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GENERATIONAL PERSPECTIVE OF HIGHER EDUCATION ONLINE STUDENT LEARNING STYLES

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GENERATIONAL PERSPECTIVE OF HIGHER EDUCATION ONLINE STUDENT
LEARNING STYLES

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Abstract

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Generational Perspective of Montana Higher Education Online Student Learning Styles

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   The purpose of this study was to determine whether students associated with a generational group exhibit similar learning styles as identified by the Felder and Soloman Index of Learning Styles instrument. The secondary purpose was to determine to what degree these generational groups rate their satisfaction with online education through the use of the Distance Education Learning Environment Survey (DELES) instrument.
   The instruments were administered to Montana University System students who were enrolled in one or more fully online courses. The data was analyzed using descriptive statistics, chi-square, and ANOVA. The collected data of 1426 (n) from a total surveyed population of 9,983 students revealed that generational learning styles indicated statistically significant differences with regard to visual-verbal learning style preferences, but no other statistically significant differences related to preferences were determined between the generational groups. Further analysis of the DELES results indicated that there were statistically significant mean difference score comparisons among the Millennial Generation, Generation X, and Baby Boomers. Specifically, the Millennial Generation reported lower scores on overall satisfaction survey components as compared with both Generation X and Baby Boomer respondents.
   This study presents recommendations that may be used by faculty, instructional designers, and college leadership to address the continued growth and diversity of student populations. This increased awareness fostering an understanding on issues such as online program development, student satisfaction, and online student retention.

DEDICATION

I dedicate this doctoral study to my loving parents Roy and Suzanne Williams who have always encouraged me through their endless love and support to learn, explore, and embark on new adventures throughout my life.

It is further dedicated to my sister Nickey, and niece Kortney for their unending support, and love throughout this journey.

To my amazing wife Annie for her unwavering love, patience and encouragement throughout my educational pursuits. You bring so much happiness and joy to my life each and every day and I look forward to perusing new journeys with you in life.

I dedicate this to each of them for the chance to take this journey in order to achieve this amazing dream in education and in my personal life. Thank you and I love each and every one of you.

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CHAPTER 1

Introduction

Education, in various forms, has presented itself as a medium in which to impart and improve the knowledge of students. From the medieval ages of students attending lectures presented by scholars dependent heavily on manuscripts to the modern age of rapid growth in technology based delivery instruction, the face of education continues to change (Calis, 2008; Duderstadt, 2007). Online education within institutions of higher education is experiencing a rapid and accelerating growth. By the end of 2005, students engaged exclusively as online students represented seven percent of post-secondary students within the United States (United States Distance Learning Association, 2007). The Sloan Foundation's *Staying the Course: Online Education in the United States 2008* reports enrollment trends for fall of 2006 to fall of 2007 show an 11.3 percent increase over the preceding year. In 2007, over 3.9 million higher education students were enrolled in at least one online course. This increase is a twelve percent increase over the previous year. In comparison the overall higher education student population experienced a 1.2 percent growth during this same time period (Allen & Seaman, 2008).

These increasing growth trends associated with online instructional delivery are also evident within the Montana Higher Education System. According to the Montana University System Data Warehouse, across all eleven campuses between FY 08 and FY 09, there was growth in online student credit hour generation for general fund, credit-bearing, online course enrollments of more than 24.7 percent in online student credit hour delivery. The total online student credit hour generation for these courses rose again from 88,473 student credit hours in FY 09 to 103,792 student credit hours in FY 10, a 17.3 percent total increase. This growth is again demonstrated when examining an increase from 103,792 student credit hours in FY 10 to

116,294 credit hours in FY 11 establishing an additional growth of 12.1 percent over the previous year (Montana, 2011).

These same institutions of higher education are also facing changing demographics as the age of the student population they serve becomes more diverse. No longer are these institutions educating students mainly from one generation. They are now simultaneously educating students from largely three separate generational groups. These groups consist of students from the Baby Boomers 1943-1960, Generation X 1961-1981, and the Millennial Generation 1982-2001 (Strauss & Howe, 1991a). As these diverse generational groups engage in higher education, they bring with them various cultural attributes, career expectations, educational backgrounds, and learning styles (Coates 2007; Strauss & Howe, 1991a). In the past, many institutions of higher education focused on the academic and social attributes of their student populations but had minimal focus on the generational differences between these student groups (Davis, Pawloski, & Houston, 2006; Hartman, Moskal, & Dziuban, 2005; Strauss & Howe, 1991b). This changing generational demographic in higher education is often overlooked even though this demographic is associated with a seventeen percent increase in student enrollment in online courses since 2007 (Allen & Seaman, 2010). Leadership and instructional faculty within higher education are now faced with uncertainty in how to address the generational differences (Greer, 2010).

The student populations associated with online education as a whole are becoming more diverse in age, educational background, and cultural traits (Dabbagh & Bannan-Ritland, 2005). Each of these generational groups of students brings individual learning styles. Learning styles can be described as "a description of the attitudes and behaviors which determine an individual's preferred way of learning" (Honey & Mumford, 1992, p. 1). A variety of learning style models

are found in the literature: Myers-Briggs Type Indicator (1956), Honey and Mumford (1992), Pask (1976), Kolb (1986), and Felder and Silverman (1988). While there are varying degrees of characteristics identified by these learning style models, all of the models are in agreement that a learner exhibits preferred preferences within which to learn. Cassidy (2004) stated that "Learning style was also found to correlate significantly with other academic performance-related factors such as academic self-efficacy and academic locus of control" (p. 439). Although there is disagreement about a direct correlation between student achievement and learning styles (Hannafin, Oliver, Hill, Glazer, & Sharma, 2003; Sandman, 2008), linkage to the student's satisfaction of an online education course has been established (Cassidy, 2004; Little, 2010; Verduin & Clark, 1991; Walker, 2003). According to Barnes, Preziosi, and Gooden (2004), "learning styles change from generation to generation requiring faster speed, a more visual approach and greater active engagement" (p. 21). Two commonly-used learning style inventories that determine student learning styles in relationship to online education are the Kolb Learning Style Inventory and the Felder-Silverman Index of Learning Styles (ILS). Both are used to determine population distributions of student learning styles associated with student learning dispositions (Felder & Silverman, 1988; Felder & Soloman, 2011; Kolb, 1984; Richmond & Cummings, 2005; Richmond & Liu, 2005; Thiele, 2003). Within the literature the Index of Learning Styles (ILS) initially created by Felder and Silverman (1988) was updated in 1991 by Felder and Soloman and is also referred to as the Felder and Soloman (2011) ILS.

A review of the literature indicates an emphasis on the participation of college students (Dennen et al., 2007; McGorry, 2003; Slater, Richards, & Cary, 2004) in online education courses as well as research on learning styles of students (Federico, 2000; Jones, Reichard, & Mokhtari, 2003; Sonnewald, 2006). Minimal research has been conducted combining these two

emphasis areas and examining them within the context of the various generations now actively engaged within the higher education setting.

Diaz and Cartnal (1999) wrote: "One of the first things we teachers can do to aid the learning process is simply to be aware that there are diverse learning styles in the student population" (p. 130). This awareness is based on the seven principles for good practice in higher education as outlined by the work of Chickering and Gamson (1987), which encourages; (a) contact between students and faculty (b) active learning; (c) increased cooperation between students; (d) providing prompt feedback; (e) communication of high expectations; (f) emphasis upon time on task; and (g) respect for diverse ways of learning and talents.

The United States Department of Education (2008) reported that "Our education system must reflect the skills and knowledge essential to succeed in this new era" (p. 2). To create learning environments that optimize the various student generational strengths and minimize their weaknesses, it is essential to understand the learning in depth (Oblinger & Oblinger, 2005).

