

**Examination of Learning Styles and Technology Perceptions among
Higher Education Students**

by

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Abstract

Today, adoption of innovative technology is an important subject for research and work. Recent research discussed the importance of integrating modern technology into teaching and learning environments in higher education settings (Aucoin, 2014; Fisher, Worley & Fernandez, 2012; Kajuna, 2009). Learning styles of individuals also play an important role in the learning process (Cassidy, 2004; Dunn & Dunn, 1998). This study examined the learning styles of undergraduate and graduate students at a Southeastern University and their perceptions of Web 2.0 technologies through using the Technology Acceptance Model (TAM) and the Index of Learning Styles (ILS) instrument. Learning styles, age and gender were independent variables that were examined to see if they affect the perceptions of Web 2.0 technologies among the students. Results indicated that students had different learning styles; however, the majority were sensing, visual, and sequential learners. Students had moderate perceptions of Web 2.0 technologies. Correlational analysis was conducted to examine the relationship between learning styles and age and Web 2.0 perceptions. The analysis revealed that there was no correlation between learning styles and Web 2.0 perceptions; however, age had a positive correlation with Web 2.0 perceptions. A T-test for independent samples was conducted to examine if there was any difference in Web 2.0 perceptions among students based on gender. The results indicated that there was no difference in Web 2.0 perceptions based on gender. Additional findings revealed that the students' level of education had a significant effect on their Web 2.0

perceptions. Graduate students had more positive perceptions of Web 2.0 technologies than undergraduate students.

A Multiple regression analysis technique was used to examine relationships among the subscales of the TAM, which were perceived ease of use (PEOU), perceived usefulness (PU), and behavioral intention (BI), and their perceptions of Web 2.0 technologies. Findings revealed that PEOU, PU and BI were highly correlated and PEOU and PU were a good predictor of BI towards Web 2.0 tools than PU. The t-test for independent samples was conducted to examine the effect of level of education on technology perceptions. Data revealed that graduate students had a higher perception and behavioral intentions toward Web 2.0 tools than undergraduate students.

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List of Abbreviations

BI	Behavioral Intentions
ILS	Index of Learning Styles
PEOU	Perceived Ease of Use
PU	Perceived Usefulness
TAM	Technology Acceptance Model

CHAPTER 1

Introduction

Learning is one of the most important issues that many people care about. Researchers who are interested in this field have continued to discover the nature of learning, how it occurs, what learning styles can produce the required effective learning, and what methods of modern technology can enhance learning. Many educators are interested in providing their students with a beneficial learning environment that assists in the attainment of a comprehensive perception and retention of the knowledge.

In the 1970s, American educators began to realize the importance of improving students' academic achievement, and they began to focus on the student as an individual. Viewing students to be actively engaged and getting them to participate in the classroom was adopted to produce an effective learning environment and promote student achievement. Astin (1985) explained: "Students learn by becoming involved. . . Student involvement refers to the amount of physical and psychological energy that the student devotes to the academic experience" (p. 133).

Today our classrooms have changed completely since the past. Our classrooms have evolved greatly because of the emerging, changing and education technology occurring during the last two decades. We can observe students today preparing themselves to go to classrooms by packing up modern technology devices such as laptops, iPads, iPods, iPhones, Mp3 players, and tablets. Most of these modern technology tools enable students to access the internet and search whatever knowledge they seek or read any materials through the use of these tools.

In 2004, Chuang stated that “the major concerns in educational technology have moved away from hardware- and software-related issues; instructional strategies, professional development, and continuity of administrative support have emerged as the new issues” (p. 1). One of the primary challenges facing educators today is the adoption of the rapidly increasing new technologies in higher education institutions for teaching and learning. The emergence of the internet or the World Wide Web (WWW) had a great influence on the education system throughout the world. Web 2.0 is the “second wave of the World Wide Web... that allows individuals to publish, collaborate and share experiences with other similar individuals or groups” (Shaohua & Peilin, 2008, p. 1121). According to Chiou (2012), Web 2.0 is known as the “second generation of the Web” (p. 12). For Barnatt (2009), Web 2.0 is “a second age of the Internet in which the worldwide web is becoming a platform for interpersonal content sharing and service delivery” (p. 47). According to Murray (2008), Web 2.0 is an innovative learning space that is located online and used to convey teaching and learning. In addition, Brown (2008), revealed that Web 2.0 is creating a new style of a contribution that is appropriate for various types of learning, especially social learning.

Web 2.0 tools are part of the new modern generation of interactive web-based services that are used for instruction and enhancing the learning processes in education by allowing users to create content themselves. These technologies allow users to communicate, interact, and engage in discussions with different users regardless of any geographical limitation.

There are many applications and Web-based services that generally demonstrate the foundations of the Web 2.0 concept, and they are already being used to a certain extent in education. Many of these tools are free and work to enhance basic skills such as communication, collaboration, creativity, and global knowledge. The application of Web 2.0 includes social

networking sites; Facebook, Twitter, and LinkedIn and many other components such as Blogs, Wikis, Skype, YouTube, Flickr, Podcasting, Voicethread, Wordle, Glogster, Prezi, Padlet, Google+, and content syndication (Sheninger, 2014).

According to Facebook (2011), social networking sites such as Facebook, Twitter, YouTube, and Myspace have been adopted and used daily by many students. Web 2.0 and social networking technology (SNT) has increased rapidly during the few past years. Currently, Facebook has over 500 million users around the globe with over 50% of those logging into Facebook daily (Facebook, 2011). In 2010, there were over 3 billion You Tube videos viewed daily and more than 13 million hours of videos uploaded to the site (YouTube, 2011).

Integration of Web 2.0 technology tools in higher education settings allows instructors to apply the Web 2.0 tools to support technological skill development and problem solving related to learning and teaching processes. According to Hemmi, Bayne, and Land (2009) they argued that “the technology infrastructure of Web 2.0 and its associated applications provide the higher education community with authoring and community-building capabilities, the pedagogical implications of which are still largely unexplored” (p. 19).

Everyone has his/her own learning styles, which differ from person to another. Learning styles of individuals are related to their learning environment. Reichmann (1978) defined learning style as specific behaviors and attitudes associated with the learning context. Learning styles describe and indicate how a person interacts with his/her learning environment. Individuals have different stimulus sense modalities from which they prefer to absorb, retain and process new information (Cassidy & Eachus, 2000; Dunn, 1983; Harrison, Andrews, & Saklofske, 2003).

Examining the relationship between learning styles and perceptions of modern technology has become a field of interest for many researchers (Berry, 2002; Bush, 2005; Hsu, 2005; Lee, 2009; Prescod, 2007; Thomas, 2011; Victor, 2012). Examining the relationship between college students' learning styles and their perceptions of modern technology, specifically Web 2.0 technologies will be an addition to the body of research and knowledge in this field of research. Thus, it will help instructors to integrate these modern technology tools into post-secondary institutions to meet the different needs of the students, which will enhance the interaction and participation in teaching and learning processes.

Over the years, researchers have investigated the factors that influence the acceptance of computer technology, so their efforts and dedicated research have produced several models that have been developed and used to examine and understand technology perceptions. These models include the *theory of reasoned action* (TRA) (Ajzen & Fishbein, 1980; Fishbein & Ajzen, 1975), the *theory of planned behavior* (TPB) (Ajzen, 1991; Mathieson, 1991), and the *technology acceptance model* (TAM) (Davis, 1989; Davis, Bagozzi & Warshaw, 1989). However, the *technology acceptance model* (TAM) has received the most focus of recent research as a method to understand the relationship between user's perceptions (such as perceived usefulness and perceived ease of use of technologies) and usage behavior. Although institutions provide benefits and investments in integrating technology into education, many technology options have been underutilized or totally abandoned due to limited user acceptance (Liu, Liao & Pratt, 2009; Park, 2009; Teo, 2009). As a result, there is a demand for effective learning and teaching opportunities, which can be considered both a challenge, and an opportunity for the educational system (Foot, 2000).

Statement of the Problem

Since Web 2.0 tools have emerged, these tools have spread widely as a dominant force for communication and interaction among diverse groups of users. Researchers and stakeholders who are interested in the education field try to discover whether these technologies show an effectiveness within the classroom setting. There have been studies conducted to investigate the relationship between students' learning styles and their acceptance and use of technologies (Abuhamdieh & Sehwal, 2007; Bush, 2005; Smith, 2008). In addition, there are some that have examined the acceptance and use of technology (Lee et al., 2003; Leong, 2003; Venkatesh et al, 2007; Venkatesh, Morris, Davis, & Davis, 2003) and studies that have examined learning styles (Kayes, 2002; Metallidou & Platsidou, 2007; Salter, Evans, & Forney, 2006). Other research studies (Bubas, Konecki & Orehovacki, 2009; Chang, Hamid, & Kurnia, 2009; Tan, 2008) have been conducted to examine whether there were any significant differences between students who are enrolled in an online course of study versus a more traditional lecture method. The results of these studies revealed that students who were enrolled in online learning communities had a higher level of enthusiasm and self-motivation than traditional students (Tan, 2008).

Although classes today use smart projectors to facilitate viewing course materials, some instructors provide handouts to use in classes. However, students may prefer to view the materials through the university's web page or learning management system. Because of the evolving technology being used in the classrooms and how it is affecting students, there is a need to examine the relationship between using the rapidly evolving Web 2.0 technology communication tools and learning styles among higher education students. Awareness of such a relationships between Web 2.0 technology, communication tools and learning styles will assist

faculty members, instructors, teachers, educators, program and training course developers, and designers to create and design curriculum that addresses individual learning needs.

Cassidy (2004) declared that “Learning styles were also found to correlate significantly with other academic performance-related factors such as academic self-efficacy and academic locus of control” (p. 439). Cassidy (2004) stated that

For those working within an educational setting wishing to utilize learning styles to promote effective learning, whether through individual or group profiling, design of instructional methods, or identifying learner preferences, operationalizing learning styles is a necessary but highly problematic endeavor. (p. 440)

Purpose of the Study

The purpose of this study was to examine learning styles and technology perceptions of undergraduate and graduate students in a higher education setting. Learning styles were examined through the use of the Index of Learning Styles (ILS) instrument and technology perceptions were examined through the use of the Technology Acceptance Model (TAM) instrument. This study sought to examine if learning styles were a factor that could affect students’ perceptions of Web 2.0 technology in higher education settings. Learning styles, age, and gender were the independent variables that may have affected the students’ perceived usefulness (PU), perceived ease of use (PEOU), and behavioral intention (BI) toward Web 2.0 technology. Students’ perceived usefulness (PU), perceived ease of use (PEOU), and behavioral intention (BI) were the dependent variables and used to identify students’ perceptions of Web 2.0 technologies in higher education setting. Learning styles were measured using the Index of Learning Styles which were active/reflective, sensing/intuitive, visual/verbal, and sequential/global. Johnson (2008) indicated that everyone has preferred learning styles, which may affect the way people take in and retain new information. The TAM is related to individual beliefs, attitudes, and behavioral intentions that predict user’s acceptance of Web 2.0

technologies (Capo, 2011; Conole, 2010; Davis, 1989). The results of this study can be used to describe and interpret students' perceptions and behavioral intentions in the use of Web 2.0 technology tools, which may be beneficial to faculty members, instructors, educators, and course designers to assist in making decisions about integrating learning styles and technology tools into course materials and instructional delivery.

Research Questions

The following research questions were used in this study:

1. What are the students' learning style preferences, as measured by the Index of Learning Styles?
2. What are the students' scores, as measured by Technology Acceptance Model?
3. What is the relationship of students' learning style preferences, as measured by the Index of Learning Styles, and scores, as measured by Technology Acceptance Model?
4. What is the relationship of students' age and scores, as measured by Technology Acceptance Model?
5. What is the relationship of students' gender and scores, as measured by Technology Acceptance Model?

Significance of the Study

Teaching in higher education is a dynamic process where learners are very different from other learners. Therefore, instructors, faculty members, adult educators, course designers, and trainers should be aware of the characteristics of their learners, their learning styles, and technology perceptions, as it may control their learning process. This investigation of students' learning styles and the perception of using of Web 2.0 tools could make a beneficial contribution to the growth and development of the learning environment in higher education settings.

Through investigating these factors that influence students' perception of Web 2.0 technologies, there will be additional research about the preferred technology tools and learning styles of higher education students. The results of this study will contribute to the enhancement of the learning process and construction of strategies and educational plans thus assisting higher education stakeholders, professors, educators, and administrators to come up with appropriate decisions for integrating new technology tools into course instructions and content delivery. The results of this study can contribute to the higher education field and assist with updating the system of communication with students, accessing relevant course material easily and effectively, and providing access to guest speakers.

This study examined how graduate and undergraduate students perceive Web 2.0 technologies, and what is their behavioral intention towards using it in the future in their learning environments. In addition, the study examined how age and gender of students may affect their perceptions of Web 2.0 tools.

Graf, Viola, and Kinshuk (2007) stated that "Incorporating learning styles in teaching plans may make learning easier and leads to better achievement" (p. 79). "With technology, developing at such rapid pace, teachers and administrators are constantly being faced with the need to make decisions about appropriate [technologies] for teaching" (Bates & Poole, 2003).

Since we live in the decade of modern technology, it might be important for educators and researchers who are interested in implementing Web 2.0 technology tools in teaching and research, so this study might assist them to make a decision regarding integrating Web 2.0 tools into their instructional design. The importance of this study is based on addressing issues that can promote Web 2.0 applications to improve learning experiences. The study might be a beneficial one not

only for educators, but also for communities through recognizing changes in teaching strategies, collaboration, interaction, and social networking, which can support a social change positively.

Assumptions of the Study

According to Leedy and Omrod (2001), “Assumptions are so basic that, without them, the research problem itself could not exist” (p. 62), the following assumptions were made in this study:

1. The Technology Acceptance Model (TAM) survey is valid for use among graduate and undergraduate students.
2. The Index of Learning Styles (ILS) survey is a valid instrument to examine the learning styles among graduate and undergraduate students (for adults).
3. The demographic questionnaire identified demographic data for this study.
4. All participants responded honestly to the surveys that were used in this study.
5. Participants voluntarily contributed to this research study.

Limitations of the Study

This study focused on examining the relationship of learning styles and perceptions of Web 2.0 technology tools among college students at Southeastern University, so this study includes the following limitations:

1. The data were collected through using the TAM survey, ILS survey, and a demographic survey.
2. The participants were enrolled students from different colleges at Southeastern University.
3. Data analysis and conclusions were based on the responses of participants.
4. This study was a quantitative descriptive study that based on using surveys for collecting data. One of the most common limitations of the survey research is the low rate of response of the participants (Fowler, 2002).

5. The results of this study should not be generalized to all higher education students in different settings.

Definition of Terms

The following definitions were used in this study:

1. *Behavioral Intention (BI)*. A determination of an individual's readiness and intent to perform a particular behavior. It is assumed to be prior to a behavior (Ajzen, 2002b).
2. *Learning Styles (LS)*: according to Keefe (1979), learning styles can be defined as “characteristics, cognitive, affective, and physiological behaviors that serve as relatively stable indicators of how learners perceive, interact with, and respond to learning environment” (p. 1).
3. *Perceived ease of use (PEOU)*. “The degree to which a person believes that using a particular system would be free from effort” (Davis, 1985, p. 320).
4. *Perceived usefulness (PU)*. “The degree to which a person believes that using a particular system would enhance his or her job performance” (Davis, 1985, p. 320).
5. *Reliability*: defined as the consistency of the results. It is the measure to the extent that two different researchers come to the same conclusion using the same procedure (Gall, Borg, & Gall, 1996).
6. *Validity*: The extent to which the results of the study can be generalized. Commonly defined as, the degree to which a test measures what it supposed to measure. Test scores cannot be valid or invalid, but rather the inferences made from the test scores can be valid or invalid (Gall et al. 1996).

7. *Web 2.0*: modern technology tools allow users to read, write, interact and collaborate with each other. Web 2.0 include Social networking sites, Blogs, Wikis, Skype, YouTube, Flickr, Podcasting, Prezi, Google Docs, Voicethread, etc. and so forth.
8. *Wikis*. Websites that allow easy creation and editing of any number of interlinked web pages with a group of people to collaborate information (Tapscott, Don, & Williams, 2006).

Organization of the Study

This dissertation included five chapters organized as follows: Chapter 1 introduced this research study. It addressed the statement of the problem, purpose of the study, the significance of the study, research questions, assumptions and limitations of the study, and the definition of the terms that were used in this study. Chapter 2 provided a literature review that relates to this study. It addressed the historical overview of both learning styles and education technology, previous research on the relationship between learning styles and technology, and a focus on variable learning style models. Chapter 3 introduced the methods used to conduct this research study. It included the study design, research questions, variables, both the independent and dependent variables, the used learning style inventory and technology survey and demographic questionnaire. Also Reliability and validity, population subjects, data collection, methods and analysis, results and summary. Chapter 4 introduced the findings of the study and a full description of the demographic characteristics of the participants, and the statistical and analytical methods that were used in this study. Finally, Chapter 5 presented a summary of the findings of the study and provides implementations and suggested ideas for future research.

CHAPTER 2

LITERATURE REVIEW

Introduction

The first chapter discussed the purpose of the study, the statement of the problem, the research questions, and the significance of the study, the assumptions, the limitations, definition of terms, and the organization of the study. The second chapter addresses the literature review related to the study. It describes the history of educational technology, perception of technology in education, integrating technology into instructions in higher education, the emergence of Web 2.0 technologies, categorizations and types of Web 2.0, evolution of World Wide Web, Web 1.0 to Web 4.0, research on technology acceptance in higher education, technology acceptance model (TAM), and Web 2.0 and learning theories. The literature review continues to discuss learning styles, its definitions, the background of learning styles, learning styles and technology, learning styles, models and instruments, and concludes with a description of the instrument – the Index of Learning Styles.

Integrating technology into teaching and learning in higher education has become an important step to enhance the learning process. According to Gynn (2001), it is important to use appropriate tools that meet the needs of the learning experience. Gynn explained that technology would be considered the tool that provides knowledge to students and enables them to connect with their teachers and other students. Educators who aim to increase learning outcomes should address the issue of integrating technology into the classroom and examine the learning styles of

students. There are studies that address the issues of integrating technology into the curriculum and students' attitudes toward the use of technology. However, these studies do not connect students' attitudes to individual learning styles (Lukow, 2002).

Purpose of the Study

The purpose of this study was to examine learning styles and technology perceptions of undergraduate and graduate students in a higher education setting. Learning styles were examined through the use of the Index of Learning Styles (ILS) instrument and technology perceptions were examined through the use of the Technology Acceptance Model (TAM) instrument. This study sought to examine if learning styles were a factor that could affect students' perceptions of Web 2.0 technology in higher education settings. Learning styles, age, and gender were the independent variables that may have affected the students' perceived usefulness (PU), perceived ease of use (PEOU), and behavioral intention (BI) toward Web 2.0 technology. Students' perceived usefulness (PU), perceived ease of use (PEOU), and behavioral intention (BI) were the dependent variables and used to identify students' perceptions of Web 2.0 technologies in higher education setting. Learning styles were measured using the Index of Learning Styles which were active/reflective, sensing/intuitive, visual/verbal, and sequential/global. Johnson (2008) indicated that everyone has preferred learning styles, which may affect the way people take in and retain new information. The TAM is related to individual beliefs, attitudes, and behavioral intentions that predict user's acceptance of Web 2.0 technologies (Capo, 2011; Conole, 2010; Davis, 1989). The results of this study can be used to describe and interpret students' perceptions and behavioral intentions in the use of Web 2.0 technology tools, which may be beneficial to faculty members, instructors, educators, and course

designers to assist in making decisions about integrating learning styles and technology tools into course materials and instructional delivery.

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4. What is the relationship of students' age and scores, as measured by Technology Acceptance Model?
5. What is the relationship of students' gender and scores, as measured by Technology Acceptance Model?

History of Education Technology

Today, technology is a great tool that many people prefer to use in their daily life especially in education. Learners from Pre-K to seniors are using various modern technology and communication tools to help them attain the best results in their learning process. These modern technology tools have changed the learning environment from an outdated process for a new modern process full of collaboration and interaction.

Early in 1960s to the 1970s, when computers were available for use in education settings, they were used basically for administration tasks, or by professors and instructors for research purposes and information exchange with other colleagues (Roth & Tesolowski, 1986). Beginning

in the 1970s, the appearance of microcomputers encouraged public schools to use them as a helpful tool for search and practice (Berg & Bramble, 1983).

