 2.0 applications will enhance my effectiveness in my teaching.</td>
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<tr>
<td>10</td>
<td>I look forward to using Web 2.0 applications to enhance the effectiveness of my teaching career in the future.</td>
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<tr>
<td>11</td>
<td>I believe Web 2.0 applications make teaching more interesting.</td>
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<tr>
<td>12</td>
<td>I believe interacting with Web 2.0 applications in my classroom requires a lot of attention.</td>
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<tr>
<td>13</td>
<td>I believe Web 2.0 applications make it possible to teach more productively.</td>
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<tr>
<td>14</td>
<td>I avoid using Web 2.0 applications in my teaching.</td>
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<tr>
<td>15</td>
<td>I like using Web 2.0 applications in my teaching.</td>
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<tr>
<td>16</td>
<td>I believe using Web 2.0 applications will increase my productivity in teaching.</td>
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<tr>
<td>17</td>
<td>I believe teaching with Web 2.0 applications is not fun at all.</td>
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<tr>
<td>18</td>
<td>I believe interacting with Web 2.0 applications for teaching is</td>
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</tbody>
</table>
I find Web 2.0 applications a useful tool in my teaching.

I believe I would avoid taking a teaching career if I knew it required working with Web 2.0 applications.

I believe I will use Web 2.0 applications regularly throughout my teaching.

I believe I need an experienced person nearby when I use a Web 2.0 application in my teaching.

I believe I will not use Web 2.0 applications in my future teaching.

I believe every Web 2.0 activity in the classroom should have a large participatory component.

25. Using a scale of 1 to 100%, what percentage of your classroom time should be Web 2.0 activities?

For example:
- Always = 100 percentage (100%)
- Often = 80 percentage (80%)
- Sometimes = 60 percentage (60%)
- Seldom = 40 percentage (40%)
- Rarely = 20 percentage (20%)
- Never = 0 percentage (0%)

So, if your answer is often or eighty percentage of your classroom time, then you write down 80 in the blank below like this: 80 percentage. If your answer is between sometimes and seldom or fifty percentage, then you write down 50 in the blank below like this: 50 percentage.

Thank you very much for your time and patience to answer this survey. Please do not hesitate to give me feedback.

Any feedback???
APPENDIX D: PERMISSION LETTERS

Permission Letter for Adopting the Attitude Scale

Dear Yu-Fang Chiou

No problem - please feel free to use/adapt the instrument

Good luck in your research

Neil Selwyn

On 20/01/2010 22:41, "Yvonne Chiou" <yc161105@ohio.edu> wrote:

> Dear Dr. Neil Selwyn,
> > This is Yu-Fang Chiou, a Ph.D. student majoring in Instructional Technology program at Ohio University, USA. I am currently working on my dissertation tentatively named The Impact of Web 2.0 on Students at the University Level in the College of Education. The instrument from your article, Students’ attitudes toward computers: Validation of a computer attitude scale for 16-19 education, published in 1997 in Computers Education, Vol. 28, No.1, fits the purpose of my study. I am wondering if I could have your permission to adapt this instrument to my dissertation.

> Thank you in advance.
>
> Sincerely,
> Yu-Fang Chiou
Permission Letter for Adopting the Attitude Scale

Dear Yvonne,

Thank you for your interest. Yes, I'll happy for you to use my instrument.

Regards,
Timothy

-----Original Message-----
From: Yvonne Chiou [mailto:yc161105@ohio.edu]
Sent: Thursday, 21 January, 2010 6:51 AM
To: TEO Kheng Guan Timothy (LST)
Subject: May I have your permission to use the instrument?

Dear Dr. Teo,

This is Yu-Fang Chiou, a Ph.D. student majoring in Instructional Technology program at Ohio University, USA. I am currently working on my dissertation tentatively named The Impact of Web 2.0 on Students at the University Level in the College of Education. The instrument from your article, A cross-cultural examination of the intention to use technology between Singaporean and Malaysian pre-service teachers: An application of the Technology Acceptance Model (TAM), published in 2008 in Educational Technology & Society, Vol.11, No.4, fits the purpose of my study. I am wondering if I could have your permission to adapt this instrument to my dissertation.

Thank you in advance.