Problem Statement

Currently three diverse generational groups of students are working toward educational degrees within higher education. These groups consist of students from the Baby Boomers 1943-1960, the Generation Xers 1961-1981, and the Millennial generation 1982-2001 (Strauss & Howe, 1991a). Each of these generational groups exhibits its own unique set of characteristics that have been shaped by societal values, trends, and historical events (Strauss & Howe, 1991a; Coates, 2007). Traditionally, institutions of higher education have taught these students in the same manner regardless of documented generational differences in student learning styles (Jones, Reichard, & Mokhtari, 2003). In the review of the literature, there are statements describing differences in the characteristics of these students. For example, Eisner (2004) wrote, "It is not

unusual for even veteran college instructors to express some bewilderment about teaching today's students. Pedagogy that these instructors previously used no longer seems to be effective" (p. 1). This same sentiment is found in research presented by Nicholson (2010), Siemens and Conole (2011), and Twenge (2006) when speaking generally of the newest generation within higher education. These researchers describe how this newest generational group exhibit different learning characteristics of impatience, multitasking yet lack of depth of skill, and networked yet autonomous in comparison to previous student generations. It is within this new context that faculty expresses struggles in order to create relevant and engaging instructional courses (Coates, 2007; Eisner, 2004; Jones, Reichard, & Mokhtari, 2003; Nicholson, 2010; Siemens and Conole, 2011; Twenge, 2006).

As online education continues to rapidly grow with over 4.6 million higher education students participating within at least one online course during the 2008-2009 academic year (Greer, 2010), and 6.1 million students by the fall of 2010 (Allen and Seaman, 2011), it is important for institutions to meet the student population's learning needs (Harr, Hall, Schoepp, & Smith, 2002).

The increased growth of distance learning in higher education has created competition in the marketplace for potential students between for profit schools and those of public education creating an environment that is ripe a technologically driven revolution according to Christensen and Eyring, (2011). This market place challenge by the for profit institution has been developing over the last decade with the advancement of technologic growth and an early warning by Peter Drucker who in 1997 stated that "Thirty years from now the big university campuses will be relics. Universities won't survive. It is as large a change as when we first got the printed book" (Lenzer & Johnson, 1997, p. 126).

A decade later a call of concern was published by U.S. Education Secretary Margaret Spelling (2006), who issued a warning that the future of higher education is:

>…an enterprise that has yet to address the fundamental issues of how academic programs and institutions must be transformed to serve the changing educational needs of a knowledge economy. It has yet to successfully confront the impact of globalization, rapidly evolving technologies, an increasingly diverse and aging population, and an evolving marketplace characterized by new needs and paradigms. (p. xii)

The same advancements in technology that have allowed higher education institutions to provide course work for their students at a distance brings with them challenges to educational leadership (Christensen & Eyring, 2011; Christensen, Johnson, & Horn, 2010). These technologic advancements coupled with the increasing cost of education, and rising tuition for students have brought competitiveness to the for profit institutions (Christensen & Eyring, 2011). According to Cassidy (2004) one concept that has provided insight into student learning behavior is that of learning styles. In order for traditional higher education institutions to be effectively competitive, there is a need to focus on the relationship among generational student groups, learning styles, and the student's satisfaction within the online educational setting

Research Question

This research will address the following research question:

>What, if any, relationships exist among learning styles, generational groups, and satisfaction with online learning?

Purpose of the Study

The purpose of this quantitative study was to determine whether students associated with a generational group as described by Strauss and Howe (1991a), exhibit distinct learning styles as identified through the use of the Felder and Soloman Index of Learning Styles instrument. The secondary purpose was to determine to what degree these generational groups rate their satisfaction with online education.

Significance of the Study

Online education is experiencing a robust growth within higher education systems and has been recognized as an integral part of educating current students within the education system. While this means of instructional delivery is not being used exclusively within all aspects of higher education programs, it is gaining substantial ground as a popular instructional delivery method to facilitate student learning. Cassidy (2004) and Walker (2004) demonstrated that by increasing an educational practitioner's understanding of the relationship between learning styles and learning satisfaction, improvements to learning situations which have an impact on performance and achievement can be achieved. According to Kolb and Kolb (2005a):

> Learning is best conceived as a process, not in terms of outcomes. To improve learning in higher education, the primary focus should be on engaging students in a process that best enhances their learning —a process that includes feedback on the effectiveness of their learning efforts. (p. 41)

Online education is student-centered learning (Walker, 2004: Little, 2010). An investigation of the characteristics and associated learning styles of these students will better help to identify the potential barriers to successful implementation of online education (Duderstadt, 2007; Galusha, 1997; Sandman 2008). With the rapid development of online course

technologies and associated student populations, a heightened need for theory and practice in the effective use of these learning environments is needed. According to Walker (2004) the online environment is "An area of study distinctively missing from the body of research involving learning environments and what type of environments are successful" (paragraph 4).

Understanding learning styles associated with each of these generational student groups and reported satisfaction with online education will add to the knowledge base of these institutions. Curry (1983, 1990) indicated that the overlying purpose to examine learning styles is to develop established outcomes associated with general learning and instructional processes. Felder (2011), retrieved from http://www4.ncsu.edu/unity/lockers/users/f/felder/.html) expands upon the ideas presented by Curry by stating:

> When mismatches exist between learning styles of most students in a class and the teaching style of the professor, the students may become bored and inattentive in class, do poorly on tests, get discouraged about the courses, the curriculum, and themselves, and in some cases change to other curricula or drop out of school. Professors, confronted by low test grades, unresponsive or hostile classes, poor attendance and dropouts, know something is not working. They may become overly critical of their students (making things even worse) or begin to wonder if they are in the right profession. Most seriously, society loses potentially excellent professionals. To overcome these problems, professors should strive for a balance of instructional methods (as opposed to trying to teach each student exclusively according to his or her preferences.) If the balance is achieved, all students will be taught partly in a manner they prefer, which leads to an increased comfort level and willingness to learn, and partly in a less preferred manner, which provides practice and feedback in ways of thinking and solving problems which they may

not initially be comfortable with but which they will have to use to be fully effective professionals. (Paragraph 2)

Information obtained may be used in addressing such issues as online program development and recruitment and retention of online student populations, determining course efficiency and need for alternative delivery methods or changes in instructional strategies (Kolb, 1984; Howell, 2004; Little, 2010; Felder & Silverman, 1988; Felder, 2011). A student's satisfaction in learning along with their satisfaction with instruction received is an important factor in the success of online education programs which are now being offered by a growing number of institutions (Sheard & Markham, 2005; Lin & Overbaugh, 2007). Cronbach and Snow (1977) noted: "What lies before us is the task of accumulating knowledge about how a person's characteristics influence his or her response to the alternatives educators can offer or invent" (p. viii).

Definitions of Terms

For the purpose of this study, the following terms will apply:

Active learning. Students are engaged with the content through writing, discussion, application, and reflection (Chickering & Gamson, 1987; Zepke & Leach, 2005).

Andragogy. The theory of adult learning that attempts to explain why adults learn differently than other types of learners (Knowles, 1990).

Baby Boomers. Generational cohort with birth years of 1943 to 1960 (Strauss & Howe, 1991a).

Cognitive Theory. An individual's consistent preferences for understanding and gathering information (Ozmon & Craver, 2003; Riding & Rayner, 1997; Kolb & Kolb, 2005b).

Distance education. "Teacher-led education that takes place over the Internet, with the teacher and student separated geographically" (Watson, Gemin, & Ryan, 2008, p. 5).

Equivalency Theory. The belief, "It is the responsibility of the distance educator to design, even overdesign, learning events that provide experiences with equivalent value for learners" (Simonson, Smaldino, Albright, & Zvacek, 2009, p. 51).

Experiential Leaning Theory. "The process whereby knowledge is created through the transformation of experience. Knowledge results from the combination of grasping and transforming experiences" (Kolb, 1984, p. 41).

Generation. Groupings of individuals by birth years based on shared common experiences such as political, economic, environmental, and social awakenings within a given time frame create overlying shared characteristics associated to that group of individuals (Howe & Strauss, 1991a, 2000).