Also in 1970s, instructional technology emerged and was being applied in the classroom. This instructional technology based on collaborative plans and comprehensive teaching styles were being incorporated with the students' learning styles. Using computers in higher education settings was a step that played a significant role in the process of enhancement of teaching and research.

From the 1970s to the 1980s, there were commonly used models based on the two designs of Skinner and Bloom, known as computer-based training (CBT), computer-aided instruction or computer- assisted instruction (CAI). These models now represent today's e-content that is deemed to be the essence of e-learning. At that time, the course designers divided learning content into smaller parts boosted with multimedia presentations and graphics.

According to Jones and Paolucci (1999), from 1980 to the mid of 1990s, higher education institutions spent more than 20 billion dollars on computer technology. At that time higher education institutions strived to integrate technology into curriculums to improve students' learning process. Late in the 1990s, implementing computer technology in teaching and learning included increasing usage of hardware and software (Penuel, 2006).

At the beginning of the 2000s, higher education institutions focused on technology adoption (Brakels et al., 2002). Rogers (2000) suggested that there were three levels of the adoption of new technology in higher education settings, including: (a) personal productivity aids; such as spreadsheets which aid professors to achieve tasks faster and more effectively (b) enrichment add-ins; such as e-mail and Web pages to improve classroom presentations and allow students to submit their assignments. This level of technology adoption was very familiar to most

students and faculty members, and (c) paradigm shift, which was the highest level of technology adoption (Rogers, 2000); this level depends on that faculty members redesign teaching and learning activities integrating new technology.

In the mid-2000s, the mobile computing devices gained the most attention of educational institutions as a method to integrate technology in teaching and learning (Finn & Inman, 2004), which enabled students to access it in and out of the classroom (Hall & Elliott, 2003). Today, the large number of the modern technology devices has infiltrated the learning environment through all grade levels and are being used by teachers and students.

Perception of Technology in Education

Technology has been used in education for many decades. There are many definitions that help learners understand the perception of technology in education. In 2003, Garrison and Anderson introduced a definition noted from the Association for Educational Communications and Technology (AECT) Definitions and Terminology Committee. The definition refers to technology as an array of tools that help in advancing student learning and may be measured in how and why individuals behave in the class room. Educational Technology includes a set of definitions of the word technology. According to Solomon (2000), technology is defined as a systematic application of the resources of an arranged knowledge (i.e., literature, science, the arts), assuming that art and science have a significant role to perform in technology application. Luppicini (2005) defined educational technology as the field concerned about designing, developing, using, managing, and evaluating the resources and the learning process.

Technology can refer to material things that are used to improve humanity, which contains machines or hardware, but it can also include several systems and techniques. Some modern technology tools include, but are not limited to calculators, overhead projectors, laptop

computers, iPad, iPhone and tablet. According to Luppicini (2005), scholars and practitioners who focus in searching in the field of educational technology realize that reaching an agreement to a formal definition of educational technology is a challenge because of many reasons which include; defining such an applied field like educational technology is more difficult than defining any other social science discipline because there is no single knowledge base to be a ground for educational technology foundation as it is the case in the social sciences. In the educational technology field, developing new knowledge leads to a change in thinking which results in changes in the field itself.

Integrating Technology into Instructions in Higher Education

Using technology in education, particularly in higher education has increased rapidly during the past years. According to Massy and Zemsky (1996), colleges and universities make investments of computer-related technology to support and improve curriculum. With the addition of the Internet, the use of technology in higher education has also increased (Sangster & Lymer, 1998). Technology plays a significant role in providing students with the opportunity to be active participants in their learning (O'Banion, 1997). According to Kershaw (1996), successful technology integration premised on managing change effectively. Faculty who had higher levels of technology integration and participate in technology training and development had higher-levels of attention to integrate technology in instructions (Adams, 2002).

O'Banion (1997) mentioned that when technology integrated teaching and learning it assisted faculty in producing a learning environment enriched with collaboration and student-centered approaches. The research continued to be followed by the work of Tapscott and Williams (2010), who stated that "First, we need to eject the old educational model of pedagogy (how learning is accomplished) and replace it with a new advanced model called collaborative

learning. Second, we need an entirely new *modus operandi* for how the subject matter, course materials, texts, written and spoken word, and other media (the content of higher education) are created” (p. 16).

Web 2.0 technologies with its components such as blogs, wikis, podcasts, and social networks, have gained wide popularity and broad usage and are gradually penetrating the classroom. Instructors need to find an advanced way to integrate these technologies in education (Williams & Chinn, 2009). In conclusion, there are concerns about integrating Web 2.0 into education:

a) The first is that many of the learning activities involved within Web 2.0 are widely adopted by current thinking of the nature of learning that 21st century education must provide the theoretical perspectives of pedagogy as well (Pea, 2004; Stahl, 2005; Vygotsky, 1978).

b) The second is that Web 2.0 tools provide advanced learning opportunities through developing skills such as critical thinking, writing, and reflection; and keeping students engaged in a new world of information sharing and social learning. Web 2.0 tools can be transferred into beneficial learning spaces based on personal task orientation within appropriate educational contexts. Thus, allowing control to the learners, altering formal learning into a more informal one, promoting learner contribution to social networks regardless of physical, geographical and institutional boundaries (Hall & Hall, 2010; Ravenscroft, 2009; Siemens 2005).

c) The third and most explicit aspect of students' readiness to adopt Web 2.0 as an effective learning environment is that most of younger people are already engaged by Web 2.0 in their personal and social lives out of school (e.g., social networking). Students are most likely prepared and familiar with new types of interaction within Web 2.0 spaces. Many educational

settings have adopted a context and environment to promote creative ways of using Web 2.0 applications offering many benefits to the students.

Emergence of Web 2.0 Technology

When investigating the history and emergence of Web 2.0 technology tools, we can find that the first emergence was in 2005 by Tim O'Reilly who created the term Web 2.0. Since then its usage has increased rapidly, penetrating the learning and teaching environment. This term was coined to refer to the modern generation of web-based technology and on the interaction and communication among users to create content themselves. This term is related to the terms of read and write web and social web which indicated that the Web 2.0 term shifted the normal use of the web/reading only to a more interactive aspect/read and write.

The actual emergence of Web 2.0 began 20 years earlier. It began with the emergence of *Open Diary*, as an early form of a social networking site based on online diary writers, in an Internet community. One year after the concept of this site, a writer of the online diary (or blogger) altered the term *Web log* for the words *we blog*, creating a new coined word known today as *a blog* (Kaplan & Haenlein, 2010).

In 2003 and 2004, more advanced social networking sites have emerged, such as MySpace and then followed by Facebook (Fuller, 2011). The availability of these site-based technologies leads to the increased use of the internet. Internet users have started to create and share photos, ideas, thoughts, writing, videos, and audio files. Any new technology that develops and grows rapidly, encourages Web 2.0 users to collaborate and be co-creators with access to technology that allows them to interact, publish, and build relationships with one another (Warschauer & Grimes, 2007).

Categorization of Web 2.0 Tools

When discussing the categorization of Web 2.0, it appears that there are many ways of categorizing Web 2.0 tools. One of the organized categorization is offered by the UK's Teaching and Learning Research Program (Selwyn, 2008). Selwyn's taxonomy is based on four human arrangements that are supported by different technologies: *expressive* (media creation and sharing), *reflective* (blogging, wikis and social networking), *exploratory* (social bookmarking, syndication, folksonomies), and *playful* (games and virtual worlds). The common advantage of all of these aspects is that they are open to public and free to use.

Expressive Technologies

These technology tools used for creating, editing, mixing, sharing and using creative output, including videos, audio and animation (e.g. YouTube, Flickr and Slideshare). In addition to providing opportunities for free storage and publication of large files, control access, and to allow comments, rating for feedback. They are massively used by the public around the world.

Reflective Technologies

This type of technology includes blogs and wikis. Today, blogs have replaced the open diary or journal that some people used to use in the past. Blogs are written by an individual and directed to be read by a massive user. Wikis are used for collaborative writing. Most institutions have their own blogging and wiki services.

Exploratory Technologies

Web 2.0 tools are beneficial for research and inquiry. One of the benefits that Web 2.0 tools provide is research and inquiry in a variety of ways, including social bookmarking, annotation and reference management services (e.g. Delicious, Diigo, CiteULike), and news feeds (RSS, Atom).

Social Technologies

Web 2.0 tools are fueled with many social networking services such as Facebook, Twitter, MySpace and LinkedIn. These sites allow users to build up high interaction with friends and to share personal and/or professional information with these friends.

According to Rich (2008), Web 2.0 tools can be classified into two basic categories of competencies, necessary competencies and supplementary competencies. Rich (2008) provided an explanation for necessary competencies as they are essential for learners to use Web 2.0 resources and comprise components like accurate searching abilities and the ability to judge the authoritativeness of the material. “They need to recognize that a range of types of publication exists on the web and that some, but by no means all, of these mirror types that also exist on paper” (Rich, 2008, p. 75). Supplementary competencies enable users to search Web 2.0 resources thoroughly could allow them to make contributions to these Web 2.0 resources. These competencies could also allow them to synthesize information from various resources and participate in discussions actively or by creating their own resources (Rich, 2008).

Types of Web 2.0 Tools

Web 2.0 technology tools contain many components that facilitate interaction among users. Some of Web 2.0 tools are mentioned here:

Audio/Podcasting

A podcast is an audio or video file created for use on mp3 players or on computers (Baker, Harrison, Thornton, & Yates, 2010). Podcasting refers to the process of placing recorded materials on a website and listen to them later at any preferred time. It is multimedia broadcasts made available on a website. These broadcasts are downloadable and portable (Felix & Stolarz, 2006). Podcasting was designed to be used for audio files through the use of the Apple iPod, but was

improved to include video files when the video enabled iPods appeared on the market (Baker, Harrison, Thornton, & Yates, 2010). Podcasting has been used by colleges and university academics in many ways. This usage includes providing a complete lecture, short explanation of difficult concepts, and assessment (Scutter et al., 2010).

Blogs/Microblogs

A blog is a simple webpage similar to an online diary that consists of a brief paragraph and expresses thoughts, ideas, personal information (Doctorow et al., 2002). According to The Pew Internet and American Life Project reported in 2009, blogs have been used in the following ways “32% of all American adults go online to read someone else’s blog; 15% work on someone else’s web page or blog; and 11% create or work on their own online journal or blog” (Weyant & Gardner, 2010, p. 68).

Facebook

In 2004, Facebook was created by Mark Zuckerberg a college student of Harvard for the purpose of developing a way to help college students, interact with each other. After that it expanded to include several high school students and then all persons who have online access (Cassidy, 2006). Facebook is a free online network that enables people to have a personal page and share materials that connect people with each other. Facebook has gained wide popularity and college administrators have been focusing on the effect of this social site on students’ life. (Morris et al., 2009). According to Salavuo, (2008), Facebook may be recognized as a preferred learning tool for current students than using the classic pedagogical/and andragogical models.

In 2007, Facebook has introduced an educational service, which is the creation of a fan page feature that allow universities to post information under their university name on Facebook. For universities, this provides a great marketing opportunity because “the current social

networking platform of choice among students in higher education is Facebook” (Wankel, 2009, p. 252). Reuben (2008) argued that there are educational opportunities through the use of Facebook. Although instructors in several disciplines are using YouTube videos in their classes, many of them have developed Facebook sites for a regular base.

Second Life

It is a three-dimensional computerized environment which enables members to interact, socialize, have virtual meetings, or conduct transactions online (Wang & Braman, 2009). According to Harris and Rea, (2009), Second Life was the largest virtual world with 15 million registered accounts in 2008.

Skype

Skype is one component of Web 2.0 technology tools. It is a synchronous visual and aural communication tool that has an influential feature because it provides synchronous video during calls (Newman, 2007). Skype has a many applications in higher education settings. According to Newman (2007), “Using Skype, enables students to contact their instructor for help at any time the instructor is logged on to his or her computer. With this synchronous form of communication in both audio and video formats, instructors have the ability to communicate with students at any time” (p. 27).

Survey Makers

Survey makers are online tools that users can create their own surveys and share it with the people they collaborate with. Survey Monkey and Qualtrics are used in education research by many researchers. Through *Survey Makers*, researchers can reach a large number of participants for their research and studies.

Twitter

Twitter is another Web 2.0 technology tool. Twitter is being used by colleges and universities as a chat service to assist students in being aware of campus events. In 2009, Wankel stated that “In a large class section of perhaps hundreds of learners, tweeting enables an immense amount of interactivity, ideally enriching the session in which it occurs” (p. 254).

YouTube

One of the most widely spread and using Web 2.0 components is YouTube. “YouTube is the most popular and widely accepted video sharing website on the Internet” (Lee, 2010, p. 23). It is the standard for video streaming on the Internet, instructors can use it as a tool for students to upload the homework assignment in video format (Lee, 2010).

Wikis

A set of websites that allow easy creation and editing of any number of interlinked web pages by anyone who is allowed to access and collaborate with a group of people (Ebersbach et al., 2006). According to (Weyant & Gardner, 2010), instructors are integrating wikis into their course curriculums for many purposes, including collaborative writing, posting of class notes, project brainstorming, and as a course management system. “Wikis support the constructivist, collaborative learning models by engaging students in the learning process” (Weyant & Gardner, 2010, p. 70).

Evolution of World Wide Web from Web 1.0 to Web 4.0

In 1989, Tim Burners-Lee created the World Wide Web (WWW), the largest transformable informational system that had changed the world totally since that time (Boulos & Wheeler, 2007). Later, the techno-social system spread widely. The concept of techno-social system means a system that improves human cognition, communication and cooperation which require cognition

(Christian et al, 2010). During the last two decades, the Web had progressed greatly to include Web 1.0 as a web of cognition and it is a system of interlinked hypertext documents and web pages designed by a small number of writers to reach a large number of readers via the Internet (Naik & Shivalingaiah, 2008).

Web 1.0 was designed to be a ready web only and it was a good way to search information and read it (Naik & Shivalingaiah, 2008). Web 2.0 as a web of communication, is the new era where people perceived that the web turned to be a read-write web which includes new technology that strengths interaction among people. As Tim Brener- Lee explained, Web 3.0 is considered as something that is related to a read-write-execute web (Berner-Lee, 2006). Web 3.0 as a term was created to describe the evolution of the web using that is based on interaction through several paths (Naik & Shivalingaiah, 2008). That includes transforming the web into a database and changing the content to be more accessible through many non-browser application.

Web 4.0 as a web will be as a read-write-execution- concurrency web based on a high intelligent interaction, but there is no exact definition of how it would be like it. Web 4.0 is still an unclear idea under construction. Also Web 4.0 may be known as a symbiotic web (Aghaei, Nematbakhsh, & Farsani, 2012).

Research on Technology Acceptance in Higher Education

When investigating the previous conducted research on individuals' technology acceptance, there are several research studies focused on the relationship between learning styles and technology acceptance relative to both students and faculty members in higher education settings (Berry, 2002; Bush, 2005; Hsu, 2005; Lee, 2009; Prescod, 2007; Thomas, 2011; Victor, 2012). Hsu (2005) examined the relationship between learning styles of faculty members and their integration of new technologies into their teaching. Also, Bush (2005) studied the

relationship between higher education students' learning styles and their behavioral intentions to adopt and use computer-mediated communication (CMC). Other researchers have scouted faculty acceptance and integration of a specific technology based on the faculty member's age, gender, personality, resistance to change, attitude toward the technology, and computer self-efficacy (Ferdousi, 2009; Henry, 2008). Researchers also have conducted several studies to examine students' learning styles, and their acceptance and use of new technologies (Abuhamdieh & Sehwal, 2007; Bush, 2005; Smith, 2008).

The research on individual-level technology acceptance and adoption is replete with valuable theories and clarification of the determinant factors of adoption and usage. There are several research studies that developed theoretical models based on the many fields such as information systems, psychology, and sociology that formally demonstrate over 40% of the differences in individual intentions to use technology (Davis et al., 1989; Taylor & Todd, 1995a; Venkatesh & Davis, 2000; Venkatesh et al., 2003). These theoretical models were created and proposed to facilitate understanding of technology adoption, acceptance, and use (Davis, 1989; Ensminger & Habb, 2005; Rogers, 2003; Scurry, Taylor & Todd, 1995a; 1995b; Venkatesh & Davis, 2000; Yi et al., 2006).

Research studies that investigated users' attitudes toward technology resulted in an influential theory, such as the theory of reasoned action (TRA) that was developed by Fishbein and Ajzen (1975), and the technology acceptance model (TAM) (Davis, 1989). In the education field, the Technology Acceptance Model (TAM) had been applied through different ways that includes educational hypermedia, online education, podcasts, and course management software (Gibson et al., 2008).

The Technology Acceptance Model (TAM) is widely used to determine the users' behavioral towards technology. TAM has been proven to show highly predictive ability of information technology adoption (Adams, Nelson, & Todd, 1992; Davis, 2000; Davis et al., 1989; Venkatesh & Davis, 2000; Venkatesh & Morris, 2000).

Research on Web 2.0 Usage in Education

Research studies about Web 2.0 technologies started soon after the emergence of Web 2.0 tools. Two researchers (Cormode & Kirshnamurthy, 2008) at the AT&T Labs - Research then studied the key differences between Web 1.0 and Web 2.0. They investigated these differences and their implication for technical work. The primary goal of their study was to identify the basic differences that produced the characteristics of Web 2.0 that was more appealing to users. The researchers mentioned that they found different structures of Web 2.0 sites, that it provided more interaction opportunities and news and features of the technology (Cormode & Kirshnamurthy, 2008).

In 2010, Waycott et al., conducted a study to examine how lecturers used Web 2.0 activities in assessment tasks in a university setting. They were interested in exploring how the assessment of students' social web activities may be able to introduce academic integrity and assessment practices. The researchers conducted a survey and interviewed the lecturers who taught in different discipline areas across Australia. The findings of this study revealed that using Web 2.0 activities in higher education included some challenges and opportunities for assessment and academic integrity. Integrating Web 2.0 content helped students to publish their work freely to an open audience, communicate through different ways, create their identity, and manage their content outside university borders (Waycott et al., 2010).

A research study conducted by Alajmi (2011) aimed to examine the students' perceptions and adoption of Web 2.0 technologies at the School of Basic Education in Kuwait. The researcher collected data from 350 students through the use of a survey instrument based on the framework of Rogers' diffusion of innovation theory (DOI) to determine the factors that affect student perceptions of adopting Web 2.0 applications in their learning environment. The findings of this study revealed a low rate of Web 2.0 awareness and adoption by the students. Data analysis of this study revealed that there was no significant statistical differences among the demographic groups participating in this study.

One of the studies about Web 2.0 tools was conducted by three researchers (Fisher, Worley, & Fernandez, 2012). Their study was aimed to explore if there was a difference between the Engineering and Technology faculty perceptions and students' perceptions towards the effectiveness of using Web 2.0 and social net technology SNT in higher education settings. Data was collected through an online survey sent to faculty and students in a School of Engineering and Technology at a higher education setting to determine the actual use and knowledge of faculty and students about SNT and Web 2.0 technologies and estimate the understanding of the appropriateness of these technologies for academic use. Results revealed that the faculty has more positive perceptions of the effectiveness of Web 2.0/SNT use within the classroom than students.

Another study was conducted by Aucoin (2014) to investigate the adult learners' view about online university programs considering the adult learners' relationships to interactive, web-based technologies in their learning, personal and work environments. The main purpose of the study was to understand the use of Web 2.0 in the learning process based on the learners' view. The researcher used an online survey and was followed by an interview with the participants.

The findings of the study showed that the adult learners were not interested in using Web 2.0 tools in their learning environments. Moreover, they showed a clear desire to use Web 2.0 in only one aspect of their lives; if learners use Web 2.0 in their personal lives they will not prefer to adopt it in their working or learning environment and vice versa.

Quadri (2014), conducted a study about high school teachers' perceptions and attitudes toward the implementation of Web 2.0 tools in secondary education. This study employed the Technology Acceptance Model (TAM) to investigate the teachers' perception towards Web 2.0 technologies. For this study, the researcher considered the independent variables to be perceived usefulness (PU) and perceived ease of use (PEOU) and the dependent variables were teachers' attitudes toward intentions to use and actual use of Web 2.0 technologies for teaching and learning. Also the researcher considered age, gender, and experience as a moderating variable. There were 160 teachers who participated in this study and answered the TAM instrument. The results of this study showed that there was a significant relationship between teachers' attitudes toward perceived usefulness and perceived ease of use of Web 2.0 technologies ($r = .304, p < .05$). Also, there was a significant relationship between the behavioral intention to use and the actual use of Web 2.0 tools ($r = .50, p < .001$). There were no significant impact of the moderating variables of age, gender, and experience of the teachers' actual use of Web 2.0 technologies. The results revealed that high school teachers have a high perception towards the actual use of Web 2.0 tools, which may result in an effective learning environments (Quadri, 2014).