Sincerely,
Yu-Fang Chiou
APPENDIX E: CONSENT FORM
Ohio University Consent Form

Title of Research: Perceived Usefulness, Perceived Ease of Use, Attitude, and Using Experience of Web 2.0 Applications for teaching by Pre-service teachers in a Midwestern University

Researchers: Yu-Fang Chiou, Doctoral student, Instructional Technology Program, College of Education, Ohio University

You are being asked to participate in research. For you to be able to decide whether you want to participate in this project, you should understand what the project is about, as well as the possible risks and benefits in order to make an informed decision. This process is known as informed consent. This form describes the purpose, procedures, possible benefits, and risks. It also explains how your personal information will be used and protected. Once you have read this form and your questions about the study are answered, you will be asked to sign it. This will allow your participation in this study. You should receive a copy of this document to take with you.

Explanation of Study

This research is being conducted by Yu-Fang Chiou, Doctoral student in Instructional Technology program at Ohio University in order to understand how students in the College of Education use Web 2.0 tools in the 21st Century.

Risks and Discomforts

I do not know of any risks to you if you decide to participate in this survey and I guarantee that your responses will not be identified with you personally. I promise not to share any information that identifies you with anyone outside of my research group.

Benefits

The information gained from this research will contribute to the instructional technology and teacher education program to enhance the quality of implementing new technology in the teacher education program.

Confidentiality and Records

The personal information collected from the participants is age range, gender, year in school, class they are enrolled in. The records will not be
labeled with the subjects’ names or a code number. Only the researcher will have access to the data. The data will be available for the advisor assisting in the condition of data analysis. In addition, the record will be destroyed after the research is complete.

Additionally, while every effort will be made to keep your study-related information confidential, there may be circumstances where this information must be shared with:
* Federal agencies, for example the Office of Human Research Protections, whose responsibility is to protect human subjects in research;
* Representatives of Ohio University (OU), including the Institutional Review Board, a committee that oversees the research at OU;

Contact Information
If you have any questions regarding this study, please contact:
Yu-Fang Chiou, via yc161105@ohiou.edu, 740-274-0226
Teresa Franklin, via franklint@ohiou.edu, 740-593-4561

If you have any questions regarding your rights as a research participant, please contact Jo Ellen Sherow, Director of Research Compliance, Ohio University, (740)593-0664.

By signing below, you are agreeing that:
• you have read this consent form (or it has been read to you) and have been given the opportunity to ask questions
• known risks to you have been explained to your satisfaction.
• you understand Ohio University has no policy or plan to pay for any injuries you might receive as a result of participating in this research protocol
• you are 18 years of age or older
• your participation in this research is given voluntarily
• you may change your mind and stop participation at any time without penalty or loss of any benefits to which you may otherwise be entitled.

Signature________________________________________ Date________

Printed Name________________________________________

Version Date: 1/13/10
APPENDIX F: IRB APPROVAL LETTERS
A determination has been made that the following research study is exempt from IRB review because it involves:

**Category** 2. research involving the use of educational tests, survey procedures, interview procedures or observation of public behavior

**Project Title:** The Impact of Web 2.0 on Students at the University Level in the College of Education

**Primary Investigator:** Yu-Fang Chiu

**Co-Investigator(s):**

**Advisor:** Teresa Franklin

**Department:** Educational Studies

Robin Stack  
Office of Research Compliance  

01/26/2010

The approval remains in effect provided the study is conducted exactly as described in your application for review. Any additions or modifications to the project must be approved (as an amendment) prior to implementation.
The amendment, detailed below, and submitted for the following research study has been approved by the Institutional Review Board at Ohio University.

Project: The Impact of Web 2.0 on Students at the University Level in the College of Education

Amendment: Change parts II, III, IV and V of questionnaire

Primary Investigator: Yu-Fang Chiou

Co-Investigator(s):

Advisor: Teresa Franklin

Department: Educational Studies

Jo Ellen Sherow, MPA
Office of Research Compliance
The amendment, detailed below, and submitted for the following research study has been approved by the Institutional Review Board at Ohio University.

Project: The Impact of Web 2.0 on Students at the University Level in the College of Education

Amendment: Add Trait Guilt Inventory to battery of questionnaires.

Primary Investigator: Yu-Fang Chiou
Co-Investigator(s):

Advisor: Teresa Franklin
Department: Educational Studies

Rebecca G. Cale, AAB, CIP
Office of Research Compliance

Protocol Expiration Date:

05/28/10
The amendment, detailed below, and submitted for the following research study has been approved by the Institutional Review Board at Ohio University.

**Project:** Perceived Usefulness, Perceived Ease of Use, Attitude, and Using Experience of Web 2.0 Applications for teaching by Pre-service teachers in a Midwestern University

**Amendment:** Title change. Survey modifications.

**Primary Investigator** Yu-Fang Chiou

**Co-Investigator(s):**

**Advisor:**

Teresa Franklin

**Department:** Educational Studies

**Protocol Expiration Date:** N/A