Generation X. Generational cohort, with birth years of 1961 to 1981. Generation Xers sometimes are referred to in the literature as the Thirteenth generation or the Slacker generation (Howe & Strauss, 1991a, 2000).

The *Index of Learning Styles* (ILS). is a learning style instrument used to assess preferences on four dimensions (active/reflective, sensing/intuitive, visual/verbal, and sequential/global) of a learning style model. This instrument was originally formulated to be 28 questions by Richard M. Felder and Linda K. Silverman. The present forty-four question instrument was developed by Richard M. Felder and Barbara A. Soloman (1994).

Learning. An individual act that occurs in relationship to others' concepts and experiences. The decision of what and when to learn is a personal one (Kolb, 1984, Felder & Silverman, 1988; Ahley-Dennison, 2010).

Learning Management System (LMS). An information system that administers instructor-led and e-learning courses and keeps track of student progress (Allen & Seaman, 2008).

Learning style. "The ways in which individuals begin to concentrate on, process, internalize, and retain new and difficult academic information" (Dunn et al., 1995, p. 353).

Learner satisfaction. The resulting emotion when one perceives that a need has been adequately fulfilled. In online courses, as in the traditional classroom, whatever the learner aspires to get from a course is the respective need (Walker, 2003, 2004).

Millennial Generation. Also known as the Net-generation or Generation Next includes individuals who have grown up with informational technologies in their day-to-day lives (Oblinger, 2008; Twenge, 2006).

Online class. As proposed by the SLOAN Consortium on Distance Learning: a course in which at least 80 percent of the course content is delivered online via a Learning Management System (LMS) (Allen & Seaman, 2008).

Online education. Is a delivery method that has "teacher-led education that takes place over the Internet, with the teacher and student separated geographically" (Watson, Gemin, & Ryan, 2008 p. 5).

Pedagogy. Refers to the strategies of instruction or a style of instruction to impart that knowledge to the student by an instructor who holds the content knowledge (Eisner, 2004; Gonzalez, 2010; Shulman, 2008).

Organization of the Remainder of the Study

This research study is organized into the following chapters: Chapter One provides the introductory information, purpose of the study, statement of the problem, and research questions along with the significance of the study. It also contains definitions of the associated terminology

used within the study. Chapter Two includes a review of the associated literature used to build a conceptual framework and on which to build and ground the research study. Chapter Three discusses the research design chosen for the study as well as the methods employed and associated assumptions, limitations, and delimitations. Chapter Four provides the research findings and associated analysis of the data. Chapter Five includes a summary and interpretation of the data, followed by recommendations for further research.

The following chapter provides a foundation for understanding the historical perspective of distance education associated with higher education and then proceeds into the technologic pedagogy and learning styles that are occurring within distance education.

CHAPTER 2

REVIEW OF THE RELATED LITERATURE

The work of Boote and Beile (2005) was used to examine the existing literature.

According to Boote and Beile, a literature review should be evaluated according to the following

criteria: The first encompasses the coverage of the literature and its inclusion or exclusion of

information. The second criterion examines the synthesis of material and the distinguishing of

practices being done in a historical as well as the future context of the subject being studied.

Third the methodology being used in the researched subject area which according to Boote and

Beile, is related to the fourth criterion this is the significance of the research problem being

investigated. The fifth criterion is the rhetoric or clarity in which the literature is presented to the

reader. In the following sections, each of the five categories defined by Boote and Beile was

considered while reviewing the associated literature.

Overview of Online Education

The initial beginnings of distance education and subsequent move towards online

education have been in place for many years beginning with correspondence courses in the early

17th century (Morabito, 1997). The initial purpose of distance education was to provide

educational opportunities to students not able to access those resources through traditional

means. These students who were place bound received printed course materials through postal

correspondence. Further development of distance education can be traced back to Europe where

in the 17th century educational opportunities for students at a distance were being offered both in

England as well as Sweden (Schrum, 1999, 2000). These early forms of distance education with

the use of postal correspondence courses later evolved in the early 1900's to the instructor

traveling to meet students (Myers, 2002; Schrum, 1999).

Improvement in communication and the introduction of television to the world at the New York World's Fair in 1939 brought about another change in the educational delivery systems. Beginning as early as 1940, educators used television to broadcast learning opportunities to diverse and distant student populations. With the development and implementation of mail delivery of correspondence materials in place, the use of radio and television provided new and broader delivery means for the transmittal of learning materials (Myers, 2002; Nasseh, 1997; Schrum, 1999). The first large breakthrough in distance education occurred in 1961 with the Midwest Program on Airborne Television, the so called 'flying classroom" being launched by Purdue University. This was followed by work at the University of Illinois and Stanford University whose scientists created a classroom system based in linked computer terminals. This linkage allowed students to access informational resources while listening to a professor who was broadcasting remotely (Cuban, 2001; Wolley, 1994).

The development of microwave technology and closed circuit television in the 1970s helped revive the waning interest in distance education. This technology along with the creation of ARPANET (Advanced Research Projects Agency Network) created by the Defense Advanced Research Project Agency (DARPA) of the United States Department of Defense set the stage for the world's first forerunner of the internet. The emergence of personal computers, technological innovations and internet connectivity in the later 1990's provided the student with increased access to instructional materials previously not possible. By the early 2000s, higher education resources frequently included online access to course information and lectures. This introduction and integration of technology created a distinct effect on how instruction was delivered, thus changing the characteristics of distance education (Benamati & Lederer, 2010; Cuban, 2001; Myers, 2002; Nasseh, 1997; Watson, Gemin, & Ryan, 2008).

Shifting Emphasis in Higher Education

Distance education also known as e-learning, online education, or online learning is defined by the United States Distance Learning Association as "the acquisition of knowledge and skills through mediated information and instruction, encompassing all technologies and other forms of learning at a distance" (USDLA, 2010, par. 3). Watson, Gemin, and Ryan (2008) explain "online learning" as "teacher-led education that takes place over the Internet, with the teacher and student separated geographically" (p. 5).

Within the literature, there is strongly documented research on the rapid increase in technology and its corresponding impact within business and the workplace (Benamati & Lederer, 2010; Francalanci & Morabito, 2008). This influx of technology into higher education has alternatively been less documented and has left many higher education administrators and faculty trying to understand the traditional role of higher education and implementation of technology on the instruction of their student populations (Calis, 2008; Cohen & Brawer, 2008; Dabbagh & Bannan-Ritland, 2005; Duderstadt, 2003, 2007; Greer, 2010). According to Palloff and Pratt (2007), "The shift to online distance learning continues to pose enormous challenges to instructors and their institutions" (p. xv). These statements are echoed by Siemens and Conole (2011) who states "Educators and researchers face a challenge in determining how the existing education system will be influenced and the new roles that will be expected of learners, teachers, and administrators" (p. i).

The United States Department of Education (2008) reported that "our education system must reflect the skills and knowledge essential to succeed in this new era" (p. 2). Online distance education although initially costly and underused by some educators, is an important aspect of the educational facilities of tomorrow's society (Cuban, 2001). This society will require

enhanced and improved professional technologic development for educators as well as students in which to use these skills and information (Cuban, 2001; Duderstadt, 2003; Picciano, 2006).