Technology Acceptance Model (TAM)

This research study used the Technology Acceptance Model (TAM) developed by Davis (1989) as a theoretical framework to determine users' technology acceptance behavior.

Technology acceptance refers to the situations in which information systems are accepted and used by individuals (Venkatesh & Davis, 2000). In 1989, the Technology Acceptance Model (TAM) was introduced by Fred D. Davis as a model used for measuring and evaluating user's acceptance in information systems. The Technology Acceptance Model (TAM) aimed to provide a theory for developers to help them in designing and implementing an information system successfully and to "provide an explanation of the determinants of computer acceptance that is general, capable of explaining user behavior across a broad range of end-user computing technologies and user populations, while at the same time being both parsimonious and theoretically justified" (Davis et al., 1989, p. 985).

According to The Technology Acceptance Model (TAM), the success of a system can be determined by user's acceptance of the system which could be measured throughout three factors: perceived usefulness (PU) of the system which defined by Davis (1989) as: "the degree to which a person believes that using a specific technology system would enhance his or her job performance"(p. 320). And Perceived Ease of Use (PEOU) which is defined as "the degree to which a person believes that using a specific technology system would be free from effort" (Davis, 1985, p. 320). And attitudes towards usage (ATU) of the system (Davis, 1989).

Based on the theoretical framework of TAM, when users are involved in a new technology system, there are many factors that play significant roles in determining their decision regarding how and when they will use this system of technology. These factors are: Perceived Usefulness (PU), and Perceived Ease of Use (PEOU). If a system is not easy to use, it may be perceived that

the system is not useful. According to the model, a user's perception about the system's usefulness and ease of use will determine the behavioral intention (BI) to use (or not to use) the system (Davis, et al., 1989; Nov & Ye, 2008).

Therefore, this study aimed to examine the relationship of students' learning styles and their perceptions of Web 2.0 technology tools through measuring the perceived ease of use (PEOU), perceived usefulness (PU), and behavioral intention (BI). Understanding the TAM model may help us to recognize the perception level of students in higher education settings. The TAM determines the relationship between the perceived usefulness (PU), perceived ease of use (PEOU), attitude toward the technology (ATT), behavioral intention to use technology (BI), and the actual use of technology (AU) (See Figure 2.1).

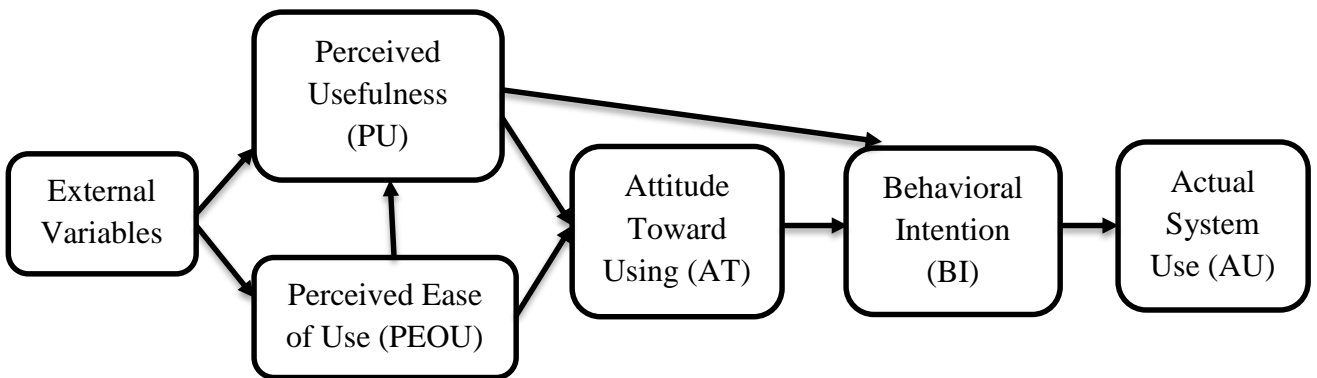


Figure 2.1. The Technology Acceptance Model (Davis, 1989)

TAM was designed based on the principles of the Theory of Reasoned Action (TRA) by Fishbein and Ajzen (1975). Theory of Reasoned Action (TRA) is a general model of social psychology that was created to recognize beliefs affect attitudes, which leads to intention then intentions generate human behavior (See Figure 2.2). TRA has three main constructs; behavioral intention (BI) as a dependent factor, attitude (A), and subjective norm (SN) as an independent

factor. According to the Theory of Reasoned Action TRA, a person's behavioral intention depends on the person's attitude about the behavior and subjective norms ($BI = A + SN$). If a person intends to do a behavior, then it is probable that the person will do it (Fishbein & Ajzen, 1975, 1980) (See Figure 2.2).

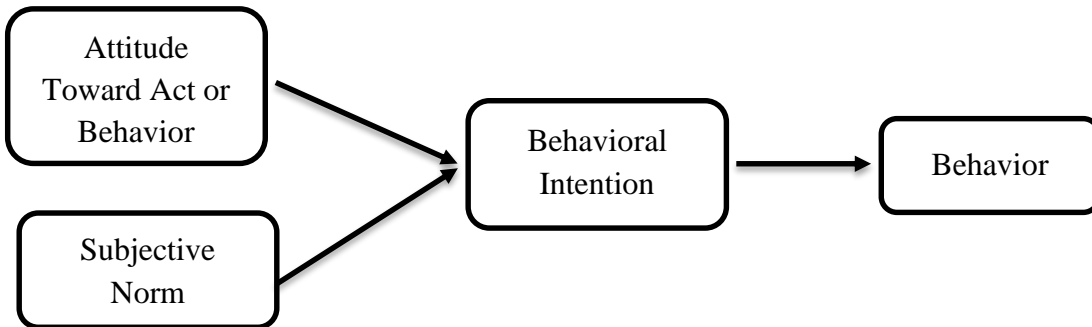


Figure 2.2. Theory of Reasoned Action (Fishbein & Ajzen, 1975)

Web 2.0 and Learning Theories

Since the emergence of Web 2.0 tools, they have been widely used in different educational settings. Examining the literature of modern technology and learning theories, advanced new technology was found to be related to many learning theories. According to Enonbun (2010), constructivism learning theory is related to the new age of information and knowledge, because the World Wide Web enables learners to access tons of information and to be self-directed learners. Web 2.0 technologies have been used in education in many forms, including broadcast style of teaching which uses web pages or delivers the content through visual learning environment (VLE), or uses discussion boards and chat to develop communication to specific groups. One of the advantages that makes Web 2.0 tools a significant technology in educational settings is that they are easy to use and seem to be familiar to both students and staff.

Even if today's students are digital natives who perceive and manage information in a different way than their ancestors (Prensky, 2001).

In 2003, Garrison and Anderson requested a deep think about pedagogy in order to maximize the opportunities offered by e-learning; they pointed out that teaching practices in higher education were not appropriate to be used for 21st century learners (Garrison & Anderson, 2003).

In 2008, Crook et al., introduced a helpful summary of the different ways that Web 2.0 can support variable theoretical frameworks for learning, including behaviorism, cognitivism, constructivism, and socio-cultural frameworks:

- Behaviorism focuses on the relationship between action and stimuli which influences subsequent actions (for example a teacher provides guidance and encouragement which shapes the next action of the learner). However behaviorism is not dominant on educational thinking, some Web 2.0 exchanges enables connection to rich social learning interactions and dialogues.
- Cognitivism focuses on information processing such as involving attention, memory and concept formation, and especially on the need for reflection and metacognition. Blogs, Wikis, and other journal tools play a significant role in supporting cognitivist approaches to learning environment, which emphasizes the relationship between Web 2.0 and cognitivism.
- Constructivism is premised on a different framework which is the creation and recreation of knowledge; when learners collaborate throughout many learning – based activities, by this way such creation of knowledge occurs which forms a type of social constructivism.

- Socio-cultural theories adopt the framework of giving external forms of thinking through writing, drawing and other creative activities in social contexts. Also a designed scaffold by the teacher would be a helpful tool for both novice and expert to work and collaborate together.

Web 2.0 technology tools can play a significant role in the learning process. Web 2.0 tools enable learners to interact with each other, so it provides them with valuable opportunities for this kind of learning process and sense-making of knowledge and creative collaboration that support, behaviorism, cognitivist, constructivist and socio-cultural frameworks. This will offer opportunities for student collaboration and working together, even if it is informal tasks such as co-creation of materials in multimedia or text formats, to simple learning activities such as commenting and providing feedback.

Learning Styles

The learning process is an important field for many researchers who are focusing on understanding this process and its implications for both educator and learner, in order to introduce the valuable knowledge that will help improve the quality of learning. Educational leaders should recognize the importance of the learning process and the variety of learning styles that individuals use through their learning process. Everyone has his/her own learning styles, which differ from person to another. These learning styles describe and indicate how a person interacts with his/her learning environment. Individuals have different stimulus sense modality from which they prefer to absorb, retain and process new information (Cassidy & Eachus, 2000; Dunn, 1983; Harrison, Andrews, & Saklofske, 2003).

When reviewing the literature of learning styles, we can find that early in the 1950s and 1960s, learning and teaching theories have been identified, which resulted in concentrating on the

varying needs of each individual learner (Koch, 1998). In 2001, Renzulli and Dai stated that “research on learning styles aids educators to examine the matter of “what are characteristics ways one approach to learning tasks” (p. 34).

According to Dunn and Dunn (1998), research and identification of learning styles were a major component in the field of education. Cassidy (2004) stated that “one concept in particular, which has provided some valuable insights into learning in both academic and other settings is learning styles” (p. 420). Kolb and Kolb (2003) pointed out that learning styles have become an essential factor in providing an effective learning experience.

Kolb (1984) argued that “individual styles of learning are complex and not easily reducible into simple typologies” (p. 66). Cassidy (2004) stated that “the manner in which individuals choose to or are inclined to approach a learning situation has an impact on performance and achievement of learning outcomes” (p. 420).

In 2004, Cassidy proposed that research interest in learning styles has started four decades ago. However, during the recent years, Cassidy claimed that the research in the area of learning styles has not had a noticeable increase. Irvine and York (1995) stated that learning styles are an “important field of examination, particularly since learning-style theory suggests that educational experiences designed to be more congruent with student learning style may enhance academic achievement” (p. 487).

Desmedt and Valcke (2002) conducted an investigation of the literature of cognitive and learning styles. The purpose of that investigation was proposing a possible organization of the field and to highlight the most influential theoretical orientation in the literature of cognitive and learning styles. The researchers used data from citation analysis, which refers to a quantitative research method that depends on citation indexes to collect data. That work resulted in identifying

the most cited first authors in the literature of cognitive and learning styles for the last four decades. As a result, these groups demonstrated how “cognitive style research and learning style research differ from, and relate to, one another” (p. 461).

Dunn and Dunn (1998) indicated that each individual’s concentration occurs in different ways, for different individuals, at different times of the day and has its significance in identifying the learning styles of each individual, using their processing ability to increase and maximize long-term memory. Cassidy (2004) stated that:

Although its origin have been traced back much further, research in the area of learning style has been active for – at the conservative estimate – around four decades. During that period the intensity of activity has varied, with recent years, seeing a particularly marked upturn in the number of researchers working in the area. (p. 419)

In the past few years, researchers focused on the research on learning styles of both students and instructors, as Roebber (2005) stated that there would be problems if the design of curriculum represented a match with “the learning style of the faculty rather than students” (p. 511). Roebber (2005) addressed the importance of plugging the gap between instructions in the classroom and real-life work situations. Also, Nelson (2004) suggested that instructors should consider students’ learning needs while they teach. As learning styles form an important issue, instructors should make student’s learning needs explicitly clear and focus deeply and consider it at the center of learning style concerns because all learning styles theories depend on individuals’ personal needs impacted by their way of acquiring knowledge and experience (Nelson, 2004).

Hackney et al. (2003) suggested that educational services should be “continually linked to clients’ needs and this is best done through systematic needs assessments and service evaluations” (p. 3), which may lead to a thorough investigation of students’ specific educational requirements, learning preferences, and need for guidance with particular instructional methods. The individual

needs of people should be the main point of education as well as all human communications and interactions (Hackney et al., 2003).

According to (Hackney et al., 2003), the common problem of our educational system was that, “often the people who actually need or use the services provided by a program have been excluded from the design and framing of the evaluation questions and process” (p. 4). Instructors should provide students with authentic needs guided by some form of needs assessment as well as authorized evaluation (Hackney et al., 2003).

In 2005, Grence-Legget suggested that most students realized their learning needs, and when teachers asked students about their opinions and allowed students freedom to choose their own learning methods, students showed higher performance and became more productive. Students gradually turned into self-directed learners (Grence-Legget, 2005).

Lipinski (2005) conducted a study about the differences among student learning outcomes in higher education and students’ learning preferences, gender, computer knowledge, and cultural background. Lipinski indicated that “educators should appeal to the various learning styles of their students if they are going to use technology” (p. 1), because students have achieved technical skills differently. Lipinski (2005) suggested that interviewing college students to identify their learning styles could enhance an effective college experience and successful course outcomes.

Doherty and Maddux (2002) conducted a research study examining the learning styles of 150 students enrolled in online courses at four community colleges in Nevada. Also, they examined the relationship between students’ learning styles and perceived effectiveness of instructional methods. The study results showed that reflective learners have a higher preference to enroll in online courses than active learners. Most students were described as sequential learners

instead of global learners. There was no significant relationship between learning styles and perceived effectiveness of instructional methods.

Definition of Learning Styles

In the past decades, the term “cognitive style” was more popular and preferred than the term “learning style”. In 1993, Jonassen and Grabowski stated that “An outgrowth of the interest in cognitive styles has been the evolution of learning styles, which are general tendencies to prefer to process information in different ways” (p. 233).

Cognitive style and learning style are very close in their meaning. Early in 1937, cognitive style was defined to refer to the individual’s regular method of problem solving, thinking, perceiving, and remembering, whereas the term learning style utilized to represent a focus on implementing the process of cognitive style in a learning environment (Riding & Cheema, 1991). To distinguish between cognitive style and learning style, Hartley (1998) presented these two definitions: cognitive styles are the ways in which individuals approach different cognitive tasks characteristically; learning styles are the ways in which individuals approach different learning tasks characteristically.

Learning style as a term emerged to be used as a tool to aid researchers in finding ways to combine course materials and presentations to match the different needs of each learner (Kirby, 1979), therefore the formula of cognitive style was included inside the broader term of learning style. Keefe (1979) confirmed that cognitive factors are “internal to the information processing system and require careful training for any adaptive change” (p. 138). Through the past decades, there have been numerous definitions of learning styles such as the one introduced by Claxton and Ralston, which was defined as students' coordinated ways of reacting to and using stimuli in the context of learning (Claxton & Ralston, 1978).

The popular and accepted definition of learning styles was presented by Keefe (1979). Keefe defined learning styles as “characteristics, cognitive, affective, and physiological behaviors that serve as relatively stable indicators of how learners perceive, interact with and respond to a learning environment” (p. 4).

Reichmann introduced another definition for learning styles which referred to learning styles as a specific behaviors and attitudes associated with the learning context (Reichmann, 1978). However, there are several definitions of learning styles, but there is no agreement among researchers on a specific definition until further research will produce a basis built on theoretical refining (Claxton & Murrell, 1987).

In 1985, Scarpaci and Fradd introduced another definition for learning styles, they defined it as different ways through which individuals perceive, organize, and recall information in their learning environment. Also, learning styles could refer to the general trend towards a specific learning approach displayed by an individual (Keefe & Ferrell, 1990; Robotham, 1999). In 1996, Felder defined learning styles as the “characteristic strengths and preferences in the ways they take in and process information” (p. 18), which means that students may prefer one learning approach over the other approaches of learning.

Learning styles are ways used by individuals to gather, grasp, organize, and transform data into applicable information (Kolb, 1984; Spoon & Schell, 1998). Learning styles viewed as the variety of ways people take in, store, and retrieve information (Sonbuchner, 1991). Another definition was presented for learning style as an educational conditions under which learner prefers to learn (Stewart & Felicetti, 1992). Loo (2002) defined learning style as “the consistent way in which a learner responds to or interacts with stimuli in the learning context” (p. 252).

Learning styles are concerned with how learners prefer to learn rather than what learners learn. It can be deemed to include three main components: information processing, instructional preference, and learning strategies (Cassidy, 2004). As described by Cassidy, information processing is how a person intellectually understands the information process. Instructional preference is described as a preferred learning environment for an individual, but it is very hard to measure the preference. Learning strategies are techniques that learners choose during the studying process.

Learning Styles and Technology

Based on the investigation of the literature, there is an obvious relationship between technology and learning styles. The relationship between technology and learning styles has been used in education to strengthen the process of engaging students and support learning (Chen, Toh & Ismail, 2005; Larsen, 1992). Technology tools play a great role in facilitating the creation of learning objectives and prolonged learning depending on the concept of learning by doing or learning by seeing experiences (Bruner & Olson, 1973).

According to (Solvie & Kloek, 2007), technology has a significant impact in students' learning styles, they concluded that "Technology tools have the ability to address students' learning needs in terms of learning style preferences, as students work as individuals and groups to construct knowledge" (p. 23). It is critical to select appropriate technology tools that are consistent with the characteristics of learning styles and logical practices that are a part of the individual and social construction of knowledge. It is essential to help students see how particular technology tools may support the construction of knowledge (Solvie & Kloek, 2007).

An example of the relationship between technology and learning styles is the online courses, as Lu, Jia, Gong and Clark (2007) recommended that "instructors using online courses

should seriously, 2000), argued that it is a vital issue to provide students a learning environment that integrate consider the diverse learning styles when designing and developing online learning modules for different students” (p. 194). In 2004, Simpson and Du, suggested that it is better for instructors to design course modules to meet the varied requirements of observing, participating, thinking and summarizing learning channels to accommodate different learning styles (Simpson & Du, 2004). Also Ruokamo and Pohjolainena (2000) argued that it is a vital issue to provide students a learning environment that integrate a variety of ways that students can access course information through it.

There are many efforts to apply learning styles theories and instruments to educational and learning environments (Yannibelli et al., 2006). In 1988 Felder and Silverman stated that “a learning-style model classifies students, according to where they fit on a number of scales pertaining to the ways they receive and process information” (p. 674). In the current years, many education researchers focus deeply on many aspects of learning styles and how they can be integrated into education technology. Several researchers examined learning styles in technology-enhanced learning and several adaptive systems were developed with the purpose of incorporating learning styles and providing courses that are pertinent to the variety of individual learning styles of students.

Incorporating learning styles in teaching strategies may facilitate learning and make it easier and it should lead to achievement improvement. Felder mentioned that learners with a strong preference for a specific learning style may struggle with learning if the teaching style does not fit their preferred learning styles (Felder & Silverman, 1988; Felder & Solomon, 1997).

Learning Styles Models and Instruments

Learning styles as a field of research is full of valuable models to help educators and researchers examine learning style preferences of each learner. Baldwin and Sabry (2003) indicated that several learning style measuring models and instruments were being created to identify and assess individual learning styles. Krätzig and Arbuthnott (2006) stated that “learning style questionnaires can provide educators with information about respondents’ preferences or self-beliefs and, thus, might assist them in instructing, learning events in ways that are more popular or familiar to their students” (p. 245). According to De Vita (2001) the last two decades saw a great progress in the development of learning styles, models and instrument to help in identifying the different individuals’ preferences. Riding and Cheema (1991) mentioned that the field of learning styles is filled with more than 20 variable learning style models. Coffield et al. (2004) identified 71 models of learning styles and stated that “many consist of rather minor adaptations of one of the leading models and therefore lack influence on the field as a whole” (p. 1).

Learning Style Inventory (LSI)

The Learning Style Inventory (LSI) was developed by Kolb (1984) based on his Experiential Learning Theory (ELT) model. Kolb’s ELT describes learning as “the process whereby knowledge was created through the transformation of experiences. Knowledge resulted from the combination of grasping and transforming experiences” (p. 41). According to (Kolb, 1984) the ELT defined learning into four domains which are; concrete experience (CE), reflective observation (RO), active experimentation (AE), and abstract conceptualization (AC). CE and AC conflict, emotional react to a learning opportunity. The CE is the act of feeling, and

AC is the act of thinking. RO and AE are conflicting experiences of the approach to a learning opportunity. RO is the act of watching, and AE is the act of doing.