Historically, institutions of higher education have followed the philosophy that education focuses on the ideals of teaching and through the teaching arrives the aspect of student learning (Achoff & Greenberg, 2008). Within the literature an instructional paradigm change is evident. The instructional paradigm deals with how a classroom is structured; the nature of the curriculum and the relationship between the instructor and student is established. This paradigm change focuses not only on the delivery mode of the educational setting but also on the pedagogical method (Barr & Tagg, 1995; Peters, 2001, 2004; Sheard & Markham, 2005; Suarez-Orozco & Sattin, 2007; Wolf, 2006). The term "paradigm shift" in education describes the changes in instructional teaching and student learning as a consequence of the rapid expansion of technology and courses offered through distance education (Peters, 2004):

> A paradigm shift in education might mean that in education certain models or patterns no longer exist because new models and patterns which differ from the old ones in a marked way have substituted them. This means that, very often, we are not dealing with a transitory process in the field of education under investigation but with a sudden, if not with an abrupt change. (p. 25)

Achoff and Greenberg (2008) described higher education systems as being flawed because the emphasis is placed on the teaching aspect instead of the student-learning aspect. The primary thing that distinguishes learner centered education from the competing traditional theoretical frameworks is that it treats the student as the primary inquiring agent of education rather than a passive receptacle. Hannum and McCombs (2008), describe distance education learners as often feeling isolated, with learning often being characterized as simplistic and

routine, with the focus on linear teaching and knowledge dissemination. While some research suggests that technology in distance education is just a means of creating a digital repository for the dissemination of the information, others see it as the center of the paradigm shift in teaching to that of focusing on learning (Schrum, 2000; Cobb, 1997; Barr & Tagg, 1995; Oblinger, 2008; Peters, 2004; Suarez-Orozco & Sattin (2007). The later viewpoint suggests that distance education students will need to adapt to new ways of accessing resources, demonstrating understanding of learning, and participating in learning activities.

Attitudes Toward Distance Learning

By the beginning of the 21st Century individuals have found themselves living in an informational age; an age in which we have access to more information than our grandparents or parents did in their lifetime (Wiles & Lundt, 2004). Just over a decade ago, technology within schools was limited, and the wiring of schools for the integration of technology was just beginning. The use of computers, distance education, blogging, podcasting, and interactive technological communication has made its way into many of the United States' educational institutions (Parsad & Jones, 2005). Escalating advancements in the placement of technology have also brought about its prevalence in our cars, homes, workplace, and social life but, at times, has been reluctantly accepted into the full realm of education (Simonson, Smaldino, Albright, & Zvacek, 2009; Wood & Smith, 2005; Yelland, 2007).

This reluctant acceptance has been punctuated by rapid technological advancements, changes in demographics, and economic pressures that challenge higher education to redefine itself (Drucker, 1998; Duderstad, 2003, 2007; Cuban 2001). Economist and management analyst Peter Drucker sounded an early alarm in 1997 by calling on higher educational administrations to examine and meet the new needs of "net-generation" (Oblinger, 2008) learners or become

"Wastelands" (Lenzer & Johnson, 1997). According to Wiles and Lundt (2004), education can either take the road of working in a system that is afraid of change, or it can embrace change that is naturally frightening and further integrate technology into education. Academic leaders and faculty within higher education were surveyed by Allen and Seaman in 2005, 2007, 2008, and 2010 about their perceptions of faculty acceptance on the legitimacy and value of online education. The Allen and Seaman survey indicated over 75 percent of the academic leaders accepted the merits of online education, but only 33 percent of their faculty had a positive opinion about the delivery mode in 2006, changing slightly to 30 percent in 2010.

With the accelerated growth of online education in higher education, many higher education instructors are entering into the online virtual classroom for their first time. The transition from the traditional classroom to that of the virtual classroom has brought about some reluctance by faculty within higher education. Faculty reluctance is based on the idea that the most effective means to achieve student learning outcomes is through the use of traditional lecture (Blin & Munro, 2008). Faculty members within higher education have also reported other factors related to their resistance to online education by noting that faculty is concerned that their traditional courses are not compatible with online education (Yang & Cornelius, 2005; Siemens & Conole, 2011).

Palloff and Pratt (2000) remind us that "technology does not teach students; effective teachers do" (p. 4). Christopher Wolf (2006) goes further by explaining that teaching online is teaching, and that the quick easy access that a student has to information is not a replacement for education. However, Crichton and Childs (2004) described how it is critical for educational leaders to view online teaching as a learned and nurtured practice because previous studies suggest that many early online faculty members were given online teaching assignments without

training, this situation was coupled with their students lacking training on how to take online courses. Online instruction requires the use of different skill sets than are required to teach face-to-face. Both require planning and developing by the faculty member. However, according to Ko (2003), the planning and developing asynchronous exercises must be completed before students enter the online course in comparison to integration of such exercises within the traditional classroom. The planning and design of the course according to Fassinger (1995) can have the greatest impact of all on student class participation. The transition of assignments, resources, texts, and course materials into the online environment can be challenging to the instructor along with learning how to communicate effectively in the online delivery medium (Ko, 2003; Moore, Winograd, Lange, & Moore, 2001; Muilenburg & Berge, 2005; Siemens & Conole, 2011; Sheard & Markham, 2005).

Equivalency Theory

From the rapidly emerging growth of distance education, an educational theory named the Equivalency Theory has been developed. The basis of this theory is that the learning experiences of distance education students should be equivalent to those students who study in a traditional classroom. This theory goes further to explain that although the educational delivery systems are not identical, because neither the instruction methods nor the learning experiences are the same, "it is the responsibility of the distance educator to design, even overdesign, learning events that provide experiences with equivalent value for learners" (Simonson, Smaldino, Albright, & Zvacek, 2009, p. 51). Because of the change in delivery, distance education as an equivalent or accepted alternative to traditional education classrooms has not been fully accepted by some instructional faculty (Crichton & Childs, 2004; Simonson, Schlosser, & Hanson, 1999; Simonson, Smaldino, Albright, & Zvacek, 2009).

Using the Equivalency Theory to examine the learning experience of distance education students, one can then examine the instructional design (Simons, et. al, 2009) and materials used to accommodate the needs of diverse groups of learners. Simonson and Schlosser (1999) elaborate on the concept of Equivalency Theory by stating:

It should not be necessary for any group of learners to compensate for different, possibly lesser, instructional experiences. Thus, those developing distance education systems should strive to make equivalent the learning experiences of all students no matter how they are linked to the resources or instruction they require. (pp. 71-72)

An obstacle for distance education instructors is the limited understanding of the learner's characteristics (Yang & Tsai, 2008). Therefore, the student's learning style and technological preferences should be taken into account in order to develop an effective learning environment (Barnes, Preziosi, & Gooden, 2004; Little, 2010; Verduin & Clark, 1991; Yang & Tsai, 2008).

We all have unique fingerprints and tongue prints; we all sign our names in different ways. We don't expect people with high blood pressure to take the same medication. Neither should we expect all students to learn the same way nor all teachers to teach the same way. (Reiff, 1992, p. 5)

One of the early advocates on the importance of learning styles and different modes of instruction in distance education was MacNeil (1980). He stressed that:

Given the fact that instruction can influence learning, efforts concentrated at enhancing the quality of postsecondary teaching will most certainly contribute to the 'instructional revolution's' stated goal of improving the student's ability to learn. . . . While few would dispute the positive effects associated with individualizing the learning process, the

principal ingredient in individualized instruction must be the identification of key

variables unique to each learner. (p. 358)

Herrington and Standen (2000) go further by stating that "little credence is now given to

learning theories that propose that learning is no more than the transmission of a body of

knowledge from teacher to student" (p. 195).

Cognitive Learning Styles

Educators as well as school administrators have expressed agreement that individual

differences and the changing demographical characteristics of learners play an important role in

learning (Dede, 2006; Felder & Silverman, 1988). "Perhaps the most vital development in

American education is the concept of individual learner's preferences" (DeBello, 1990, p. 203)

when examining the importance of learning styles associated with learning outcomes. Previous

research has provided support to the theory that a student's learning style makes a difference in

his or her academic achievement (Zhang, 2002, 2005). These experienced educators further

agree that students exhibit preferences in filtering instruction, manipulating importance of

concepts, and forming understanding at different rates as well as in differing learning

environments (Felder & Silverman, 1988; Kolb, 2005b; Lang, 2004; Richmond & Cummings,

2005; Little, 2010).

Early Origins of Cognitive Research

The idea of cognitive learning styles can be traced back to the times of the early Greeks

and the writings of Aristotle where in his observations of children he writes that "each child

possesses specific talents and skills" (as cited in Reiff, 1992, p. 7). With the passage of time,

individual differences were examined by other philosophers. One such was sixteenth century

philosopher John Locke who working off the earlier work of Thomas Hobbes brought forth the

concept that individuals are able to sense information. Hobbes and Locke believed that the learner must be allowed to learn at a level and speed that is appropriate for that individual (Ozmon & Craver, 2003).

From these early beginnings of educational research, researchers and psychologists have examined a wide variety of cognitive styles, which have been also referred to as learning styles or preferences. Cognitive styles are defined as an individual's consistent preferences for understanding and gathering information (Riding & Rayner, 1997). Cognitive styles have been shown to affect academic performance, achievement (Allinson & Hayes, 1996; Little, 2010), and decision making (De Ciantis & Kirton, 1996; Richmond & Cummings, 2005). Within the literature, ample research examines gender and cognitive learning styles (Dunn, Theis, & Honigsfeld, 2001; Honigsfeld & Dunn, 2003). These research studies suggest that cognitive style and gender are linked (Honigsfeld & Dunn, 2003). This suggested gender linkage to cognitive learning has been further shown to exist in cross-cultural studies (Honigsfeld & Dunn, 2003). According to Shaughnessy (1998), an individual's age is also a variable affecting learning style preferences. This idea is further reiterated in an interview conducted by Shaughnessy (1998) of Rita Dunn who states, "Styles often vary with age, achievement level, culture, global versus analytic processing preference, and gender" (p. 141).

In the literature, one of the original studies associated with distance education and conducted by Aragon, Johnson, and Shaik (2002), examined if learning styles have an impact on outcome differences between two student groups enrolled in the same course. The study included one cohort of students who attended the course in a traditional campus setting while the other cohort attended the course via distance education. Each of the two cohorts received the same textbooks, lessons, and assignments. The variable examined in this study was that of student

interaction and discussion associated with the delivery means of the course. The traditional

delivery method allowed for open interaction and classroom discussion where the distance

education students' discussion occurred via text messaging, chat, discussion boards, a one-hour

synchronous virtual class meeting, and email.

The study results indicated that there was no statistically significant difference between

the two student cohort groups receiving instruction via different mediums. The study did indicate

that the students enrolled in the distance education course were more reflective in their learning

styles than those of the traditional classroom. This according to Argon, Johnson, and Shaik

(2002) was attributed to their ability to participate in the distance education class at their own

pace as well as both independently and interactively. Similar research conducted by Clouse

(2001) examined the use of asynchronous, and synchronous instructional interaction methods

associated with on-campus and off-campus MBA students. The results of the study support

claims for these instructional methodologies in both face-to-face as well as distance learning

environments.

Terminology Disagreements

The area of learning style research is a contentious area of study. According to Cassidy

(2004), active research on learning styles has been progressing over the last four decades. During

this time period, arguments for and against learning styles have been promoted in the field of

research. The examination of the literature exposes a wide disagreement on the terminology used

to describe cognitive theory and learning style theory. According to Cassidy:

The terms 'learning style,' 'cognitive style,' and 'learning strategy' are frequently used

imprecisely in theoretical and empirical accounts of the topic. The terms learning style

and cognitive style are, on some occasions, used interchangeably, while at other times

they are afforded separate and distinct definitions. (2004, p. 420)

This disagreement is further rooted in that the concept of learning styles has originated

out of various disciplinary backgrounds which include the study of cognitive psychology.

According to Coffield et al. (2004) the field of learning style research:

… as a whole draws on a variety of disciplines, although cognitive psychology is

dominant. In addition, influential figures such as Jean Piaget, Carl Jung and John Dewy

leave traces in the work of different groups of learning theorists who, nevertheless, claim

distinctive differences for their theoretical positions. (p. 11)

The idea of cognitive theory is defined as an individual's consistent preferences for

understanding and gathering information (Riding & Rayner, 1997) and is based on the concept

that there are two measureable differences in examining cognitive function. The first type is the

cognitive functions associated with being sequential, structured, detail oriented, and analytical.

Cognitive theory advocates believe that learning takes place in the mind, not in behavior. It

involves the formation of mental representations of the elements of a task and the discovery of

how these elements are related. Learning theory, in contrast, is centered on the cognitive

functions of intuition, divergence, and holistic approach (Kolb, 1984; Riding & Cheema, 1991;

Riding & Rayner, 1997). Learning theory behaviorists explain that learning involves the

formation of associations between specific actions and specific stimuli in the environment.

These stimuli may either precede or follow the action. The distinction being that the cognitive

style is a core characteristic of the individual; whereas, learning styles are viewed as the

adaptation strategies used to learn concepts as effectively as possible (Kolb, 1984; Riding &

Wigley, 1997; Yecan, 2005).

Andragogy

The rapid increase and access to knowledge and information by way of technology has had an effect on the manner in which adults are taught within education (Christensen, Johnson, & Horn, 2010). As a result, understanding the adult learning process is one factor that provides additional insight into the effectiveness of the educational setting (Christensen, Johnson, & Horn, 2010; Knowles, 1980). The term andragogy was originally formulated by Alexander Kapp in 1933 (Knowles, Holton & Swanson, 2011). The term was based on the Greek origins of the word 'andr' which means 'man/adult' and 'agogus' which means 'leader of'. Malcolm Knowles who is credited as the father of adult learning expanded upon and developed from the term a theory of adult education. Knowles (1980) identified the term andragogy as being "the art and science of helping adults learn" (p. 38). According to Knowles (1990), the experiences of the adult learner have the greatest impact on their ability to learn. In looking at the components associated with the adult learner (i.e. interaction, motivation, sound, temperature, lighting, etc.) an inclusive evaluation of how the individual prefers to learn can be obtained (Felder & Silverman, 1988; Sims, 1995; Kolb, 2005b; Chickering & Gamson, 1987; Richmond & Cummings, 2005; Little, 2010).

Knowles (1990) explained that the theory of andragogy acts as a guideline in the development of curriculum for adult education and instructional design. The theory differs from the child based theory of pedagogy in that andragogy has direct implications for adult education in terms of experiential learning, self-concept, self-growth and stages of development in readiness to learn (Knowles, 1990; Knowles, Holton & Swanson, 2011). Another associated difference according to Knowles (1990), is that adults are voluntary learners and when faced with unsatisfactory learning experiences will leave the instruction environment. Pedagogy, in

contrast, follows the teacher-centered approach to learning compared to the andragogy theory of student-centered learning (Knowles, Holton & Swanson, 2011).

According to Knowles (1990), the theory of andragogy is based on six different assumptions about the characteristics of adult learners. These assumptions associated with andragogy include:

1. Adult learners need to know why they are learning before undertaking the learning process.

2. Learners require a self-concept of being responsible for their own decisions.

3. Prior experiences of the adult learner's life provide rich resources for learning.

4. The readiness to learn occurs when the realization that what they learn will help them to perform future tasks in life.

5. Orientation to leaning is based on the perception that learning is directly applicable to real life settings.

6. Motivation to learn occurs as both internal and external motivators so as the adult matures; they become more motivated by various internal incentives, such as need for self-esteem, curiosity, and desire. (p. 39)

Christensen, Johnson, and Horn (2010), express that in an era of increasing use of online education, educators are confronted with enormous implications associated with the education of adult learners. They further explain that the increase in technology may be the catalyst for an educational shift in the instructional paradigm from the current teacher-centered structure to that of student-centered. Christensen, Johnson, and Horn (2010), refer to this online learning as "disruptive technology" which may bring about a change to the paradigm. Christensen describes this disruptive technology as a catalyst to looking at problems in completely creative and new

ways while challenging the traditional way of instruction and associated preferences of the adult learning. According to Christensen, Johnson, and Horn (2010), the use of digital technologies can undoubtedly play a big role in bringing about the opportunity to individualize learning opportunities for the adult learner.