The Learning Styles Inventory LSI was revised many times to improve the instrument. In 2005, Kolb released the third version 3.1 of the LSI, the LSI is used heavily in research to determine an individual's preferred learning style (Kolb & Kolb, 2005; McCarthy, 2010). The Learning Styles Inventory LSI assists individuals to identify their preference for learning by responding to 12 statements. Respondents will be classified into four categories; convergers, divergers, assimilators, or accommodators. Kolb's learning style was a 2 x 2 matrix, in which individuals are grouped by the way they perceived and processed information. The way an individual perceived information was identified as CE or AC, and the way an individual processed information was identified as an AE or RO. According to Kolb (1984), the LSI helps individuals identify their learning style as either a diverger with a preferred style of CE and RO, an assimilator with a preferred style of AC and RO, a converger with a preferred style of AC and AE, or an accommodator with a preferred style of CE and AE.

The Learning Style Inventory (LSI) is a psychometric instrument that identifies individuals into four types of learners: (a) Divergers were viewed as creators who learned from concrete experience through reflective observation, (b) Assimilators were viewed as planners who learned from reflective observation which led to abstract conceptualization, (c) Convergers were decision makers who learned from abstract conceptualization and followed through with active experimentation, and (d) Accommodators were viewed as doers who learned from active experimentation as a way of producing concrete experience (Kayes, Kayes, & Kolb, 2005; Kolb, 1984).

Multiple Intelligence Inventory

The Multiple Intelligence Inventory was developed by Dr. Howard Gardner (1983) and was built on the theoretical framework of Gardner's theory of multiple intelligence. The understanding of human intelligence is very limited. Gardner demonstrated eight different strengths and intelligences that described how humans learn. Gardner's multiple intelligences theory has been beneficial and implemented in many aspects of education such as curriculum development, instructional design, selection of course activities, and related assessment strategies. According to (Gardner, 1983), here is a description of the eight multiple intelligences:

1. *Verbal/Linguistic Intelligence*: the ability to communicate through language components; reading, writing, listening, and speaking. It is based on understanding the order and meaning of words in both writing and speech and how to use the language properly.
2. *Logical/Mathematical Intelligence*: the ability to understand the logic, reasoning and problem solving; math, science, and sequences. This type of intelligence, based on recognizing abstract patterns, uses facts to support an idea, and generates ideas based on evidence. They can performing complex calculations and use numbers, math and logic to understand the different patterns of our daily life.
3. *Visual/Spatial Intelligence*: the ability to understand spatial relationships and create images; visual arts, graphic organizer, maps and charts. This intelligence involves recognizing what occurs through the shapes, images, patterns, designs, and textures.
4. *Bodily/Kinesthetic Intelligence*: the ability to use physical body movements skillfully and to take in knowledge through body movements and working with the hands.
5. *Musical/Rhythmic Intelligence*: This is the ability to grasp and create significant sounds of music. Understanding comes through sounds and vibrations. This intelligence includes

many aspects such as music, rhythm and auditory-vibrations as it deals with sound, tones, beats, and vibrational patterns as well as music.

6. *Interpersonal Intelligence*: It is the ability to relate to others, understand them and focus on their moods. They use and enjoys motivations and feelings, social activity, teamwork, and cooperative learning. This way of knowledge requires a range of social skills that are needed for effective person-to-person communication and relationships. These learners tend to learn through personal interactions, have many friends, and have a strong deal of empathy for others.
7. *Intrapersonal Intelligence*: the ability to understand one's own behavior and feelings, self-awareness, understands feelings and using them to guide behavior, evaluates own thinking, and understanding of self in relation to others. Intrapersonal intelligence learners may like to work alone and sometimes feel shy towards others.
8. *Naturalistic Intelligence*: the ability to identify, recognize, and classify items, always interested in elements of the natural environments. The naturalist intelligence involves knowing what occurs within the natural world and an understanding of the natural environment. It involves classifying species, interact with the natural world and its phenomena, and the ability to recognize and classify various flora and fauna.

Gregorc's Style Delineator (GSD)

The Gregorc Style Delineator was designed as a self-analysis tool premised on a Mediation Ability Theory, which states that the human mind has channels through which it receives and expresses information. The Gregorc Style Delineator is designed to indicate two basic types of mediation abilities/dimensions: perception and ordering. Perception abilities, consist of abstractness and concreteness, which are ways that an individual grasps information.

Abstractness and concreteness are identified as: Abstractness refers to the ability to visualize and imagine data mentally. Concreteness refers to the ability to collect data through direct use and through physical senses. Ordering abilities, consists of sequential and random and indicates arrangement, systematization, reference and disposition of information. The sequence is identified as the characteristics of grasping and organizing information in a linear order or process. Randomness is characterized as grasping and organizing information in a nonlinear way, therefore, enhancing the ability to deal with a variety of stimuli, information, and activities. (Gregorc, 1982). The Gregorc Style Delineator (GSD) (Gregorc, 1982 b) classifies learning styles into four styles: Concrete-Sequential (CS), Abstract-Sequential (AS), Abstract-Random (AR), and Concrete-Random (CR):

Concrete Sequential (CS): The CS learners prefer direct, hands-on experience, tends to use order and a logical sequence of tasks, and follow directions well.

Abstract Sequential (AS): The AS learners prefer working with ideas and symbols, logical and sequential in thinking, and tend to focus on the task away from distractions.

Abstract Random (AR): The AR learners are concerned about people and the surroundings, prefer discussions and conversations, and want time to reflect on experiences.

Concrete Random (CR): The CR learners are experimental and a risk taker, tend to explore unsolved problems, show smartness in solving them, and uses trial and error to test solutions.

Felder-Silverman Learning Style Model (FSLSM)

The model of Felder-Silverman Learning Style Model (FSLSM) is a learning style instrument designed for traditional learning and for technology-enhanced learning. According to Carver et al. (1999), “the Felder Model is most appropriate for hypermedia courseware” (p. 34). The FSLSM was developed by Felder and Silverman (1988) to investigate the most important

learning preferences among engineering students and to provide a good resource for instructors to help them in designing a teaching method that would address the different learning needs of all students (Felder & Spurlin, 2005).

The Felder-Silverman Learning Styles Model (FSLSM) presents the learning styles of a learner in a comprehensive way and describes learning preferences on four dimensions. One of the significant characteristics is that FSLSM is based on the tendencies, indicating that learners with a high preference for certain behavior can also act differently sometimes. The FSLSM is used in research related to learning styles with advanced learning technologies. Kuljis and Liu (2005) conducted a comparison of learning style models related to the application in e-learning and Web-based learning systems. As a result, they suggested that FSLSM was the most appropriate model.

Felder and Silverman (1988) proposed that there were different ways that students use when they learn. These ways include learning by hearing and seeing; by acting and reflecting; reasoning either logically or intuitively; by memorizing or visualizing; and, either steadily or in leaps (p. 674). The Felder-Silverman model explores three issues: (1) learning style that is significant in engineering education, (2) the most preferred learning styles of students and the preferred teaching styles by educators; and, (3) strategies that will fit with students whose learning styles are not addressed through regular engineering education methods (Felder & Silverman, 1988). Felder (1996), indicates that the Felder-Silverman model groups learners to be described in one of the following four dimensions of learning styles:

- *Active learners*; people who prefer to learn by doing, trying things out, and working with others. *Reflective learners*; people who prefer to learn by thinking about things through, working alone or independently away from distraction.

- *Sensing learners*; people who are concrete, practical, oriented towards facts and procedures. *Intuitive learners*; those learners are conceptual, innovative, oriented towards theories and meanings.
- *Visual learners*; learners who prefer visual representations of learning material – pictures, diagrams, flow charts. *Verbal learners*; prefer written and spoken explanations.
- *Sequential learners*; learners who are linear, orderly, tend to learn in small gradual steps. *Global learners*; learners who are holistic, systematic thinkers, learn in large leaps.

Although the combination of these four dimensions is unique to Felder, each of these four dimensions is related to different learning style models. According to Felder and Spurlin (2005), each of these dimensions (active/ reflective, sensing/ intuitive, visual /verbal, or sequential/ global) is parallel to another dimension in different learning style models. The first dimension- active/reflective -is a component of Kolb's learning style. The second dimension- sensing/intuition - is one of four dimensions of Jung's theory of psychological types, the third dimension – visual/verbal- is analogous to the visual-auditory - kinesthetic formulation of modality theory and its roots are in cognitive studies of information processing. The fourth dimension – sequential/global – is related to many different models (p. 103).

The Index of Learning Styles (ILS)

In 1991 the initial version of the Index of Learning Styles (ILS) was created by Richard Felder and Barbara Solomon to assess individuals' preferences on the four dimensions of the Felder–Silverman Learning Styles model (FSLSM): active/reflective, sensing/intuitive, visual/verbal, and sequential/global (Felder & Brent, 2005; Felder & Spurlin, 2005). A new version was designed in 1994 and was available on the internet in 1996 as a paper- pencil format. In 1997, the online version became available. The Index of Learning Styles is one of the

instruments that is used to integrate learning styles into instruction and provide an effective learning experience for the learners. The ILS is available at no cost to individuals who are interested in determining their learning styles. Also, it is available at no cost for educators to use for teaching and research purposes.

According to Dee et al. (2002), the ILS instrument is a short questionnaire and easy to use to assess students' learning styles. It focuses on the cognitive process and does not require professional scoring. In 2003, Baldwin and Sabry stated that while the learning styles and models "are not without their critics or weakness, one of the most frequently used is the Index of Learning Styles developed by Felder and Solomon" (p. 329) and they added that they chose the instrument for their study "because of its applicability to online learning and its relevance to the principles of interactive learning systems (ILSs) design" (p. 329). According to De Vita (2001):

Felder and Silverman's learning style model (1988), which was first applied in the context of engineering education, categorizes students' preferences in terms of the type and mode of information perception (sensory or intuitive; visual or verbal), approaches to the organization and processing of information (inductive or deductive; active or reflective), and the rate at which students progress towards understanding (sequential or global). (p. 166)

De Vita (2001) mentioned that the ILS instrument "was chosen over other instruments because it has been developed in an explicit way to make it applicable in the classroom and, though it is suitable to outline individual learning preferences" (p. 168). According to Papp (2001), the Index of Learning Styles ILS is one of the best instruments as it was found to have a high, consistent and applicable predictive value more than many commonly existing used instruments. In 2004, Bacon introduced a description of the Index of Learning Styles survey as follows:

Felder developed a learning style measure comprising four dimensions. The first dimension, sensing versus intuitive learners, distinguishes between learners who prefer concrete, practical facts and procedures (sensors) and learners who prefer conceptual or

theoretical information (intuitors). The second dimension, visual versus verbal learners, distinguishes between learners who prefer pictures, diagrams, charts (visuals) and learners who prefer written or spoken explanations (verbal). The third dimension, active versus reflective learners, distinguishes between learners who prefer to learn by trying things out or working with others (actives) and learners who prefer thinking things through and working alone (reflective). Finally, the fourth dimension, sequential versus global learners, distinguishes between learners who prefer linear, orderly learning in steps (sequential) and learners who are more comfortable with holistic approaches and learn in large leaps (global). (p. 205)

Felder and Silverman (1988) introduced a summary of the four dimensions of learning styles as follows:

Felder and Silverman (1988) proposed two basic categories which are responsible for the complex mental processes that are responsible for converting the perceived information into knowledge. These categories are: (1) active experimentation; refers to using the information in the external world, such as discussing, explaining, or testing it in way of application, and (2) reflective observation; means examining and manipulating the information based on a self-analyzing approach (p. 678).

Active Learners: prefer to learn using team work. They don't prefer to learn from lectures where they are required to receive information in a passive way. They prefer to work and learn in learning environments where they are engaged in hands on activities and experimentation (Felder & Silverman, 1988).

Reflective Learners: prefer to learn in a learning situations that provide them with an opportunity to think about the given information. They tend to work very well alone or in a one-on-one learning situation with another partner or when they have a chance to create theories (Felder & Silverman, 1988).

Felder and Silverman (1988) indicated that the opposite of active is passive, not reflective. This idea refers to the context of student participation in class. They explained that active is considered a sign of what activities the students are doing other than listening and

watching in class. Active student participation will ensure the learning processes of both active experimentation and reflective observation.

Sensing and Intuitive Learners: as described by Felder and Silverman (1988), sensing and intuition represent two different approaches in which people prefer to perceive, understand the world and interact with the surrounding situations. Sensing refers to and describes the observation and gathering data through using the senses. Intuition refers to using and depending on an indirect perception such as guessing, imagination, and feelings. However, learners will use both of these styles, but most learners will prefer to use one style over the other.

Sensing learners: like to deal with facts, data, and solving problems using a standard method, but they do not like surprises. They are patient with details, but dislike complicated process. *Sensing learners:* are defined as those learners that are good at memorizing facts, and they try to be careful and slow down while they complete their work (Felder & Silverman, 1988).

Intuitive learners: prefer to deal with the principles, theories, and innovation, but dislike repetition. Details may bother them, and they welcome complications. Also intuitors are good at understanding new ideas, usually they prefer to complete tasks in short time, and sometimes this results in carelessness (Felder & Silverman, 1988).

According to Felder and Silverman (1988), an important distinction between intuitors and sensors is that intuitors are more comfortable with symbols. Since words are symbols, translating them into what they represent comes naturally to intuitors and is more of a struggle for sensors.

Visual learners: refers to a group of learners who tend to learn by using visual representations, remember well what they see, such as pictures, diagrams, flow charts, timelines, videos, and demonstrations. They may forget information that is delivered to them verbally (Felder & Silverman, 1988).

Verbal learners: refers to the learners who prefer to learn through the use of their verbal ability, by expressing their thoughts and ideas, and tending to remember most of what they heard. They depend on verbal discussion and consider it a good resource of learning. For verbal learners, discussion is better than visual representation and they prefer to learn by explaining things to others (Felder & Silverman, 1988).

Sequential Learners: Sequential learners are those learners who prefer to master the material given in a logical order, and like to learn the material as the instructor presents it. When they solve problems, they follow the instructions using a linear reasoning process. They can understand the learning material in steps and small parts, may be strong in critical thinking and analysis, and learn best when educators allow them to progress in the material at a fixed rate of complexity and difficulty (Felder & Silverman, 1988).

Global learners: these learners prefer to learn slowly, bit by bit, they may feel lost for days or weeks and unable to solve simple problems or show basic understanding, until suddenly they feel that they “get it “and are then able to solve the problems. And as a result, they may then thoroughly understand the material and apply it to problems that are difficult for most of the sequential learners (Felder & Silverman, 1988).

Summary

This chapter addressed the literature review related to the study. The chapter included issues containing the historical review and background of educational technology and learning styles. Research indicated that technology can be related to learning styles. So learning styles may be considered a factor that may impact the perception of a Web 2.0 technology system. Integrating technology into instruction in higher education was discussed. Also the emergence of Web 2.0 tools and its categorizations and types were introduced. There is a description of

Technology Acceptance Model (TAM), Felder – Silverman (FSLSM), and the Index of Learning Styles (ILS). The chapter also discussed the four dimensions of the Index of Learning Styles (ILS) – active/reflective, sensing/intuitive, visual/verbal, and sequential/global. The literature review also identified the Web 2.0 and learning theories, learning styles and technology. The following chapter will discuss the methods and the design of the study.

CHAPTER 3

METHODS

Introduction

Throughout this era where technology is rapidly changing, research on perception of new technology is a necessity. Because learning styles may affect our learning process, it is vital to investigate the relationship between learning styles and the perception of Web 2.0 technology tools among students in higher education. The first chapter addressed the purpose, statement, research questions, significance, assumptions, definition of terms, and organization of the study. The second chapter discussed the literature review, including the history of educational technology, integrating technology into instruction in higher education, emerging of Web 2.0 technologies, categorizations and types of Web 2.0, Technology Acceptance Model (TAM), background of learning styles, learning styles and technology, learning style models, Felder–Silverman Learning Style Model (FSLSM), and concludes with the Index of Learning Styles (ILS). This chapter describes the design of the study, the reliability and validity of the instruments, the sample, data collection, procedure and analysis.

Purpose of the Study

The purpose of this study was to examine learning styles and technology perceptions of undergraduate and graduate students in a higher education setting. Learning styles were examined through the use of the Index of Learning Styles (ILS) instrument and technology perceptions were examined through the use of the Technology Acceptance Model (TAM) instrument. This study sought to examine if learning styles were a factor that could affect

students' perceptions of Web 2.0 technology in higher education settings. Learning styles, age, and gender were the independent variables that may have affected the students' perceived usefulness (PU), perceived ease of use (PEOU), and behavioral intention (BI) toward Web 2.0 technology. Students' perceived usefulness (PU), perceived ease of use (PEOU), and behavioral intention (BI) were the dependent variables and used to identify students' perceptions of Web 2.0 technologies in higher education setting. Learning styles were measured using the Index of Learning Styles which were active/reflective, sensing/intuitive, visual/verbal, and sequential/global. Johnson (2008) indicated that everyone has preferred learning styles, which may affect the way people take in and retain new information. The TAM is related to individual beliefs, attitudes, and behavioral intentions that predict user's acceptance of Web 2.0 technologies (Capo, 2011; Conole, 2010; Davis, 1989). The results of this study can be used to describe and interpret students' perceptions and behavioral intentions in the use of Web 2.0 technology tools, which may be beneficial to faculty members, instructors, educators, and course designers to assist in making decisions about integrating learning styles and technology tools into course materials and instructional delivery.

Research Questions

The following research questions were used in this study:

1. What are the students' learning style preferences, as measured by the Index of Learning Styles?
2. What are the students' scores, as measured by Technology Acceptance Model?
3. What is the relationship of students' learning style preferences, as measured by the Index of Learning Styles, and scores, as measured by Technology Acceptance Model?

4. What is the relationship of students' age and scores, as measured by Technology Acceptance Model?
5. What is the relationship of students' gender and scores, as measured by Technology Acceptance Model?

Design of the Study

This study used a nonexperimental, quantitative research design to investigate the students' perception of Web 2.0 technologies in a higher education setting. Swanson and Holton (2005), stated that quantitative techniques "are particularly strong at studying large groups of people and making generalizations from the sample being studied to broader groups beyond that sample (p. 30).

This study used the Index of Learning Styles (ILS) survey developed by Felder and Solomon (1999) to identify the learning styles of participants. Also the Technology Acceptance Model (TAM) developed by Davis (1989) was used to investigate the acceptance of Web 2.0 technologies among the participants and five-question demographic survey designed by the researcher to provide demographic information. All surveys were administered in person (paper-pencil- format). Instructors were contacted and asked to allow the researcher to visit their classes and administer the surveys. Also, the researcher recruited individual participants who represented the target population, explained the study for them and arranged for the surveys to be administered.

Each participant received an information letter attached in the first two pages of the survey packet (see Appendix D). The information letter introduced all needed information about the study such as the reason for data collection, description of the surveys, number of questions, commitment time to complete the survey. The researcher answered any questions. Participants

were not required to write down their names as all data was kept anonymous. Participants volunteered to participate in this research project so there were no incentives for contributing to this study.

Sample

The participants of this study consisted of undergraduate and graduate students who were enrolled at a southeastern university. The researcher contacted 11 professors and instructors through e-mails and phone calls asking for permission to visit their classrooms and conduct the study. After receiving permission, the researcher sent an e mail indicating that their participation was appreciated. Then the researcher visited 9 classrooms and invited the students to participate in the study. Students completed the paper-based survey during the class. The researcher explained the study to the participants and clarified that participating was optional and voluntary. The students who participated in the study were enrolled in different colleges. Data collection took place over a period of three weeks at the beginning of the semester – Spring 2015. Participants were allowed to participate in this study only if they were 19 years of age and older.

Instrumentation

To conduct this research study, two instruments were used. The Technology Acceptance Model (TAM) (see Appendix C) was used to investigate the participants' perception of Web 2.0 technologies. The Index of Learning Styles (ILS) (see Appendix B) was used to identify the learning styles of the participants. The demographic survey was created by the researcher and used to obtain the required demographic information for this study (see Appendix A). The surveys were available in person (paper & pencil) and at no cost. Since the ILS was completed using the paper and pencil format the researcher was responsible for scoring it. To score the ILS,

researcher entered all the responses through the online ILS website. The researchers then noted the scores on the back of each participant's.

Technology Acceptance Model (TAM) Survey

The Technology Acceptance Model (TAM) survey was originally constructed by Davis (1989) to measure user's acceptance and implementation of a technology system. The model was developed based on an individual's perception of two factors which are perceived usefulness (PU) of the technology and their perception of ease of use (PEOU) of the technology. These two factors PEOU and PU are used to predict the behavioral intentions BI towards a technology system. The TAM represented an extension of the Theory of Reasoned Action (TRA) (Ajzen & Fishbein, 1980; Fishbein & Ajzen, 1975) replacing the attitude variable with ease of use and usefulness. According to Davis's (1989) theory, the more an individual perceived technology to be useful and the easier a technology was for the user to implement, the more likely an individual would intend to use the technology (behavioral intention-BI).

The TAM has been widely used in technology acceptance research since 1986, (Lee et al., 2003; Ma, Anderson, & Streith, 2005; Venkatesh, Davis, & Morris, 2007) and is chosen because of the simplicity of the research instrument and its validity and reliability (Lee et al., 2003).

As shown in Figure 3.1, the TAM indicates that when students are presented with a new technology (Web 2.0), a number of factors influence their decision about how and when they will use it. As illustrated in Figure 3.1, learning styles, age, and gender represent an external factors that may influence the perceived usefulness (PU) and perceived ease of use (PEOU) of students which may affect their attitude towards technology (ATT), then affect the behavior intention (BI) which in turn may affect the actual use (AU) of Web 2.0 technology tools (Davis,

1989). Based on the research on TAM, the external factors may have a direct influence on PU and PEOU and BI.

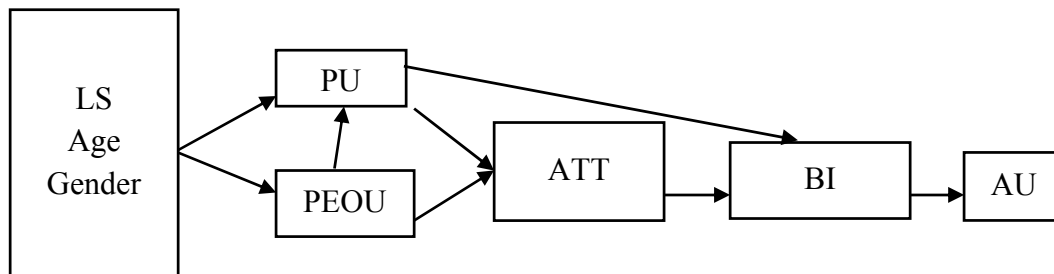


Figure 3.1. Technology Acceptance Model (TAM) designed for this study.

For this study, the TAM was modified to measure the acceptance of Web 2.0 technology tools among higher education students. The TAM instrument consisted of 3 main sections. The first one measured the perceived ease of use PEOU and contained 6 questions. The second section measured the perceived usefulness PU and included 6 questions. Finally, the last part measured the behavioral intention BI and contained 5 questions. The TAM instrument is a five point Likert-type scale, 1 indicates *strongly disagree*, 2 indicates *disagree*, 3 means *neutral*, 4 indicates *agree*, and 5 indicates *strongly agree* (see Appendix C).

The Index of Learning Styles (ILS)

The Felder-Solomon Index of Learning Styles (ILS) was used to investigate the learning styles of the participants. This instrument was designed to identify individual preferences on the four dimensions of the Felder-Silverman Learning Styles Model: active/reflective, sensing/intuitive, visual/verbal, and sequential/global (Felder & Brent, 2005; Felder & Silverman, 1988; Felder & Spurlin, 2005). Boyd and Murphrey (2004) stated that the instrument

“combines three facets of learning styles: personality, learning modality, and cognitive processing and that it allows a multi-modal approach” (p. 124).

The Index of Learning Styles (ILS) was chosen for this study because it is easy to administer and score. Also, it could be available in pencil and paper format. The ILS was developed for classroom implications, so it is an appropriate tool to examine students’ learning preferences (De Vita, 2001).

The Index of Learning Styles (ILS) consists of 44 questions, measures four domains which are: the *active/reflective* dimension is related to how individuals process information, the *sensing/intuitive* dimension is related to how individuals perceive information, the *visual/verbal* dimension is associated to the process of information input by individual and the *sequential/global* dimension is associated with the understanding of information (Felder & Brent, 2005; Felder & Silverman, 1998; Felder & Spurlin, 2005). Each domain has 11 questions to measure learning preferences. All of the 44 questions have two choices, either “a” or “b” options. The option *a* represent +1 value and the option *b* represents a -1 value. Each participant has to choose only one answer that reflects their preferences.

The 11 questions of the domain active/reflective are 1, 5, 9, 13, 17, 21, 25, 29, 33, 37, and 41. The choice “a” means active and “b” means reflective. Questions 2, 6, 10, 14, 18, 22, 26, 30, 34, 38, and 42 measure the domain of sensing/intuitive and choice “a” reflects sensing and “b” reflects intuitive. For the domain visual/verbal, the 11 questions are 3, 7, 11, 15, 19, 23, 27, 31, 35, 39, and 43, the choice “a” reflects visual and “b” reflects verbal. Questions 4, 8, 12, 16, 20, 24, 28, 32, 36, 40, and 44 measure the domain of sequential/global with “a” refers to sequential and “b” refers to global (see Appendix B).

The ILS is a dichotomous structured survey that enables learners to choose one of two decisions which increase the chance of detecting the learning preferences of learners (Litzinger et al., 2007). Also, the number of items per domain and scoring method was chosen so that a score of zero means no learning preferences, which was not possible (Litzinger et al., 2007, p. 310).

After the participant answered the 44 questions, the researcher was responsible for scoring process. Hawk and Shah (2007) described the ILS and explained that scoring ranges between 1, 3, 5, 7, 9, and 11, with 1, 3 representing a mild preference, 5, 7 representing a moderate preference, and 9, 11 a strong preference.

Demographic Survey

The researcher designed the demographic survey that included five questions to obtain the demographic information for this study. These five questions refer to age, gender, the college in which they are enrolled, ethnicity and the educational level to determine whether the participant is a graduate or undergraduate student. The question which asks about the college is a multiple choice, one that has 11 different choices representing all colleges and two choices for others. The ethnicity question has five choices representing some of ethnicities and an option for “others”. Also the question about education level has three choices representing two different education levels and an option for “others”. All questions were multiple choice except for age, each participant has to provide his/her age (see Appendix A).

Reliability and Validity of the Instruments

According to Johnson and Christensen, (2004), the main difference between reliability and validity was that reliability referred to the consistency of the test scores and validity referred to the accuracy of the inferences made from test scores. Reliability is the measure to the extent that two

different researchers come to the same conclusions about using the same method and it can be calculated in several ways (Gall, et al., 1996). According to Litzinger et al., (2007), the internal consistency provides an estimate of reliability when conducting a single administer of an instrument and is based on the average correlation between items on the instrument (p. 310). For Garson (2011), reliability is the correlation of the item, the scale of an instrument when considering a specific. Also Garson (2011) confirmed the importance of reliability as it enables the replication of the research results. Reliability in quantitative research is a “synonym for dependability, consistency and reliability over time, over the instruments and over group of respondents” (Cohen et al., 2007, p. 146).

For validity there are two types of validity. Internal validity refers to the “extent to which the results of a study can be attributed to the treatments [variables] rather than flaws in the research design” (Vogt, 1993, p. 114). External validity refers to the extent to which the researcher can generalize the findings to other settings (Wiersma & Jurs, 2009). The construct validity of an instrument means that the instrument measures what it supposed to measure (Litzinger et al., 2007, p. 311).

Reliability and Validity of TAM

In 1989, Davis developed the Technology Acceptance Model (TAM) survey. TAM scores were tested during the period from 1992 to 1996, and reliability and validity were repeatedly found to be powerful and consistent (Lee et al., 2003). In 1992, Adams, Nelson and Todd repeated Davis’s 1989 study and found the measurements PU and PEOU to be valid and reliable (Lee et al., 2003). According to (Adams et al., 1992), the Cronbach’s alpha for PU was .94 and .88 for PEOU was identified in one study, and another study showed .93 and .81 respectively (Adams’s et al., 1992). These results were very similar to Davis’s 1989 study, with .97 and .86 respectively (Davis,

1989). Also the study of Venkatesh and Davis's (2000) indicated that the TAM showed PU as a strong, consistent factor for intention to use and PEOU as a less consistent factor for intention to use.

For the construct validity and reliability of TAM, a study was conducted by Shroff, Deneen, and Ng (2011), using 72 students to examine the students' behavioral intention to use an e-portfolio system. The researchers used the Confirmatory Factor Analysis (CFA) to examine the construct validity of the items of TAM and Cronbach's Alpha to examine the reliability of the items of TAM. The results of CFA showed the following range for factor loading: for PEOU items, factor loading ranged from .86 to .91, for PU items, it ranged from .86 to .91, and for the items of BI the factor loading ranged from .87 to .92. According to the results of CFA, the scales were not only reliable, but also valid for the factors under study. The Cronbach's Alpha test results indicated the following coefficient values: PEOU $\alpha = .96$, for PU $\alpha = .95$, and for BI $\alpha = .95$ which represented very high consistency.

Also, a study was conducted by Kigongo (2011) using the Technology Acceptance Model (TAM) to examine the relationship between perceived usefulness PU and behavioral intention BI, and the relationship of perceived ease of use PEOU and PU and the effect on BI. The Cronbach's Alpha coefficient showed the following values: for PU, $\alpha = .79$, for PEOU $\alpha = .85$, and for BI $\alpha = .77$ which means that the scale showed a high internal consistency.

Reliability and Validity of ILS

The Index of Learning Styles (ILS) was studied to determine its validity and reliability. According to Zywno (2003) who conducted a three-year study in an environment that had adopted hypermedia educational courses and was examining students' learning styles and their academic achievements. Zywno used the ILS to collect data from 557 participants to evaluate the

psychometric instrument's "test-retest reliability, factor structure, internal reliability, total item correlation and inter-scale correlation" (p. 1). The results of the test-retest correlation coefficient showed that the values ranged from .51 to .68, and for the Cronbach's Alpha it ranged from .53 to .70. According to the results, Zywno (2003) reported that the consistency of test-retest results, the internal reliability of the ILS scales, the Cronbach alpha coefficients, and the predictive power of the instrument for all items of the survey all met the required standards of a reliable and valid instrument. Zywno (2003) concluded that the reliability and validity data identified that the ILS was, "an appropriate and statistically acceptable tool for characterizing learning preferences" (p. 2).

Based on a study at Penn State (Litzinger et al., 2005) using the ILS, the reliability estimates fell in the range from 0.56 to 0.77, when the Cronbach's alpha test was used.

The ILS was found to be a reliable instrument as it showed a high internal consistency.

Livesay et al. (2002) conducted a study to examine the learning styles of 255 students at Tulane University, New Orleans and used the ILS. They found that the alpha for the ILS ranged from 0.54 to 0.72, and the correlation coefficient ranged from .60 to .78. A test-retest was conducted and they found high reliability results using the ILS in different measurements over time. They concluded that the psychometric instrument (ILS) was a reliable tool to measure the learning styles of students.

Felder and Spurlin (2005) conducted numerous studies and examined the reliability and validity of ILS. They reported that at the level 0.05 of significance, the reliability and validity of the "test-retest correlation coefficient for all four scales of the instrument varied between 0.7 and 0.9 for an interval of four weeks between test administration and between 0.5 and 0.8 for intervals of 7 months and 8 months" (p. 110).

Data Collection

Data collection for this study continued for a period of a semester. The study was conducted at a southeastern university in the USA. The participants of this study consisted of 315 students who were enrolled and representing all academic colleges and all education levels. The data collection followed the guidelines of the Institutional Review Board (IRB) at the southeastern university. IRB permission was obtained before starting the data collection (see Appendix D).

An invitation was sent via e-mail to professors and instructors to allow the researcher to administer the surveys in their classes. The e-mail explained the research study and stated that participation was voluntary. The professors who agreed to participate were sent an acknowledgement of their cooperation and requested an appropriate time to visit the class and administer the surveys. The researcher prepared the research packets and visited many classes from different colleges representing different educational levels. The research packet included the information letter, the demographic survey, the ILS and the TAM. Each participant was responsible for reading the information letter before answering the surveys. All surveys were administered in person (paper & pencil format). The data were collected confidentially and reported anonymously as the participants were not required to identify themselves. The information letter provided the purpose of this study and the definition of Web 2.0 technology tools, learning, and how to answer the surveys. The estimated time for completing these instruments was 8-10 minutes as was stated in the information letter. After completing the research packet, each participant returned the packet to the researcher. The researcher also invited individual students from all over the campus to participate in the study. Each individual completed the same steps as conducted in the classrooms. All research packets were collected and secured by the researcher.

Data Analysis

The participants consisted of 315 students enrolled in southeastern university. The participants represented all colleges and different education levels. Participants completed the research packet which included the five-question demographic survey. The ILS which consists of 44 questions, and the TAM with 17 questions. The research packets were available to participants in paper and pencil format. Data collection took place over a period of one semester – Spring 2015. Data collection followed the guidelines provided by the Institutional Review Board (IRB) at the southern university.

All data analysis were conducted using the Statistical Package for the Social Sciences (SPSS) version 19 except for the Index of Learning (ILS) Style Survey. The ILS was scored online through the official website of the ILS instrument to identify the different learning styles for each participant. To address the research questions for this study, both descriptive and inferential statistics were used to analyze data. The basic statistical analysis techniques were *correlation and (simple & multiple) regression, and the t-test for independent samples*. Descriptive statistics were used to provide a full description of the participants' demographic profile.

This study was conducted to answer five research questions. To address the first and the second questions, the researcher used descriptive analysis. For the third question, a correlational analysis was used. For the fourth question, a correlation was used. For the remaining research questions, a t-test for independent sample was used. For reliability, validity and internal consistency of the TAM Cronbach's' Alpha was used.

Summary

This chapter restated the purpose of the study and the research questions that guided this study. Also, this chapter introduced the design of the study, sample for the study, and instrumentation. An explanation of both Technology Acceptance Model (TAM) and the Index of Learning Style (ILS) were presented. The validity and reliability related to both instruments also addressed. At the end, a description of the data collection methods and analysis were provided.

CHAPTER 4

FINDINGS

This chapter describes the purpose of the study and the research questions that were used in the study. It presents the results of the analyzed data related to each of the research questions. In this chapter the demographic profile of participants is provided. Further, this chapter provided the results of descriptive, chi-square, correlation, simple and multiple regression analysis, and t-test for independent samples. All data analysis was conducted using the Statistical Program for the Social Sciences (SPSS) version 19.0, except for the Index of Learning Styles (ILS) Survey. Participants' scores were entered through the ILS website. The scores of the dominant learning styles of each participant were recorded. Data were collected following the guidelines of the Institutional Review Board (IRB) (see Appendix D).

Purpose of the Study

The purpose of this study was to examine learning styles and technology perceptions of undergraduate and graduate students in a higher education setting. Learning styles were examined through the use of the Index of Learning Styles (ILS) instrument and technology perceptions were examined through the use of the Technology Acceptance Model (TAM) instrument. This study sought to examine if learning styles were a factor that could affect students' perceptions of Web 2.0 technology in higher education settings. Learning styles, age, and gender were the independent variables that may have affected the students' perceived usefulness (PU), perceived ease of use (PEOU), and behavioral intention (BI) toward Web 2.0 technology. Students' perceived usefulness (PU), perceived ease of use (PEOU), and behavioral

intention (BI) were the dependent variables and used to identify students' perceptions of Web 2.0 technologies in higher education setting. Learning styles were measured using the Index of Learning Styles which were active/reflective, sensing/intuitive, visual/verbal, and sequential/global. Johnson (2008) indicated that everyone has preferred learning styles, which may affect the way people take in and retain new information. The TAM is related to individual beliefs, attitudes, and behavioral intentions that predict user's acceptance of Web 2.0 technologies (Capo, 2011; Conole, 2010; Davis, 1989). The results of this study can be used to describe and interpret students' perceptions and behavioral intentions in the use of Web 2.0 technology tools, which may be beneficial to faculty members, instructors, educators, and course designers to assist in making decisions about integrating learning styles and technology tools into course materials and instructional delivery.

Research Questions

The following research questions were used in this study:

1. What are the students' learning style preferences, as measured by the Index of Learning Styles?
2. What are the students' scores, as measured by Technology Acceptance Model?
3. What is the relationship of students' learning style preferences, as measured by the Index of Learning Styles, and scores, as measured by Technology Acceptance Model?
4. What is the relationship of students' age and scores, as measured by Technology Acceptance Model?
5. What is the relationship of students' gender and scores, as measured by Technology Acceptance Model?

Instrument– Index of Learning Styles

This study used two instruments: the Index of Learning Styles (ILS) Instrument was used to examine the learning styles of the participants in four domains (active/reflective, sensing/intuitive, visual/verbal, and sequential/global). The Technology Acceptance Model (TAM) was used to examine the participants' perception of Web 2.0 technology tools. The demographic questionnaire contained five questions and was developed by the researcher to provide the demographic information needed for this study and was presented in the first section of the packet. The ILS survey consists of 44 questions and was in the second section of the survey. In the third and last section, the TAM was presented and contained 17 questions. All five questions of the demographic questionnaire were questions regarding age, gender, the college in which the participant was registered, race and the level of education. To identify the learning styles of each participant, the researcher used the online official website of the ILS to score and identify the different learning styles of each participant within in the four domains. Descriptive statistics were used to determine and describe the learning styles and participant's demographic information.

When scoring the ILS, the results could be represented in two ways: (1) a categorical description of learners to have one description of his/her learning styles from each domain pair active vs reflective, sensing vs intuitive, visual vs verbal, or sequential vs global or (2) to have a specific continuous score in each domain ranging from 1 to 11 total score. Each participant obtaining a positive score was described as active, sensing, visual, or sequential learner. The participant who obtained a negative score in each domain was described as reflective, intuitive, verbal, or global. If a participant obtained a positive score in the left side of the domain he/she

will have the same score in the negative for the right side of the domain, if a participant scores a 7 on active, this participant has a corresponding score of -7 on reflective.

The Technology Acceptance Model (TAM) consists of 17 questions representing three subscales. The first subscale has 6 questions and measured the perceived ease of use (PEOU). The second subscale contains 6 questions and measured the perceived usefulness (PU). The third subscale consists of 5 questions and measured the behavioral intention (BI).

Demographic Profile

In this study, there were a total number of 336 students invited to complete the survey. Eleven participants did not return the surveys, four participants were 18 years old (and therefore not eligible to participate), three participants did not provide their demographic information, and three participants did not complete the TAM survey. A total number of 315 (*N*) undergraduate and graduate students from different colleges at southeastern university provided valid responses. Each participant received the research packet with the information letter and the three surveys. Each participant answered the five demographic questions, the 44 learning style questions and the 17 questions from the TAM (see Appendices B, C, & D).

Age

Participants' age ranged from 19 to 65 years with an average of 24.1, median of 21, mode of 21, and standard deviation of 7.247. The results revealed that the majority of the participants were between the ages of 19 – 23 (see Table 1). The highest percentage (69.5%) of participants were those 19 to 23 years of age, followed by 24-28 years of age (13%). The following table represented the distribution and the percentage of participants of the participants by the age groups (see Table 1).

Table 1

Distribution and Percentages of Participants by Age groups

Age Group	<i>n</i>	%
19-23	219	69.5%
24-28	41	13%
29-33	23	7.5%
34-38	14	4.5%
39-43	3	1%
44-48	10	3%
49-53	0	0%
54-58	3	1%
59-63	0	0%
64-68	2	.5%

N=315

Gender

Both males and females participated in this study. According to the Office of Institutional Research Assessment (OIRA) at the southeastern university, in the academic year 2014/2015, there was a total number of enrollments of 25,912, 12,798 females which represent 49.4 % and 13,114 males which represent 50.6%. Out of the 315 participants, there were 122 males, and 193 females. The data showed that the percentage of females was twice as the percentage of males (see Table 2) and were overrepresented relative to the university population.

Table 2

Distribution and Percentages of Participants by Gender

Gender	<i>n</i>	Sample %	University %
Female	193	61%	49.4%
Male	122	39%	50.6%

N=315

Colleges

The participants of this study were from all colleges at a southeastern university. According to the demographic of the southeastern university for the academic year 2014-2015, here is the description of the students by college. Out of the 315 participants, 78 were from the College of Science & Mathematics, which represents the highest percentage of participants. Followed by the College of Education with 72 participants. Then the College of Engineering had 49 participants. The fewest participants were the school of Nursing (*n*=4) and the College of Veterinary Medicine (*n*=5). Overall, the percentage of participants represented the university distribution of students by their college enrollment (see Table 3).