<div align="center">**Neuroscience Cognitive Research**</div>

Addressing these learning opportunities has involved examining the associated student populations within higher education. One such examination area has been the development of two sub classifications known as digital natives and digital immigrants. According to Marc Prensky (2001, 2005), digital natives are those individuals who have grown up within the world of digital technology. This is in comparison to digital immigrants who were born before the large integration of digital technology. Prensky (2005), and Harding (2010), expand upon this by stating that students entering educational institutions of today are far more fluent in the language of technology than previous generations of students. Oblinger and Oblinger (2005) suggest that the generation of student known as either the millennial or net generation are more visually literate than earlier generations with "..many being more fluent in personal expression using images" (p. 2.14). This statement is echoed by Coates (2007) who states that this group is "the most visual of all learning cohorts" (p. 126). These statements are reflective of Dr. Jane Healy, an expert on neuropsychology who stated, "Fast paced, nonlinguistic and visually distracting television may literally have changed children's minds, making sustained attention to verbal input, such as reading or listening, far less appealing than faster paced, visual stimuli " (1999, p. 32).

Recent research conducted by Small, Moody, Siddarth, and Bookheimer (2009), from UCLA has suggested that brain development found in digital native millennial generations may

be developing differently than those of the older Baby Boomer generation. According to Small and Vorgan (2008), the human brain is malleable especially in younger brains allowing for the development of synaptic plasticity to expand at a greater rate than previously had thought to occur. This expansion of synaptic processes in the brain according to research conducted by Small, Moody, Siddarth, and Bookheimer (2009) is being shaped by the individual's immersion in technology. Their research demonstrated that after individuals participated in internet computer searches an increased level of brain activity in the region controlling decision-making and complex reasoning was recorded. This was in comparison to lower brain activity readings when the participants were reading from a traditional book (Small, Moody, Siddarth, & Bookheimer, 2009). This electronic form of transmitting information to the brain according to Small and Vorgan (2008) is cognitively and socially richer than traditional forms of education. Lin (2009) further states that digital multi-tasking can be beneficial if used properly. Ophir, Nass, and Wagner (2009) in comparison to Lin (2009) found that high digital multitaskers were less effective than low multitaskers in terms of memory, focused attention, and task switching.

An opponent to the embracing of technologies immersion and the reported benefits of the exposure is that of Nicholas Carr. According to Carr (2010), there is a danger to the synaptic development process based on the fragmented accumulation of knowledge. Carr (2010), states that:

Given our brain's plasticity, we know that our online habits continue to reverberate in the workings of our synapses when we're not online. We can assume that the neural circuits devoted to scanning, skimming, and multitasking are expanding and strengthening while those used for reading and thinking deeply, with sustained concentration, are weakening or eroding. (p. 141)

Harvard research professor John Palfrey has written the book entitled, *Born Digital: Understanding the First Generation of Digital Natives*. Inside of this book he examines how the newest youth and millennial generation are different from previous generations based on their immersion within technology. Palfrey (2009), explains that the millennial digital natives proceed through states of development when processing information. This informational processing according to Palfrey (2009) has created a generational gap based on the way in which technology has evolved the individuals processing stages of informational gathering. These stages include the first stage of "grazing" by skimming and browsing information from various readers, RSS feeds, Facebook and like informational sources. A second, much smaller digital native subset, will proceed to the second stage and "dive deeper" looking for further analysis while the larger subset will continue to skim and browse. The third and smallest subset of digital native will proceed to the final stage according to Palfrey (2009), where they will actually engage in the article to critique its content and then share or debate those results with others. Palfrey (2009), explains in the book that the largest concern for educators is that of how to challenge this newest generation of students to proceed through all three stages.

The literature in this area provides no clear solutions, and the debate with ongoing research continues. On the one hand, some of the researchers have suggested that the technologic immersion of information literacy of the Millennial Generation (digital natives) far exceeds that of earlier generational groups (digital immigrants), and that this has profound implications for how the Millennial Generation should be educated. On the other hand, other researchers have suggested that educational use of digital technology has missed the mark in terms of effectively integrating the process of teaching and learning (Christensen, Johnson, & Horn, 2010; Cuban, 2001).

Learning Style Theories

Various learning style theories exist within the overarching concept of cognitive theory. In the examination of the terminology "learning style," Curry (1983) identified twenty-one different models or theories using the term. Some of the learning style theories suggest that it is personality related (Curry, 1983), and others state that it is physiologically based (Sternberg & Grigorenko, 1997; Sternberg & Zhang, 2001).

Curry developed what has become known as the Curry Onion Model. Curry uses the analogy of the onion to create an organizational structure for examining and dividing the various learning style models presented in the literature (Curry, 1983; Swanson, 1995). According to Bentham (2002), "Curry's Onion Model of Learning Styles attempts to explain how learning style can be viewed as both a structure and a process, both relatively stable and at the same time open to modification" (p. 99). The Curry Onion Model (1983) is considered to be one of the current standard methods of classifying learning styles (Gordon & Bull, 2004). According to Swanson (1995) the "layers of an onion are analogous to the different layers of a person's characteristic or style" (p. 2). The layers of an onion concept in this model are divided into four categorical layers or learning models as described by Curry (1983):

- Cognitive Personality: Is described as the inner core of the onion and focuses on the influences of personality and how those personality traits shape their orientations to acquire and integrate information. Example of a learning style theory based on this model is the Myers-Briggs model.
- Informational Processing: Focuses on the processes by which information is obtained, sorted, stored, and utilized by the learner. Examples of learning style

theories categorized under this model include the Gregoric, Gardner, Kolb and, Felder - Soloman learning style models.

- Social Interaction: Include those models that focus on how learners interact with their peers in the learning environment. An example of such a model is William Perry's intellectual maturity model.

- Instructional and Environmental Preferences: Is the outermost layer of the onion and describes those learning style models that focus on the most observable traits of the learning. These traits include environmental, sociological, and emotional preferences. The Dunn and Dunn and Grasha preferences are based on this model.

Curry's Onion Model has proven effective in differentiating and describing the contributions to the development of learning style theories (Gordon & Bull, 2004). It is through the use of the Curry Onion Model that learning style instruments and models were categorized as shown displayed in Table 1 in this examination of the development of cognitive learning styles and associated research found in the literature.

Development of Early Learning Style Theory

In John Locke's examination of learners in the late 1600's, he identified three distinct modes of cognitive perception. According to Locke, these modes include the intuitive, demonstrative, and sensitive (Ozmon & Craver, 2003; Stapleford, 2009). The intuitive learning mode is where the learner has immediate understanding based on the idea being certain and obvious. Locke describes the demonstrative mode as learned understanding where the individual may not immediately gain understanding, but through small simple concepts being put together to form an understanding, a certainty of truth is created. The sensitive learning of knowledge according to Locke is the lowest level and least uncertain because learning is based on sensing an

item instead of understanding an idea.   It is through the learner's perception modes that ideas are processed intuitively, demonstratively, or sensitively (Ozmon & Craver, 2003).

Locke's cognitive learning theories were followed in the 17th Century by John Comenius who is often referred to as the father of modern education. Comenius provided the foundation for progressive concepts on cognitive learning. He theorized that learners understand and learn at different rates and in different manners (Ozmon & Craver, 2003). Thus, he pushed for the ideology that education should be individualized. He further believed that the cognitive learning approach in individualized education should be one that is holistic and include philosophy, theology, and secular knowledge. Jean Jacques Rousseau in the early 1800's embraced the ideas of Comenius and continued to call for learner-centered education. Rousseau, like Comenius, held strong theological beliefs, and it was through those beliefs that Rousseau pushed that learning should be directed by the hand of God, and since "everything is good as it comes from the hands of the Creator" (Henson, 2003, p. 7), students should be allowed to explore freely in an experiential style of cognitive learning. Comenius recommended a "type of education that at the time was unknown, an education that was natural, child centered, and experience-based. His intent was to protect the children from a corrupting society and permit them to develop naturally" (Henson, 2003, p. 9).