Table 3

Distribution and Percentages of Participants by College

College	University Enrolment	University %	<i>n</i>	Sample %
Agriculture	1,355	5%	34	11%
Architecture	1,333	5%	16	5%
Business	4,331	16.7%	7	2%
Education	2,593	10%	72	23%
Engineering	5,539	21.6%	49	16%
Human Sciences	1,238	4.8%	19	6%
Liberal Arts	3,701	14.3%	21	7%
Nursing	916	3.5%	4	1%
Pharmacy	623	2.4%	8	2%
Science & Mathematics	3,055	11.8%	78	25%
Veterinary Medicine	574	2%	5	1%
Not Enrolled in a program	292	1%	2	1%

N=315

Race/Ethnicity

According to the demographic profile of students at the southeastern university, the total number of students during 2014/2015 was 25,912. Out of the total number of students, 20,855 (80.4%) were Caucasians/White, 1,886 (7.3%) were Black/African American, Asian were 601 (2.3%) and 2,570 (10%) represent other races. The participants of this study were a diverse group of students. There were 232 White/Caucasian, 24 Black/African American, 6 Hispanic, 38 Asian, and 15 from other races. The highest percentage of the participants were White/ Caucasian

representing three-fourths of the total number of participants. The percentage of Asian participants was higher than the proportion in the university. The overrepresentation of Asian students may affect results based on their learning styles or acceptance of technology (see Table 4).

Table 4

Distribution and Percentages of Participants by Race/Ethnicity

Race/Ethnicity	<i>n</i>	Sample %	University %
White/Caucasian	232	74%	80.4%
Black/African American	24	8%	7.3%
Asian	38	12%	2.3%
Other	21	6%	10%

N=315

Education Level

According to the Office of Institutional Research Assessment (OIRA) at the southeastern university in (2014-2015), there were 21,506 (83%) undergraduate and 4,198 (17%) graduate student. All participants of this study were either undergraduate or graduate students. Of the 315 participants, 235 were undergraduate students, and 80 were graduate students (see Table 5). Graduate students were somewhat overrepresented in this study; making up 25% when they are 17% of the campus population.

Table 5

Distribution of Participants by Education Level

Education level	<i>n</i>	Sample %	University %
Undergraduate	235	75%	83%
Graduate	80	25%	17%

N=315

Research Question 1

What are the students' learning style preferences, as measured by the Index of Learning Styles?

The data in Table 6 represent the distribution and percentages of participants by learning styles domains and gender. The data revealed that the number of active, sensing, visual, and sequential learners in both females and males is higher than the number of reflective, intuitive, verbal, and global learners.

Active/Reflective Learners

Out of the 315 participants, there were 175 active learners, and 140 were reflective learners. The number of active learners is close to the number of reflective learners (see Table 6).

Sensing/Intuitive Learners

The results of the study revealed that 247 learners were sensing learners and 68 were intuitive learners. The number of sensing learners was almost four times the number of intuitive learners (see Table 6).

Visual/Verbal Learners

The data indicated that there were a total number of 242 learners were visual and 73 were verbal learners. There were almost three times as many visual as verbal learners (see Table 6).

Sequential/Global Learners

The results revealed that there were 210 sequential learners and 105 were global learners. The number of global learners was exactly half of the number of sequential learners (see Table 6).

Table 6

Distribution and Percentages of Participants by Learning Styles Domains

Domain	Active/Reflective		Sensing/Intuitive		Visual/Verbal		Sequential/Global	
	Active	Reflective	Sensing	Intuitive	Visual	Verbal	Sequential	Global
<i>n</i>	175	140	247	68	242	73	210	105
%	56%	44%	78%	22%	77%	23%	67%	33%

N=315

Learning Styles by Gender

A Chi-Square test was conducted to examine if there was any difference in learning styles based on participants' gender. The results showed no significance $X^2 (1, 315) = 0.33, p = .86$ for active/reflective, $X^2 (1, 315) = 2.54, p = .11$ for sensing/intuitive, $X^2 (1, 315) = 2.96, p = .09$ for visual/global, and $X^2 (1, 315) = 1.13, p = .29$ for sequential/global. The following table represented the distribution and percentages of participants by learning styles and gender. According to the information about (Table 7), there were no differences in learning styles based on gender (see Table 7).

Table 7

Distribution and Percentages of Participants by Learning Styles Domains and Gender

Learning Styles	<u>Female</u>		<u>Male</u>	
	<i>n</i>	%	<i>n</i>	%
Active	108	56%	67	55%
Reflective	85	44%	55	45%
Sensing	157	81%	90	74%
Intuitive	36	19%	32	26%
Visual	142	74%	100	82%
Verbal	51	26%	22	18%
Sequential	133	69%	77	63%
Global	60	31%	45	37%

N=315

Learning Styles by College

A Chi-Square test was conducted to examine if there was any difference in learning styles domains based on the college in which the participants enrolled. The results showed that there were no significant differences in learning styles based on the participants' college. For active/reflective $X^2(12, 315) = 13.12, p = .86$, so, there was no difference in this domain of learning styles. For sensing/intuitive, $X^2(12, 315) = 10.37, p = .50$, there was no differences in this domain. For visual/verbal domain, $X^2(12, 315) = 21.31, p = .03$, which means that probably there could be a type I error, or the College of Science and Mathematics which represented the highest percentage of participants could have the highest visual/verbal students and the College of Nursing which represented the least percentage of participants could have the lowest visual or verbal students. For sequential/global, $X^2(12, 315) = 17.15, p < .10$ which means that there was

no significant difference in this domain based on the participants' college. The following table provided the distribution and percentages of participants by learning styles and college (see Table 8).

Table 8

Distribution and Percentages of Participants by Learning Styles Domains and College

Learning Styles	<u>Agriculture</u>		<u>Architecture</u>		<u>Business</u>	
	<i>n</i>	%	<i>n</i>	%	<i>n</i>	%
Active	14	41%	9	56%	5	71%
Reflective	20	59 %	7	44%	2	29%
Sensing	29	85%	12	75 %	7	100 %
Intuitive	5	15%	4	25%	0	0%
Visual	23	68%	12	75 %	6	86 %
Verbal	11	32%	4	25%	1	14 %
Sequential	20	59%	9	56%	5	71%
Global	14	41%	7	44%	2	29%

N=315

Table 8 (Cont.)

Distribution and Percentages of Participants by Learning Styles Domains and College (Cont.)

Learning Styles	<u>Education</u>		<u>Engineering</u>		<u>Human Sciences</u>	
	<i>n</i>	%	<i>n</i>	%	<i>n</i>	%
Active	47	65%	25	51%	10	53%
Reflective	25	35%	24	49%	9	47%
Sensing	57	79%	37	76%	14	74%
Intuitive	15	21%	12	24%	5	26%
Visual	53	74%	46	94%	13	68%
Verbal	19	26%	3	6%	6	32 %
Sequential	48	67%	32	65%	13	68%
Global	24	33%	17	35%	6	32 %

N=315

Table 8 (Cont.)

Distribution and Percentages of Participants by Learning Styles Domains and College (Cont.)

Learning Styles	<u>Liberal Arts</u>		<u>Nursing</u>		<u>Pharmacy</u>	
	<i>n</i>	%	<i>n</i>	%	<i>n</i>	%
Active	13	62%	4	100%	4	50%
Reflective	8	38%	0	0%	4	50%
Sensing	12	57%	3	75%	6	75%
Intuitive	9	43%	1	25%	2	25%
Visual	14	67%	2	50%	6	75%
Verbal	7	33%	2	50%	2	25%
Sequential	10	48%	3	75%	5	63%
Global	11	52%	1	25%	3	37 %

N=315

Table 8 (Cont.)

Distribution and Percentages of Participants by Learning Styles Domains and College (Cont.)

Learning Styles	<u>Science & Math</u>		<u>Veterinary Medicine</u>		<u>No Program</u>	
	<i>n</i>	%	<i>n</i>	%	<i>n</i>	%
Active	42	54%	1	20%	1	50%
Reflective	36	46%	4	80%	1	50%
Sensing	64	82%	4	80%	2	100%
Intuitive	14	18%	1	20%	0	0%
Visual	63	81%	4	80%	0	0%
Verbal	15	19%	1	20%	2	100%
Sequential	62	80%	1	20%	2	100%
Global	16	20%	4	80%	0	0%

N=315

Learning Styles by Race

A Chi-Square test was conducted to examine if there was any difference in learning styles based on the race of the participants. The results showed that $X^2 (4, 315) = 10.19, p = .04$ for active/reflective, so there could be a difference in this domain of learning styles based on the race of the participants. The White/Caucasian students who represented the highest percentage of the participants could show a higher preference to be active or reflective learners than the participants from other races. For sensing/intuitive, $X^2 (4, 315) = 3.30, p = .51$, $X^2 (4, 315) = 5.35, p = .25$ for visual/verbal, and $X^2 (4, 315) = 13.05, p = .01$ for sequential/global, it was statistically significant, which means there could be a significant difference in this domain of learning styles based on participants' race. The White/Caucasian students who represented the highest percentage of the participants could show a higher preference to be sequential or global

learners than the participants from other races. The following table provided the distribution and percentages of participants by learning styles and race (see Table 9).

Table 9

Distribution and Percentages of Participants by Learning Styles Domains and Race

Learning Styles	<u>Caucasian</u>		<u>African American</u>	
	<i>n</i>	%	<i>n</i>	%
Active	140	60%	11	46%
Reflective	92	40%	13	54%
Sensing	183	79%	16	67%
Intuitive	49	21%	8	33%
Visual	173	75%	21	88%
Verbal	59	25%	3	12%
Sequential	161	69%	20	83%
Global	71	31%	4	17%

N=315

Table 9 (Cont.)

Distribution and Percentages of Participants by Learning Styles Domains and Race (Cont.).

Learning Styles	<u>Asian</u>		<u>Other</u>	
	<i>n</i>	%	<i>n</i>	%
Active	13	34%	11	52%
Reflective	25	66%	10	48%
Sensing	31	82%	17	81%
Intuitive	7	18%	4	19%
Visual	33	87%	15	71%
Verbal	5	13%	6	29%

Sequential	17	45%	12	57%
Global	21	55%	9	43%

N=315

Learning Styles by Education Level

A Chi-Square test was conducted to examine if there was any difference in learning styles based on the education level of the participants. The results showed that $X^2 (1, 315) = 4.95, p = .08$ for active/reflective, so there was no difference in this domain of learning styles based on the education level of the participants. For sensing/intuitive, $X^2 (1, 315) = 12.13, p = .002$, it was statistically significant, there was a difference in this domain based on the education level of the participants. Undergraduate students showed a higher preference to be sensing or intuitive learners than graduate students. For visual/verbal domain, $X^2 (1, 315) = 2.34, p = .31$ which means that there was no difference in this domain based on the education level. For sequential/global, $X^2 (1, 315) = 18.98.05, p < .001$ it was statistically significant which means that there was a significant difference in this domain based on the education level of the participants. Undergraduate students had a higher preference to be sequential/global learners than graduate students. The following table provided the distribution and percentages of participants by learning styles and education level (see Table 10).

Table 10

Distribution and Percentages of Participants by Learning Styles Domains and Education Level.

Learning Styles	<u>Undergraduate</u>		<u>Graduate</u>	
	<i>n</i>	%	<i>n</i>	%
Active	138	59%	37	46%
Reflective	97	41%	43	54%
Sensing	195	83%	52	65%
Intuitive	40	17%	28	35%
Visual	185	79%	57	71%
Verbal	50	21%	23	29%
Sequential	172	73%	38	48%
Global	63	27%	42	52%

N=315

The Technology Acceptance Model (TAM)

The Technology Acceptance Model (TAM) is a Likert-type scale with the 5 point scales to measure the perception of technology system through three subscales. The first subscale contained 6 items and measured the perceived ease of use (PEOU) of a technology system. The second subscale had 6 items and measured the perceived usefulness (PU) of a technology system. The last subscale contained 5 items and measured the behavioral intention (BI) of users toward a technology system. The 5 points scale of TAM starts at 1 which means strongly disagree, 2 represents disagree, 3 means neutral, 4 means agree, and 5 refers to strongly agree. If

the participant scored mean higher than 3, this represents a positive perception of Web 2.0 technology tools.

Data revealed that the (TAM) has a high internal reliability. A Cronbach’s Alpha was conducted to examine the internal consistency of the scale. Survey items were then disaggregated by constructs, it showed that for the three subscales (PEOU), (PU), and (BI) Cronbach’s Alpha were respectively, .934, .938, and .914. For the full TAM alpha was .954 which represent strong reliability, indicating that the scale is adequate to use, so the scale of TAM meets typical standards for internal consistency (see Table 11).

Table 11

The Internal Consistency of TAM

Scale	Cronbach’s Alpha	N of Items
PEOU	.934	6
PU	.938	6
BI	.914	5
Total	.954	17

N=315

Research Question 2

What are the students’ scores, as measured by Technology Acceptance Model?

Data analysis indicated that the students had a positive perception of Web 2.0 technology tools. For the scale of perceived ease of use (PEOU) of Web 2.0 the total score ($M = 22.50$, $SD = 4.701$). For the scale of perceived usefulness (PU) of Web 2.0 ($M = 20.62$, $SD = 5.426$). For the scale of behavioral intention (BI) of Web 2.0 it was ($M = 17.36$, $SD = 4.455$). So the undergraduate and graduate students at the southeastern university perceived Web 2.0 to be easy

to use, useful in studying, and they had a good behavioral intention towards using the Web 2.0 technology in the future. Table 12 summarized the mean score of participants for the subscales of TAM.

Table 12

Summary of Mean and Standard Deviation of participants of TAM measurements

Variable	<i>M</i>	<i>SD</i>
Perceived Ease of Use	3.75	.783
Perceived Usefulness	3.44	.874
Behavioral Intention	3.47	.891

N=315

A correlation analysis was conducted among the three subscales of TAM, it revealed that there was a positive strong correlation among the total score of perceived ease of use PEOU, perceived usefulness PU and the behavioral intention BI (see Table 13).

Table 13

The Correlation among the Total Scores of Technology

	PEOU	PU	BI
PEOU	1		
PU	.56*	1	
BI	.71*	.70*	1

N=315

A Standard Multiple Regression was conducted to examine which variable PEOU or PU has the best prediction of behavioral intention BI. Data analysis indicated that, for the total score of perceived ease of use (PEOU) and the total score of perceived usefulness that the multicollinearity is not a problem, it is not present among the independent variables. For Tolerance (T) greater than .01 and the Variance Inflation Factor (VIF) less than 10, the multicollinearity is not a problem in the analysis $T = .688$, $VIF = 1.454$. Also the variance portion of the independent variables that resulted from the collinearity diagnostics indicated that the multicollinearity was not a problem among the independent variables.

According to the analysis, the amount of variance of BI accounted for by the model of PEOU and PU is 64%, $R = .800$ which represents the strength of the relationship between BI and PEOU and PU. An $R^2 = .640$, $F(2, 312) = 277.795$, $p < .001$, is statistically significant, hence, there is significant relationship between the weighted linear composite of PEOU and PU. So, 64% of the behavior intention variance can be predicted by the combination of PEOU and PU. Hence, the prediction of the total score of BI by the combination of PEOU and PU is not due to chance. Based on the p value both independent variables influence the behavioral intention, $p < .001$ for both variables. Hence the regression model is:

$$\text{Total score of BI} = -.289 + .444 \times \text{PEOU} + .372 \times \text{PU}$$

Examination of the technology scores (see Table 13) and the Scatter Plot in Figure 4.1 revealed that the two variables; the total score of perceived ease of use (PEOU) and the total score of behavioral intention (BI) were positively correlated. The value of Pearson $r = .71$ indicated a positive strong correlation between the two variables.

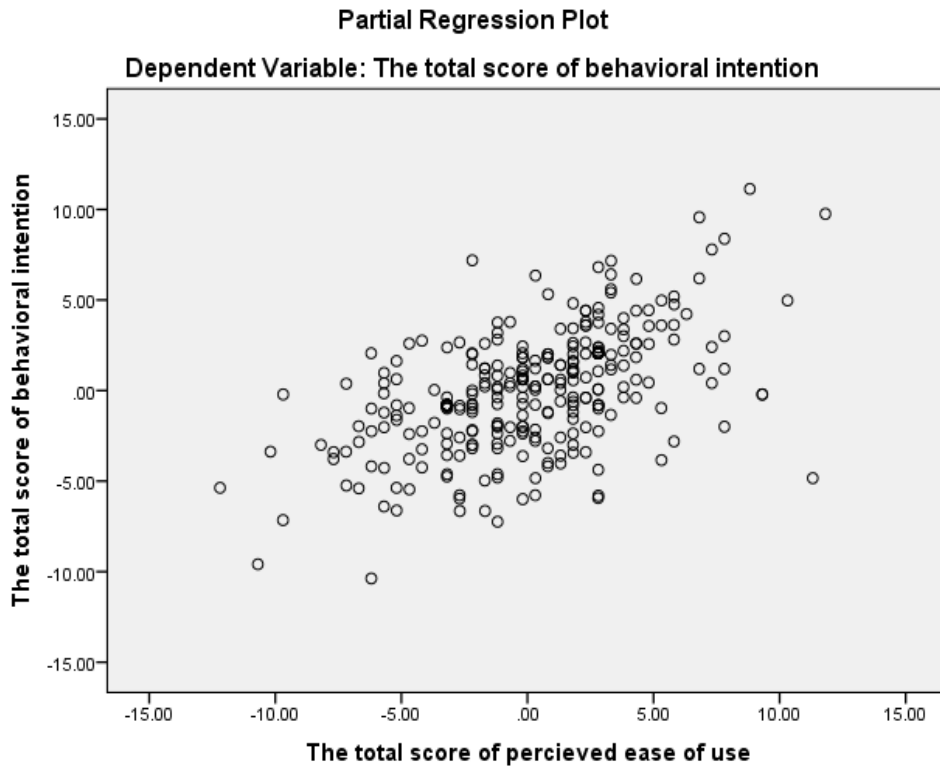


Figure 4.1: The Correlation between the Total Score of PEOU and BI

Examination of the technology scores (see Table 13) and the Scatter Plot in Figure 4.2 revealed that the two variables; the total score of perceived usefulness (PU) and the total score of behavioral intention (BI) were positively correlated. The value of Pearson $r = .70$ indicated a positive strong correlation between the two variables.

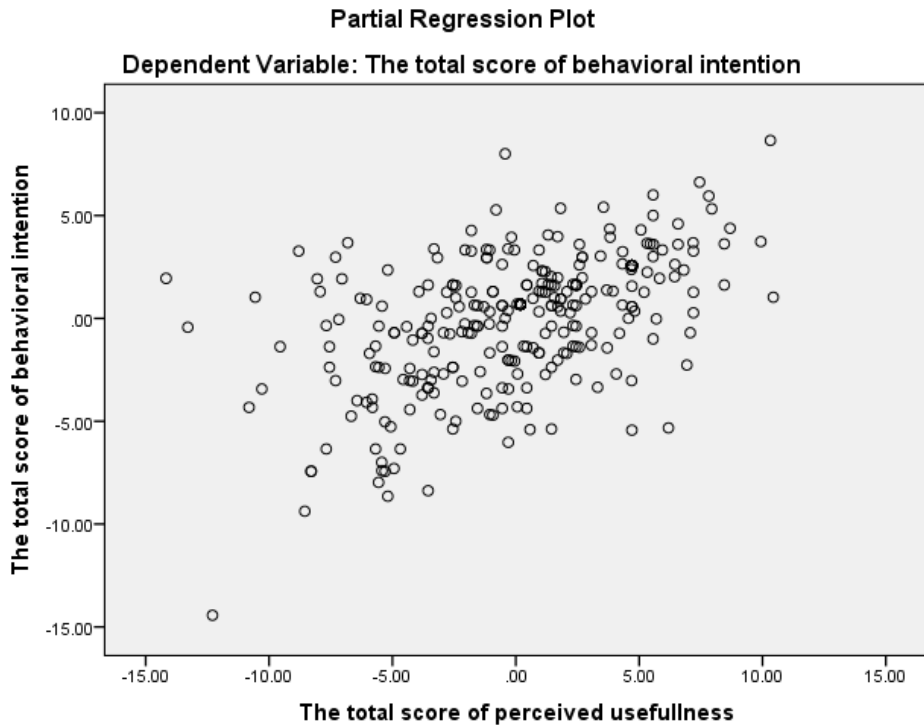


Figure 4.2: The Correlation between the Total Score of PU and BI

Research Question 3

What is the relationship of students' learning style preferences, as measured by the Index of Learning Styles, and scores, as measured by Technology Acceptance Model?