In the mid 1890's, Cattell and Jastrow produced one of the original research studies conducted on differentiating learning styles. Through their research, they attempted to reveal differences between the perceptual modes of earlier research to that of general intelligence and measured performance levels of the learner. At the time their research was inconclusive, but it added interest for further research that would be conducted by Carl Jung (Fazzarro & Stevens, 2004; Felder & Silverman, 1988; Keefe, 1979; Ozmon & Craver, 2003).

Table 1

Comparison of Learning Style Models

Learning Style Model	Curry Cognitive Personality	Curry Informational Processing	Curry Social Interaction	Curry Instructional Environmental	Theoretical Base Elements	Year
Myers-Briggs Type Indicator	x				Psychological type identified psychologically opposing preferences	1962
Dunn and Dunn Learning Style Model				x	Focus on environmental, emotional, sociological preferences	1979
William Perry Intellectual Development Model			x		Nine intellectual levels of development	1981
Gardner Theory of Multiple Intelligences		x			Intelligences generated from various mental pools of energy preferences	1983
Gregorc Mind Style Indicator		x			Perception and ordering associated with the cognitive abilities of perception	1984
VARK Learning Style Theory		x			Processing information through visual, aural, reading, and kinesthetic modalities	1987
Kolb Experiential Learning Style Indicator (LSI)		x			Experiential learning based on concrete vs. reflective /abstract conceptualization vs. active experimentation	1984
Felder and Soloman Index of Learning Style (ILS)		x			Four learning style dimensions consisting of: sensing/intuitive, active/reflective, visual/verbal, and sequential/global	1988

Jungian Psychological Type

Following Cattell and Jostrow's research in the early 1900's, the work of Carl Jung greatly influenced the beginnings of developing learning style theories. Jung's work focused largely on the development of identifying distinctive personality patterns (Felder & Silverman, 1988; Kolb, 1984). These personality patterns he described as a combination of four psychic functions: thinking verses feeling and intuition verses sensation. The basis of his theory was that information is perceived either concretely through the act of sensing or abstractly though intuition. According to Kolb (1984), Jung began to distinguish between individuals who viewed the world with a preference towards the external world or those with a preference towards the internal world. Jung claimed that cognitive personality functions are based on the idea that thinking and feeling are rational functions because both require acts of judgment. The sensation and intuition functions, in comparison, are based on immediate experiences of the individual. In Jung's opinion the learner's individuality develops through the social and environmental transactions that the individual encounters which then reward development of one's individual preference over another functioning preference (Dunn & Dunn, 1993; Felder & Silverman, 1988; Kolb, 1984; McCaulley, 2000).

The influence of Jung's research on the development of learning style theories is explained by Keefe and Ferrell (1990):

Several learning style instruments are based on Carl Jung's theory of personality type. Jung postulated two functions for perceiving – sensing and intuition – and two for making judgments – thinking and feeling. He further proposed two fundamental orientations to concepts and tasks – introversion and extraversion. These elements have been combined in various ways to produce as many as 16 types. The Jungian-based

Myers-Briggs Type Indicator, for example, diagnoses learner's preferences for perceiving meaning, expressing values and commitment, and interacting with the world. (p. 58)

Myers-Briggs Type Indicator

Applying the research of Carl Jung, researchers Isabel Myers and Katherine Briggs, influenced the direction of cognitive learning style research by creating the Myers-Briggs Type Indicator (MBTI). It was through their work in the mid 1940's that educational research focused on attempting to understand the specific differences in human learning:

The MBTI is a written tool that indicates a person's likely psychological type. Psychological type describes the different ways people prefer to take in information, prefer to make decisions, are energized by the outside world or by the inner world, and prefer to keep things open or move towards closure. (Myers and Briggs Foundation, 2010, p. 1)

The work of Myers and Briggs is based on the idea that a learner's psychological type can be identified by examining four pairs of psychologically opposing preferences. These preferences according to Myers and Briggs (2002) are extraversion-introversion, sensing-intuition, thinking-feeling, and perceiving-judging preferences.

The extraversion-introversion preference is used to indicate how a person is motivated in regard to dominance. This description is used to describe the individual's interpersonal relations. The extrovert according to Myers and Briggs (2002) is energized from outside sources and being around other individuals. An introvert is more likely to be involved with solitary activities, analytical before speaking, and concerned with inner feelings. This trait does not just describe whether or not a person exhibits an outgoing or shy personality characteristic, but also considers whether a person prefers working alone or feels energized in a socialized team environment.

The sensing-intuition preferences are a description of how the individual takes in information. An individual with a sensing preference relies on gathering information through the five senses and prefers to obtain concrete, practical facts. The individual with a sensing preference is less likely to see the 'bigger picture' and more likely to follow a step-by-step approach in solving problems.   The intuitive individual according to Myers and Briggs (2002) is more likely to be drawn by abstract possibilities in relationships and insight in order to solve problems. This individual seeks meaning and relationships and is more likely to be innovative and theoretical in his or her character.

The thinking and feeling category is used to identify individuals as to how they prefer to make decisions based on their preference of taking in information. Individuals displaying a preference for the thinking category are more likely to prefer decisions made in an impersonal, logical, objective manner. In contrast, feeling individuals make decisions based more on relationships, personal values, and their feelings toward others.

The final identification, perceiving-judging, is a description of how individuals make their decisions, deal with the outside world, and formulate their attitudes towards those decisions. Perceivers formulate opinions on events through sensing or intuition but prefer spontaneity, flexibility, freedom, and autonomy. However, individuals characterized with a judging preference are more likely to look for planned and controlled events, seek closure, and tend toward planning and regulation in life (Myers, McCaulley, Quenk, & Hammer, 1998; Myers & Briggs, 2002; McCaulley, 2000).

From these four pairs of opposing preferences, sixteen combinations of the four personality characteristics can be identified. The use of the MBTI is widely used in education, as well as business management analysis, and in family counseling settings (Myers and Briggs

Foundation, 2010). The MBTI is used in order to identify the preferred ways in which individuals gather information and make decisions according to the four overarching dichotomies (Felder, 1996; Kolb, 1984; McCaulley, 2000; Saggino, Cooper, & Kline, 2001).

Dunn and Dunn Learning Style Model

In 1979, Rita and Kenneth Dunn developed what is known as the Dunn and Dunn Learning Style Model. Their research defined learning style as "the way in which individuals begin to concentrate on, process, internalize, and retain new and difficult academic information" (Dunn & Dunn, 1993, p. 8). This learning style model, like the Myers and Briggs model, is based on set preferential learning styles. Placing an emphasis on the biological and developmental characteristics of the learner, Dunn and Dunn believe that the learner's potentials within the educational environment are strongly influenced by preferential characteristic traits.

Dunn and Dunn base their learning style model on the assumption that it is possible to identify an individual's learning preferences that are associated with the environment in which they are located and that it is possible to use an assortment of instructional practices to modify the instructional environment to match those learning preferences. According to Dunn and Dunn (1993), and Dunn and Burke (2008), if the instructional environment is organized in a manner that takes advantage of the learner's preferences, the achievement levels and quality of learning is increased by the learner. They go on to state, "When students are taught according to their identified learning-style preferences, they display statistically increased academic achievement, improved attitudes toward instruction, and better discipline, than when they are taught without attention to their preferred style" (Dunn & Burke, 2008, pp. 3-4). With individual learner's preferences differing depending upon the associated stimuli source, it is important to provide the compatible instructional strategy (Braio, Dunn, Beasly, Quinn, & Buchanan, 1997). According to

Dunn and Burke (2008), many instructors do not realize that a third of their students cannot recall what they heard or viewed within a classroom lecture, but these same learners remember well when they learn through tactile or kinesthetic instruction.