After examining the relationship between learning styles and technology, there could be a relationship between them. Lu, Jia, Gong and Clark's (2007) study of the relationship between learning styles and online courses recommended that "instructors using online courses should seriously consider the diverse learning styles when designing and developing online learning modules for different students" (p. 194).

Correlation analysis was conducted to explore the relationship between learning styles and the total scores of technology measured in the three subscales; perceived ease of use PEOU, perceived usefulness PU, and behavioral intention BI. Based on the results, the visual group of

learners acquired the highest mean score of learning style $M = 3.69$, $SD = .477$ followed by sensing learners with $M = 3.58$, $SD = 4.91$, then sequential learners with learning style $M = 1.54$, $SD = 4.24$, the active group of learners acquired the least mean learning style $M = .733$, $SD = 4.45$. The results indicated that overall participants had a mild learning styles preferences.

Data revealed that there was no correlation between PEOU and the four domains of learning styles. For the learning style domain of active/reflective, $r = -.001$, the $p = .483$ it was not significant, for sensing/intuitive domain $r = -.013$, $p = .407$, for visual/verbal, $r = .085$, $p = .067$, and for sequential/global domain, $r = .045$, $p = .213$. So, the correlation between PEOU and the four domains of learning styles was not statistically significant.

For PU, there was no correlation between PU and the four domains of learning styles. For the learning style domain of active/reflective, $r = .011$, the $p = .420$ it was not significant, for sensing/intuitive domain $r = -.032$, $p = .285$, for visual/verbal $r = .060$, $p = .144$, and for sequential/global domain, $r = .005$, $p = .464$. So, the correlation between PU and the four domains of learning styles was not statistically significant.

For BI, there it was no correlation between BI and the four domains of learning styles. For active/reflective, $r = .034$, the $p = .271$ is not statistically significant, also for sensing/intuitive domain, $r = -.047$, $p = .203$, for visual/verbal, $r = .040$, $p = .240$, and for sequential/global domain, $r = .028$, $p = .310$. So, the correlation between BI and the four domains of learning styles was not statistically significant.

According the previous results, the perceptions of Web 2.0 technology were not correlated with the four domains of learning styles (see Table 14).

Table 14

The Correlation among the Domains of Learning Styles and Technology Scores

	PEOU	PU	BI	LS/Active	LS/Sensing	LS/Visual	LS/Seq
PEOU	1						
PU	.56*	1					
BI	.71*	.70*	1				
LS/Active	-.00	.01	.03	1			
LS/Sensing	-.01	-.03	-.05	.15	1		
LS/Visual	.09	.06	.04	.12	-.05	1	
LS/ Seq	.05	.01	.03	.18*	.40*	-.02	1

N = 315

Research Question 4

What is the relationship of students’ age and scores, as measured by Technology Acceptance Model?

Data analysis revealed that there was no correlation between the age of the participants and the scores of perceived ease of use (PEOU) of Web 2.0 technology, $r = .036, p = .523$. There was a correlation between participants’ age and their perception of Web 2.0 technology to be useful (perceived usefulness PU) in their learning environment, $r = .226, p < .001$ it was statistically significant so older/graduate students perceived Web 2.0 technologies to be useful in learning and studying. For behavioral intention (BI) and age of participants is correlated with their behavioral intention to use Web 2.0 tools in the future ($r = .177, p = .002$) and it was statistically significant (see Table 15).

Table 15

Correlation of Age and the Technology Scores

	PEOU	PU	BI	Age
PEOU	1			
PU	.56*	1		
BI	.71*	.70*	1	
Age	.036	.226*	.177*	1

N=315

A simple regression was conducted to discover whether age could predict the perceptions of Web 2.0 technology. For perceived usefulness (PU), an *r* of .226 indicated a correlation between PU and age, only 5% of total variance in the total scores of PU could be accounted for by the age of participants. For behavioral intention (BI), an *r* of .177 indicated a weak correlation between BI and age, only 3% of total variance in the total scores of BI could be accounted for by the age of participants.

The t- test for independent samples was conducted to examine if there was any difference in technology perceptions among students based on their level of education. Data analysis revealed that level of education had a significant effect on students' perceptions of Web 2.0 technology. For PEOU scores, the score mean of undergraduates was ($M=22.19, SD=4.69$) and for graduate ($M=23.41, SD=4.66$), $t(312) = -1.999, p = .047$, which was statistically significant. The Cohen's *d* effect size was $d = -0.261$, which represented small effect size, so the two groups of undergraduate and graduate students did not have much difference in their perceptions of Web 2.0 technologies and ease for use.

For the PU scores, there was a difference in the score means between undergraduate and graduate students. For undergraduates ($M=19.86$, $SD=5.22$) and for graduates ($M=22.82$, $SD=4.71$), $t(312) = -4.460$ $p < .001$ there was a difference in PU scores and it was statistically significant. The Cohen's d effect size was $d = -0.595$, which represented a moderate effect size, so the two groups of undergraduate and graduate students differ in their perceptions of Web 2.0 technologies and their usefulness in learning environment.

For BI scores, there is a difference in the score mean between undergraduate and graduate students. For undergraduate it was ($M=16.79$, $SD=4.44$) and for graduate it was ($M=19.08$, $SD=4.10$), $t(312) = -4.032$ $p < .001$ is statistically significant. The Cohen's d effect size was $d = -0.535$, which represented a moderate effect size, so the two groups of undergraduate and graduate students differed in their behavioral intentions to use Web 2.0 technologies in the future. The level of education was associated with technology perceptions. The graduate students had a higher level of technology perceptions than undergraduate students.

Research Question 5

What is the relationship of students' gender and scores, as measured by Technology Acceptance Model?

To investigate if there is any difference in the technology scores of students (PEOU, PU, and BI) based on their gender, the t -test for independent samples was conducted, and the results revealed that gender of the participant does not have any significant effect on students' scores relating to technology. For PEOU scores, there was no difference in the score means between males ($M=22.86$, $SD=4.67$) and females ($M=22.27$, $SD=4.72$), $t(313) = 1.088$, $p = .28$.

For PU scores, there was no difference in the score means between males ($M=20.64$, $SD=5.39$) and females ($M=20.60$, $SD=5.17$), $t(313) = .063$, $p = .95$. For BI scores, there is no

difference in the scores mean between males ($M=17.43$, $SD=4.69$) and females ($M=17.32$, $SD=4.31$), $t(313) = .229$, $p = .82$.

Summary

This chapter presented the required data analysis to answer all the research questions. There were five research questions, and several analyses were conducted to answer the research questions, including descriptive, chi-square, correlation, simple and multiple regression, and t-test for independent samples. The findings of this study indicated that the majority of students preferred the learning styles domains of active, sensing, visual, and sequential, rather than the domains of reflective, intuitive, verbal and global. The participants of this study had a positive perception of Web 2.0 technology and a behavioral intention to continue using it in the future. The three subscales of the Technology Acceptance Model (TAM) were highly correlated with each other. The perceived ease of use PEOU and perceived usefulness PU both can predict the behavioral intention (BI) towards using Web 2.0 technologies in the future. There was no correlation between all domains of learning styles and the technology perceptions of the participants of this study. The age of the participants was found to be correlated with their technology scores. Older students perceived the Web 2.0 technology to be more useful than the younger participants, and they have a higher behavioral intention towards using Web 2.0 in the future than younger sample. The level of education had a significant relationship with participants' technology perceptions. Graduate students had higher perceptions and behavioral intentions towards Web 2.0 technology than undergraduate students. Gender did not affect the technology perceptions among the participants.

CHAPTER 5

SUMMARY, DISCUSSIONS, IMPLICATIONS, AND RECOMMENDATIONS

This study was conducted to examine the learning styles and technology perceptions of students in the higher education setting and explore the factors that may affect students' technology perceptions. The first chapter discussed the purpose of the study, the statement of the problem, the research questions, and the significance of the study, the assumptions, the limitations, definition of terms, and the organization of the study.

The second chapter introduced the literature review related to the study. It described the history of education technology, perception of technology in education, integrating technology into instructions in higher education, the emergence of Web 2.0 technologies, categorizations and types of Web 2.0, evolution of World Wide Web, Web 1.0 to Web 4.0, research on technology acceptance in higher education, research on Web 2.0 in education, technology acceptance model (TAM), and Web 2.0 and learning theories. The literature review continued to discuss learning styles, the definitions of learning styles, the background of learning styles, learning styles and technology, learning styles, models and instruments, and concluded with a description of the instrument – the index of learning styles.

The third chapter discussed the design of the study, the instruments – Index of Learning Styles ILS–Technology Acceptance Model TAM– reliability and validity, the demographic survey, the sample, data collection, and data analysis, and concluded with a summary of the chapter.

The fourth chapter introduced the findings of data analysis. Also, it contained an explanation of the utilized instruments ILS and TAM. It presented the results that answer all the research questions of this study. The results provided the demographic profile, age, gender, college, race, education level, with descriptive analysis of TAM and the results of correlation, simple regression and multiple regression. This chapter presents the summary, discussion, implications, and concludes with recommendations for future research.

The Purpose of the Study

The purpose of this study was to examine learning styles and technology perceptions of undergraduate and graduate students in a higher education setting. Learning styles were examined through the use of the Index of Learning Styles (ILS) instrument and technology perceptions were examined through the use of the Technology Acceptance Model (TAM) instrument. This study sought to examine if learning styles were a factor that could affect students' perceptions of Web 2.0 technology in higher education settings. Learning styles, age, and gender were the independent variables that may have affected the students' perceived usefulness (PU), perceived ease of use (PEOU), and behavioral intention (BI) toward Web 2.0 technology. Students' perceived usefulness (PU), perceived ease of use (PEOU), and behavioral intention (BI) were the dependent variables and used to identify students' perceptions of Web2.0 technologies in higher education setting. Learning styles were measured using the Index of Learning Styles which were active/reflective, sensing/intuitive, visual/verbal, and sequential/global. Johnson (2008) indicated that everyone has preferred learning styles, which may affect the way people take in and retain new information. The TAM is related to individual beliefs, attitudes, and behavioral intentions that predict user's acceptance of Web 2.0 technologies (Capo, 2011; Conole, 2010; Davis, 1989). The results of this study can be used to

describe and interpret students' perceptions and behavioral intentions in the use of Web2.0 technology tools, which may be beneficial to faculty members, instructors, educators, and course designers to assist in making decisions about integrating learning styles and technology tools into course materials and instructional delivery.

Research Questions

The following research questions were used in this study:

1. What are the students' learning styles preferences, as measured by the Index of Learning Styles?
2. What are the students' scores, as measured by Technology Acceptance Model?
3. What is the relationship of students' learning styles preferences, as measured by the Index of Learning Styles, and scores, as measured by Technology Acceptance Model?
4. What is the relationship of students' age and scores, as measured by Technology Acceptance Model?
5. What is the relationship of students' gender and scores, as measured by Technology Acceptance Model?

Summary

This study included a sample consisting of 315 undergraduate and graduate students from all colleges at a southeastern university during the spring semester 2015. To examine the learning styles, the Index of Learning Styles (ILS) was used for this purpose. The Technology Acceptance Model (TAM) was used to examine the students' perceptions of technology, particularly the Web 2.0 technology. To obtain the demographic information of participants, the researcher designed a 5 question demographic survey. The ILS consisted of 44 questions, measuring the learning styles in four domains which are active/reflective, sensing/intuitive,

visual/verbal, and sequential/global. The TAM contains 17 questions, the first 6 items measure the perceived ease of use (PEOU), the second 6 items measure the perceived usefulness (PU), and the last 5 items measure the behavioral intention (BI). The instruments were administered in person (paper & pencil). Since the participants were not required to sign a consent letter, all data collected was recorded anonymously.

Since the purpose of this study was examining the learning styles and technology perceptions among higher education students, learning styles, age and gender were the independent variables that may affect the dependent variables which were the total scores of the three subscales of the TAM; perceived ease of use (PEOU), perceived usefulness (PU), and the behavioral intention (BI).

Participants were the 315 students. The demographic profile revealed that the percentage of females was higher than the percentage of males; females, 193 (61%) and 122 (39%) for males. The age of participants ranged from 19 – 65 with an average of 24 years and mode of 21. Participants were from different colleges; Agriculture, Architecture, Business, Education, Engineering, Human Sciences, Liberal Arts, School of Nursing, Pharmacy, Science & Mathematics, and Veterinary Medicine. The majority of participants were White/Caucasian 232 (74%), Black/African American 24 (8%), Asian 38 (12%), and other races 21 (6%). The majority of the participants were undergraduate students 235 (75%) and 80 (25%) were graduate students.

For learning styles examination, out of the 315 participants, there were 175 (56%) active vs. 140 (44%) reflective, 247 (78%) sensing vs. 68 (22%) intuitive, 242 (77%) visual vs. 73 (23%) verbal and 210 (67%) sequential vs. 105 (33%) global learners. These results agreed with the previous studies which found that the American population consists of 75% sensing learners and 25% intuitive learners (Jacob & Shoemaker, 1993; Kiersey & Bates, 1978, 1984). Teevan,

Michael, and Schlesselman (2011) conducted a study using the ILS to examine the learning styles of students at a U. S. School of Pharmacy. Out of their 210 participants, they found that 84% were sensing learners and the intuitors were 16%, 73% visual and 23% verbal, 67% sequential, and 33% were global learners. The results of this study had similar findings with this current study. The Index of Learning Styles was confirmed to be a valid instrument that identifies the learning styles preferences. Also, the results of this current study are supported by the findings of Al-Othman (2004) who found that the participants in his study was 65% sensing and 35% were intuitive. Pallapu (2008) found that the sensing learners were 79% and the intuitive were 21%. According to Falt (1999), “best estimates are that there are about 75% sensors, and 25% intuitors in the general population. This ratio holds equally for men and women” (Para. 7).

For measuring technology perceptions, the TAM is considered a reliable and valid construct with Cronbach’s Alpha of .954. For the students’ perceptions of Web 2.0 technology tools, results showed a good perception of Web 2.0 technologies for the three sub scales PEOU ($M = 3.75$), PU ($M = 3.44$), and BI ($M = 3.47$). The mean score of participants indicated a higher technology perception and there were no difference between the scores across the three measurements.

Correlation analysis revealed that there was no significant correlation between learning styles domains and technology scores including perceived ease of use PEOU, perceived usefulness PU, and behavioral intention BI. As revealed by data analysis, age did not have a significant relationship to PEOU, but for PU and BI there was a significant relationship to age. However, there was no effect of gender on technology scores of participants. The findings of gender supported the findings of Quadri (2014) who found that participants had a high

perception of Web 2.0 and there was no positive relationship between age and gender and attitudes towards the actual use of Web 2.0 technology.

Discussion

Our classrooms have evolved rapidly over the past couple of decades. Modern technology tools are being used in our learning environments throughout all grade levels. Higher education settings are full of adult learners who have a different experiences and backgrounds. Those adult learners are motivated and self-directed learners which require instructors, professors, course designers, and adult educators to be aware of these characteristics when they design educational plans and instructions. According to Gynn (2001), integrating technology into instruction in higher education has become a necessity, it is important to use an appropriate tool that meets the needs of the students' different learning experience. Gynn explained that technology would be considered the tool that provides knowledge to students and enables them to connect with their teacher and each other (Gynn, 2001).

Educators who aim to increase learning outcomes should have opportunities to address the issue of integrating technology into the classroom and examine the learning styles of students. When doing a background investigation in the field of technology research, we can find studies that addressed the issues of integrating technology into the curriculum and students' attitude toward using technology; however, these studies did not connect students' attitudes to individual learning styles (Lukow, 2002).

There are many elements that may affect student' usage of modern technology, these elements include, but are not limited to motivations, beliefs, age, gender, and learning styles. The emergence of the internet or World Wide Web (WWW) has a great influence in the education system all over the world. Today Web 2.0 technology tools have been used in many higher

education institutions. According to Shaohua and Peilin (2008), Web 2.0 is the “second wave of the World Wide Web...that allows individuals to publish, collaborate and share experiences with other similar individuals or groups” (p. 1121). Through these technologies people are able to communicate, interact, and engage in discussions regardless of the geographical limitation. Investigating the relationship between college students’ learning styles and their perception of modern technology tools is a vital issue that can assist instructors to integrate these modern tools into the instructions to meet the specific needs of today’s students and keep them engaged and collaborating in the teaching and learning processes.

The purpose of this study was to examine the learning styles and technology perceptions among higher education students and explore the relationship between learning styles and Web 2.0 technology tools. Learning styles, age, and gender were external variables that were considered to possibly affect the perception of Web 2.0 technology tools. Analysis techniques were used to answer the research questions that included, correlation, simple and multiple regression and t-test for independent samples.

Data analysis revealed that students at the southeastern university have a good perception of Web 2.0 tools and a mild learning styles dominance which could be explained that students have a limited knowledge about learning styles and they could be used in the learning process. There was no significant correlation between learning styles as an independent variable and the perception of Web 2.0 technology tools among the students. Gender did not have any effect on the perception of Web 2.0 tools. Age was found to be positively correlated with the Web 2.0 perceptions of the students, older students had higher perceptions that Web 2.0 tools would be more useful and had higher behavioral intentions towards using Web 2.0 in the future. Graduate

students had higher perceptions and behavioral intentions toward using Web 2.0 technology than undergraduate students.

Implications

Within the rapidly increasing usage of instructional technologies, there has been a concern in the educational environments about an effective learning environments that are based on integrating the modern technology and students' needs. The effectiveness of Web 2.0 technology tools could be integrated into the instructional design process to produce the best desired learning outcomes. To meet the variety students' needs, integrating different learning styles could help in this issue. Based on the findings of this study, learners have a variety learning styles. The use of learning styles domains can be comprehensive and it may be difficult for a learner to use only one learning style.

Learning Styles

The findings of this study related students' learning styles to higher education institutions which can bear extension of the body of knowledge and the research in the field of learning styles. Literature review and the findings of the previous studies support the findings of this study that students have different learning styles. Learning style is one of the elements that can impact achievement of the desired learning outcomes. According to Sims and Sims (1995), learning styles help instructors, teachers, professors, and educators to understand and explain why learners have different behaviors, actions, and feelings in the learning environment.

It is important to integrate a variety of learning styles when designing curriculum. Federico (2000) indicated that there was no single instructional design that can accommodate the different learning styles of the students. Students' performance and academic achievement could

be improved significantly when adopting appropriate teaching and learning styles (Hawk & Shah, 2007).

As revealed from the results, students at the southeastern university represent many learning styles. Each student that participated in this study was found to be classified into four domains of learning styles; active/reflective, sensing/intuitive, visual/verbal, and sequential/global. Each of these domains has a specific characteristics that should be considered when designing learning activities, educational plans, and the overall instructions. Here are some implications for each domain of learning styles.

Active and Reflective Learners

As indicated from data analysis of this study, more than half (56%) of the participants were active learners. Active learners do not prefer to learn from lectures, as they do not prefer learning environments that require them to receive information passively. They prefer to work and learn in a learning situation that keep them engaged in working in groups and hands on activities (Felder & Silverman, 1988). De Vita (2001) demonstrated that the most appropriate techniques for active learners was brainstorming, critical thinking, group projects, problem solving, and learning activity-based doing.

Reflective Learners prefer situations that provide opportunity that allow them to think about the information. They work well alone or with one partner. They like to think and create theories (Felder & Silverman, 1988).

In 1988, Felder and Silverman proposed that instructors should use comprehensive materials that integrate both a problem-solving based model (active) and fundamental perception (reflective). Graf and Kinshuk (2007) demonstrated a model that is based on increasing the number of exercises and self-assessment tests with a chapter summary for active learners, and

this information should be introduced first for learners and then they can provide their reflection on it before starting the exercises and provide outlines beginning with the topic of the chapter and its conclusion for reflective learners.

Sensing and Intuitive Learners

Sensing and Intuitive Learners: Felder and Silverman (1988) explained that sensing and intuition were two different ways to enable learners to perceive the world around them. Sensing depends on observing and gathering data through the use of the senses; intuition prefers to perceive information indirectly or by way of the unconscious, imagination, and guessing. Most learners use both of these domains; however, most learners will prefer to use just one style over the other.

Sensors, these groups of learners prefer to deal with facts, data, experimentation, and solve problems through using standard methods, but they dislike surprises. They are patient with detail that are free from complications. Sensors are good at memorizing facts, and prefer to be careful and slower in completing their work (Felder & Silverman, 1988).

Intuitors learners are totally different than sensing learners. Intuitors prefer to deal with concepts, principles, theories, and innovation, but do not like repetition. They may get bored with details and they work well with complications. Intuitors are good at grasping new concepts, and they tend to complete tasks quickly, but sometimes they are careless about some details (Felder & Silverman, 1988).

Felder and Silverman (1988), suggested that instructors should use material that is a combination of comprehensive information that contains concrete parts such as data and facts for sensing learners and theories, principles, and abstract concepts for intuitive learners.

Visual and Verbal Learners

Visual learners are learners who remember what was easily seen such as pictures, graphs, diagrams, flow charts, films or any visual representation. They probably cannot easily recall the information that they received verbally (Felder & Silverman, 1988). The visual modality refers to the ability to perceive, process and recall information depending on vision sensory. Learners who are visual as a major perceptual preference are supposed to attain the best learning through different visual stimulus such as pictures, graphs, maps, or images. According to the learning style theory, a visual learner has to look, notice and write to achieve the best learning (Dunn, 1993; Zapalska & Dabb, 2002).

Verbal learners remember well what they hear in lectures or discussions. They will learn well if they repeat what they heard. They depend on learning from discussions, prefer to use verbal explanation over the visual demonstration, and prefer to learn through explaining information to others (Felder & Silverman, 1988).

Teachers, adult educators, and instructors who seek integrating visual preference into the learning environment should provide visual demonstrations such as graphs, charts, or illustrations, use handouts with white margin to allow learners to draw pictures, ask questions that require illustrations for answers and include images and visual aid in the presented text. An effective implications for verbal learners could be considered when designing the learning materials to include textual material and use presentation, allow the learner to interact with other classmates in a discussion, and allow learners to write notes and use online chat for more interaction.

Sequential and Global Learners

Sequential learners prefer to master the presented learning materials in an ordered progression based on logic format. They try to learn it exactly as the educator presents it and follow linear processes when solving problems. They are able to work with material even when they only understand it partially. They may be strong in critical thinking and analysis, and learn best when educators present the materials in a constant progression of complexity and difficulty (Felder & Silverman, 1988).

Global learners may feel that they need to solve simple problems or show the basic understanding and then suddenly they see the problem as a whole (Felder & Silverman, 1988).

Graf and Kinshuk (2007) introduced a model to help sequential and global learners attain the best learning. They recommended “presenting first the learning material, then some examples and afterwards a self-assessment test and some exercises for sequential learners and by providing outlines additionally between the topics, presenting a conclusion straight after the content, and providing a high number of examples after the learning material” would assist global learners (p. 2579).

For an effective implications for sequential learners, adult educators, teachers, instructors, and course designers should design materials that allow sequential learners to adopt a linear approach and progress step-by-step until they acquire the best desired learning. For global learners, it would be beneficial if the course materials include an overview of the main topic and then progress towards details.

The Relationship between the Index of Learning Styles and Brain Hemisphericity

According to the National Institute of Neurological Disorders and Stroke (2007), the human brain is a composite organ in our bodies that is responsible for performing many essential functions such as movement, intelligence, thinking and learning, senses, and behavior (p. 1). The human brain contains two hemispheres, the “right” hemisphere and the “left” one. Both hemispheres have different functions to perform and neither of the two hemispheres is upper to the other (Gazzaniga, 1998). The research about the brain functions started many decades ago. This research produced many theories about the brain functions. One of the beneficial theories about the brain is the theory of Hebb’s (1949) theory which supposed that the left hemisphere and the right one perform different functions during receiving different information in different paths (Jensen, 2008; Kolb, 1984; Williams, 1983)

Characteristics of Left and Right Brain

According to Dew (1996), the left side brain hemisphere has a tendency to use analytical, logical, sequential way when performing functions and dealing with situations. The left brain depends on data collection, performing analyses, and will reach a logical conclusion by using a rational thinking process. Left brain prefers to divide information into discrete parts for analysis. The right brain has a tendency to function the same in situations, but in a different way. The Right brain depends on intuitive leaps to reach the answers utilizing insights and perceptions. The right brain tends to collect information together to form a whole picture.

The characteristics of the left- brain include many skills such as language skills; reading, writing, and speaking, analytical skills; logic and reasoning, and mathematical skills; math and science (Sousa, 1995). On the other hand, the characteristics of right-brain includes many different skills such as creativity, the ability of pattern recognition, and the perception of how

things relate to each other in different contexts, art abilities, drawing, painting and sculpting, and imaginative thinking skills. Individual with right-brain dominance are good at recognizing faces, places, and objects (Sousa, 1995).

When comparing the characteristics of learners of each domain through the four domains of the learning styles and the characteristics of learners who are left-brained and right-brained, we can discover that three domains of the Index of Learning Styles (ILS), the left side has the same characteristics of left-brained learners and the right side of the three domains has the same characteristics of the right-brained learners except for the visual/verbal domain of the ILS. The left side of that domain which is visual has the same characteristics of the right-brained learners and the opposite for the right domain which is verbal has the same characteristics of left-brained learners. From the previous literature review, there is a relationship between the domains of the Index of Learning Styles and the brain hemisphericity (Ali & Kor, 2007). This will lead to further research in the future, focusing on the ability of the Index of Learning Styles to measure the brain hemisphericity among learners.

Web 2.0 Technology Tools

There are many implications of learning styles and Web 2.0 technologies in learning environments. Web 2.0 is a broad term that contains a number of web-based technologies that facilitate communication among users. The term Web 2.0 was initially created by Timothy O'Reilly (2005), who defined Web 2.0 as an active and open web design that worth users' participation.

Although the term Web 2.0 has emerged early in 2005, Web 2.0 technology tools have been viewed as vague tools by many educators and instructors, so it requires efforts to design teaching methods that integrate such tools.

Web 2.0 tools can serve as applications that facilitate and improve learning experiences by building collaboration among students with no geographic limitations (Klamma et al., 2007). According to McLoughlin and Lee (2007), the new features of Web 2.0 have turned the learning environment concept of learner-centered approach to an actual application in education environments. Today, several tools of Web 2.0 such as blogs, wikis, media sharing applications, and social networking sites are able to provide learning in many communities. Through the Web 2.0 tools, people can have informal conversations, dialogue, collaborative content, and information sharing through accessing the available massive knowledge resources. As a result of emerging and using of Web 2.0 tools, the traditional method of teaching which a teacher-centered approach is is being reduced over the years.

There are many components of Web 2.0 technology tools that can be used in learning. Selwyn (2007) argued that many social networking components of Web 2.0 such as Myspace and Facebook may be used to provide a great chance for informal learning through allowing users to freely express their thoughts and ideas. Web 2.0 technology tools can be used to keep learners engaged in an appealing way of learning that is full of interaction and collaboration.

Richardson (2006) indicated that the different components of Web 2.0 technology tools such as blogs, wikis, podcasts, and many others can have many implications for classrooms. Richardson (2006) introduced the following implications of Web 2.0 technologies to be used in our learning classrooms:

- Encourage analytical and critical thinking.
- Promote creative and intuitive thinking, and associational thinking.
- Develop analogical thinking.
- Increase access and usage of quality information.

- Provide a good combination of solitary and social interaction.

One of the basic ideas about Web 2.0 is that these successful network applications are systems for employing collective intelligence through the connection of large group of people. These connections can create a collective work whose value is more effective than what is provided by any of the individual participants (O'Reilly & Battelle, 2009).

In conclusion, Web 2.0 technologies have many tools that could be used in teaching and learning. The decision to use any of these tools and which tools will be appropriate to be used by learners and teachers, depends on the specific needs of learners and the pedagogical needs of the teaching situation. Web 2.0 tools allow learners to contribute to informal learning through connecting and interacting with others. As a result, Web 2.0 applications enable educators to design and establish a learning environment that is based on personalized, active, and cooperative learning that enhance desired learning outcomes (McLoughlin & Lee, 2007).

Recommendations

After conducting this study, there are many recommendations for future research. This study was conducted at a southeastern university in the semester of Spring 2015. The results of data analysis led to the following recommendations:

1. Replicate the study in a different setting with the same characteristics of students at the southeastern university and compare the findings.
2. Conduct a study to examine the learning styles and left and right brain dominance using the Index of Learning Styles ILS and another instrument that explores the left and right brain dominance. Compare the results of the ILS and the brain hemisphericity instrument and examine the nature of the relationship between the ILS and the other instrument.

3. Replicate the study and consider other variables that may have a significant affect on technology perceptions such as motivation, majors and the educational level.
4. Extend the study to include international students and examine their learning styles and their technology perceptions and compare the group to USA students.
5. Consider age as a variable, but include balanced samples of older adult learners and young adult learners. Divide the sample into two groups based on age and compare between them.
6. Replicate the study in a University in a Middle Eastern country where there may be different learning styles usage or technology perceptions. The importance of that study will be beneficial to that university, so instructors can integrate modern technology and learning styles into their curriculum and teaching methods.
7. Consider adding a variable such as English as a Second Language (ESL) students. Some ESL students struggle in using modern technology because of the language limitations.
8. Examine the perceptions of modern technology among professors to examine their use of modern technology tools.
9. The study could be designed to consider the technology perception as a factor and the affect on the grade point average (GPA) of the students and examine if there is any correlation between the technology perception and GPA.
10. Examine the learning styles and teaching styles of the professors and explore if their learning styles affects their choice and use of teaching styles.
11. Examine the motivations and beliefs about modern technology and their impact on technology perceptions and behavioral intention.

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Appendices

Appendix A
Demographic Questionnaire

Demographic Questionnaire

What is your age?

What is your gender?

- Male
- Female

What college are you in?

- Agriculture
- Business
- Education
- Engineering
- Human Sciences
- Liberal Arts
- Nursing
- Pharmacy
- Science & Mathematics
- Veterinary Medicine
- Architecture
- None of the above
- Not enrolled in a program

What is your ethnicity?

- White/Caucasian
- Black/African American
- Hispanic
- Asian
- Other

What is your educational level?

- Undergraduate level
- Graduate level
- Visiting scholar
- Language level
- Others

Appendix B

Index of Learning Styles Instrument

INDEX OF LEARNING STYLES

DIRECTIONS

Enter your answers to every question on the ILS scoring sheet. Please choose only one answer for each question. If both “a” and “b” seem to apply to you, choose the one that applies more frequently.

1. I understand something better after I,

a) try it out.

b) think it through.

2. I would rather be considered

a) realistic.

b) innovative.

3. When I think about what I did yesterday, I am most likely to get

a) a picture.

b) words.

4. I tend to

a) understand details of a subject but may be fuzzy about its overall structure.

b) understand the overall structure but may be fuzzy about details.

5. When I am learning something new, it helps me to

a) talk about it.

b) think about it.

6. If I were a teacher, I would rather teach a course

a) that deals with facts and real life situations.

b) that deals with ideas and theories.

7. I prefer to get new information in

a) pictures, diagrams, graphs, or maps.

b) written directions or verbal information.

8. Once I understand

a) all the parts, I understand the whole thing.

b) the whole thing, I see how the parts fit.

9. In a study group working on difficult material, I am more likely to

a) jump in and contribute ideas.

b) sit back and listen.

10. I find it easier

a) to learn facts.

b) to learn concepts.

11. In a book with lots of pictures and charts, I am likely to

a) look over the pictures and charts carefully.

b) focus on the written text.

12. When I solve math problems

a) I usually work my way to the solutions one step at a time.

b) I often just see the solutions but then have to struggle to figure out the steps to get to them.

13. In classes I have taken

a) I have usually gotten to know many of the students.

b) I have rarely gotten to know many of the students.

14. In reading nonfiction, I prefer

- a) something that teaches me new facts or tells me how to do something.
- b) something that gives me new ideas to think about.

15. I like teachers

- a) who put a lot of diagrams on the board.
- b) who spend a lot of time explaining.

16. When I'm analyzing a story or a novel

- a) I think of the incidents and try to put them together to figure out the themes.
- b) I just know what the themes are when I finish reading and then I have to go back and find the incidents that demonstrate them.

17. When I start a homework problem, I am more likely to

- a) start working on the solution immediately.
- b) try to fully understand the problem first.

18. I prefer the idea of

- a) certainty.
- b) theory.

19. I remember best

- a) what I see.
- b) what I hear.

20. It is more important to me that an instructor

- a) lay out the material in clear sequential steps.
- b) give me an overall picture and relate the material to other subjects.

21. I prefer to study

- a) in a study group.

b) alone.

22. I am more likely to be considered

a) careful about the details of my work.

b) creative about how to do my work.

23. When I get directions to a new place, I prefer

a) a map.

b) written instructions.

24. I learn

a) at a fairly regular pace. If I study hard, I'll "get it."

b) in fits and starts. I'll be totally confused and then suddenly it all "clicks."

25. I would rather first

a) try things out.

b) think about how I'm going to do it.

26. When I am reading for enjoyment, I like writers to

a) clearly say what they mean.

b) say things in creative, interesting ways.

27. When I see a diagram or sketch in class, I am most likely to remember

a) the picture.

b) what the instructor said about it.

28. When considering a body of information, I am more likely to

a) focus on details and miss the big picture.

b) try to understand the big picture before getting into the details.

29. I more easily remember

a) something I have done.

b) something I have thought a lot about.

30. When I have to perform a task, I prefer to

a) master one way of doing it.

b) come up with new ways of doing it.

31. When someone is showing me data, I prefer

a) charts or graphs.

b) text summarizing the results.

32. When writing a paper, I am more likely to

a) work on (think about or write) the beginning of the paper and progress forward.

b) work on (think about or write) different parts of the paper and then order them.

33. When I have to work on a group project, I first want to

a) have “group brainstorming” where everyone contributes ideas.

b) brainstorm individually and then come together as a group to compare ideas.

34. I consider it higher praise to call someone

a) sensible.

b) imaginative.

35. When I meet people at a party, I am more likely to remember

a) what they looked like.

b) what they said about themselves.

36. When I am learning a new subject, I prefer to

a) stay focused on that subject, learning as much about it as I can.

b) try to make connections between that subject and related subjects.

37. I am more likely to be considered

a) outgoing.

b) reserved.

38. I prefer courses that emphasize

a) concrete material (facts, data).

b) abstract material (concepts, theories).

39. For entertainment, I would rather

a) watch television.

b) read a book.

40. Some teachers start their lectures with an outline of what they will cover. Such outlines are

a) somewhat helpful to me.

b) very helpful to me.

41. The idea of doing homework in groups, with one grade for the entire group,

a) appeals to me.

b) does not appeal to me.

42. When I am doing long calculations,

a) I tend to repeat all my steps and check my work carefully.

b) I find checking my work tiresome and have to force myself to do it.

43. I tend to picture places I have been

a) easily and fairly accurately.

b) with difficulty and without much detail.

44. When solving problems in a group, I would be more likely to

a) think of the steps in the solution process.

b) think of possible consequences or applications of the solution in a wide range of areas.

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Appendix C

Technology Acceptance Model (TAM

Technology Acceptance Model (TAM)

The following questions ask about Web 2.0 technology tools. Web 2.0 sites allow users to read, write, interact and collaborate with each other. Web 2.0 include Social networking sites, Blogs, Wikis, Skype, YouTube, Flickr and Podcasting. Using the following scale, please check the number that best reflects your answers:

1 = *strongly disagree* 2= *disagree* 3= *neutral* 4= *agree* 5= *strongly agree*

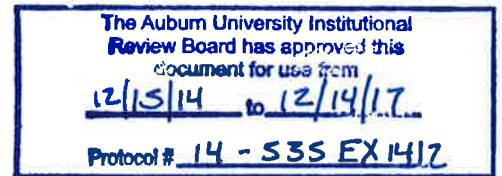
Answer as accurately as possible. Remember there are no right or wrong answers.

#	Statements	Strongly Disagree 1	Disagree 2	Neutral 3	Agree 4	Strongly Agree 5
1	Learning to use Web 2.0 tools would be easy for me.					
2	I would find it easy to get Web 2.0 tools to do what I want them to do.					
3	My interaction with Web 2.0 tools would be clear and understandable.					
4	I would find Web 2.0 tools flexible to interact with.					
5	It would be easy for me to become skillful at using Web 2.0 tools.					
6	I would find Web 2.0 tools easy to use.					
7	Using Web 2.0 tools would enable me to accomplish my tasks more quickly.					
8	Using Web 2.0 tools would improve my performance in class assignments.					
9	Using Web 2.0 tools in my classes would increase my productivity.					
10	Using Web 2.0 tools would enhance my effectiveness for my assignments.					

11	Using Web 2.0 tools would make it easier to do my assignments.					
12	I would find Web 2.0 tools useful in my studying.					
13	I always try to use Web 2.0 tools to do a task whenever it has a feature to help me perform it.					
14	I always try to use Web 2.0 in as many cases as possible.					
15	I plan to use Web 2.0 tools in the future.					
16	I intend to continue using Web 2.0 tools in the future.					
17	I expect my use of Web 2.0 tools to continue in the future.					

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Appendix D
Information Letter



AUBURN UNIVERSITY

COLLEGE OF EDUCATION

EDUCATIONAL FOUNDATIONS, LEADERSHIP AND TECHNOLOGY

(NOTE: DO NOT AGREE TO PARTICIPATE UNLESS AN IRB APPROVAL STAMP WITH CURRENT DATES HAS BEEN APPLIED TO THIS DOCUMENT.)

"The Auburn University Institutional Review Board has approved this document for use from December 15, 2014 to December 14, 2017. Protocol # 14-535 EX 1412"

INFORMATION LETTER

For a Research Study entitled

"Examination of Learning Styles and Technology Perceptions of Undergraduate and Graduate Students"

You are invited to participate in a research study to provide information about your learning styles and technology perceptions. The study will include information about how do you use Web 2.0 technology tools in your studying and learning environment. Also the study includes information about how do you perceive information, arrange it, retain and recall it. The study is being conducted by Nahla Moussa in the Auburn University Department of Educational Foundations, Leaderships & Technology. You were selected as a possible participant because you are 19 years or older and maybe use modern technology tools in your learning process.

What will be involved if you participate? If you decide to participate in this research study, you will receive a research packet and be asked to complete 2 surveys in person (Paper & pencil). One of the surveys is about how do you learn and the other is about how to prefer using Web 2.0 technology tools. Your total time commitment will be approximately 10 minutes.

4036 Haley Center, Auburn, AL 3684-5221; Telephone: 334-844-4460; Fax: 334-844-3072

www.auburn.edu

Are there any risks or discomforts? The risks associated with participating in this study are: None.

Are there any benefits to yourself or others? If you participate in this study, please don't expect to receive any personal benefits. All benefits will be for research and body of knowledge.

Will you receive compensation for participating? There is no compensation for participating to this study. Participating is voluntary.

Are there any costs? If you decide to participate, you will don't have to pay anything.

If you change your mind about participating, you can withdraw at any time during the study. Your participation is completely voluntary. If you choose to withdraw, your data can be withdrawn as long as it is identifiable. Your decision about whether or not to participate or to stop participating will not jeopardize your future relations with Auburn University, the Department of Educational Foundations, Leadership & Technology or your department.

Any data obtained in connection with this study will remain anonymous. We will protect your privacy and the data you provide by keeping it secured by the researcher only. Information collected through your participation may be *(e.g., used to fulfill an educational requirement, published in a professional journal, and/or presented at a professional meeting, etc.)*

If you have questions about this study, please ask them now or contact Nahla Moussa at nmm0013@auburn.edu

If you have questions about your rights as a research participant, you may contact the Auburn University Office of Research Compliance or the Institutional Review Board by phone (334)-844-5966 or e-mail at IRBadmin@auburn.edu or IRBChair@auburn.edu

HAVING READ THE INFORMATION PROVIDED, YOU MUST DECIDE IF YOU WANT TO PARTICIPATE IN THIS RESEARCH PROJECT. IF YOU DECIDE TO PARTICIPATE, THE DATA YOU PROVIDE WILL SERVE AS YOUR AGREEMENT TO DO SO. THIS LETTER IS YOURS TO KEEP.

Nahla Moussa
Investigator's signature
Nahla Moussa
Print Name

Dec 16th, 2014__
Date

4036 Haley Center, Auburn, AL 3684-5221; Telephone: 334-844-4460; Fax: 334-844-3072

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