The learning style model identifies five major categories of stimuli sources and twenty-one learning style elements. These stimuli sources were termed "stimuli strands" (Dunn, 2003, p. 2) and include emotional, sociological, environmental, psychological, and physiological elements. Each of these strands is then broken down into given stimuli for each category based on the age of the learner. These associated stimuli within each strand include:

- Emotional (motivation, responsibility/conformity, task persistence, and structure);

- Sociological (learning alone, in a small group of peers, in pairs, as part of a team, with an adult, with a variety of routines);

- Environmental (light, sound, seating design, and temperature);

- Psychological (time of day, need for intake, mobility of learning, and perceptual strengths); and

- Physiological elements (global/analytic and impulsive/reflective) (Dunn & Burke, 2008, pp. 3-4).

Although the Dunn and Burke (2008), learning style model was originally designed for use with students in the primary grades, it is now used at all grade levels. Expanding upon their research, Dunn and Dunn found that stimuli strands are often clustered together enabling them to identify relationships between certain identified elements within the five variable categories.

The Dunn and Dunn model and learning style inventory both target the learning environment and have been criticized by Jonassen and Grabowski (1993) for not looking specifically at differences within the internal learning strategies. According to Jonassen and

Grabowski (1993) because many of the stimuli strands identified by Dunn and Dunn are external to the learner, these strands should not be included as components of the learning style. This criticism by Jonassen and Grabowski, however, is countered by a study conducted by Loveless (2005) that lends validity to the Dunn and Dunn's model by concluding that "matching students' learning-style preferences with complementary instruction improved academic achievement and student attitudes toward learning" (p. 178).

William Perry Intellectual Development Learning Style Model

The work of William Perry in 1981 developed a model to examine how students developed intellectually through their time in higher education. Perry's research was based upon the examination of the students' essays and interviews. These tools resulted in the identification of nine intellectual levels of development. According to Felder and Brent (2005), the lowest levels associated with Perry's model include the first level labeled dualism where knowledge is black and white and all problems are solvable. The second level titled full dualism is based on students learning the right solution and ignoring all other possible solutions. Within this level the students rely on memorization and do not like to engage in cooperative learning or abstract models.

Levels three and four are described as the multiplicity level. Here students may start using supportive evidence to resolve issues rather than accepting the instructors' preconceptions and prejudices. This level includes student's examinations of some questions that may not include concrete answers but may be answered over an extended period of time. Students also begin to use supporting evidence to resolve a question rather than the solution provided by the instructor. At this level, according to Felder (1996), Felder and Soloman (2011), and Perry

(1981), students accept preconceptions and prejudices, and once a solution has been determined there is rarely further thought given to examine other possible solutions.

The fifth and sixth levels are titled relativism and are comprised of students maturing intellectually into constructing knowledge and values dependent upon the context and their individual perspectives (Felder, 1996). At the fifth and sixth levels individuals recognize multiple perspectives on issues and begin to apply judgment based on reasoning, criteria, and evidence. According to Perry (1981), few college graduates gain this level.

The final levels, consisting of seven through nine, according to Perry (1981) are the commitment and relativism levels. At this level individuals are intellectually able to make personal commitments and evaluate the consequences of those commitments. On this level individuals engage in discussions and arguments for various positions but hold recognition of the validity and merits associated with the competing perspective.

An initial criticism of Perry's model was that it initially focused primarily on white, traditional-aged male college students. This has since lead to additional studies lending support to Perry's model and including an additional base level of silence by female learners who have experienced abuse (Goldberger, Tarule, Clinchy, & Belenky, 1996).

Gardner Theory of Multiple Intelligences

The continued growth through the decades of learning style research expanded in 1983 with the introduction of two additional learning styles which can be categorized in Curry's (1983) Onion under the Informational Processing Model. Howard Gardner (2006) suggested that the previous means of testing intelligence, based on the measurement of IQ testing, was limited to only the examination of the verbal and mathematical side of the mind. He challenged that instead intelligence should be defined as "the ability to solve problems or to create products, that

are valued within one or more cultural settings" (Gardner, 2006, p. x). This new description of intelligence, he suggested, arises not from the centralized region but rather from different kinds of intelligences that are generated from various mental pools of energy. These intelligences are mental styles of learning. Based on this idea, Howard Gardner proposed nine different intelligences to account for a broader range of human potential in children and adults. The nine intelligences proposed by Gardner are linguistic, logical-mathematical, spatial, bodily-kinesthetic, musical, interpersonal, intrapersonal, naturalistic, and existential.

Gregorc Mind Style Indicator

Unlike the work of Howard Gardner who focused on nine different intelligences, Anthony Gregorc's (1984) work is centered on creating a map focusing on the cognitive abilities of perception. This learning style model, like Gardner's, is classified under Curry's (1983) Onion of Informational Processing Model but is arranged in a four quadrant design. The intersecting axis of this model is referred to by Gregorc as the perceptual space duality axis or concrete vs. abstract and the ordering duality axis consisting of sequential vs. random. According to Gregorc (1984), perceptual abilities, or means through which information is obtained are translated into two qualities: abstract and concrete. The ordering abilities are the ways the learner organizes information, either sequentially (linear) or through random (non-linear) abilities. Gregorc then couples these qualities to form four learning categories: concrete/sequential (CS), abstract/sequential (AS), abstract/random (AR), and concrete/random (CR).

These four basic learning style types are defined by Gregorc as:

1. Concrete Sequential (CS) – learning style preference towards conventional, accurate, factual, and organized.

2. Abstract Sequential (AS) – learning style preference toward analytical, objective, logical, deliberate, and systematic.

3. Abstract Random (AR) – learning style preference toward sensitive, compassionate, perceptive, imaginative, idealistic, and flexible.

4. Concrete Random (CR) – learners are quick, curious, realistic, creative, innovative, instinctive, and adventurous.

According to Gregorc, while an individual has all four qualities, the individual develops patterns of comfort and preference towards one or two in his or her learning style category (Gregorc, 1984; Gregorc & Butler, 1984; Gregorc, 2009). According to Gregorc (2009) there is a lack of alignment between learning styles and the associated instructional methodologies and due to this the student suffers.

VARK learning Style Theory

The VARK learning style theory was proposed by Neil Fleming in 1987. The model is designed to describe how four distinct types of learners process information. The acronym VARK stands for Visual, Aural, Read/write, and Kinesthetic sensory modalities. The categories according to Lang (2004) refer to the ways that individuals prefer information to be delivered to them and the way that they would prefer to deliver information. Fleming and Mills (1992) describe these four categories that reflect the experiences of their students as:

1. Visual (V)

    Learning preference includes the preference for information in charts, graphs, flow charts, and other devices that represent what could have been presented in auditory words.

2. Aural / Auditory (A)

    This perceptual mode includes preference for information that is auditory in nature. This

    individual's learning preference includes obtaining information best from lectures, tapes,

    speaking and discussing ideals and concepts.

3. Read/write (R)

    This preference is for obtaining information is based in written words. This preference

    emphasizes text-based input and output in all its forms.

4. Kinesthetic (K)

    Includes the perceptual preference related to the use of experience and practice simulated

    or real in which the learning experiences the process. (pp. 140-141)

Kolb's Experiential Learning Style Theory

Kolb's (1984) learning style research, the Experiential Learning Theory, is based upon

the earlier work of John Dewey and Carl Jung. Specifically Kolb examined individual behaviors

associated with the extrovert-introvert and concrete-abstract continuums that Jung proposed. It

was through the examination of individual behaviors that Kolb developed the idea that

experiences build upon previous experiences. These previous experiences then influence how

future experiences will affect the learner (Felder, 1996; Felder & Soloman, 1991, 1994; Kolb,

1984; Kolb & Kolb, 2005a). The concept of Experiential Leaning Theory is defined as "The

process whereby knowledge is created through the transformation of experience. Knowledge

results from the combination of grasping and transforming experience" (Kolb, 1984, p. 41). A

central concept of the Experiential Learning Theory is that "personal characteristics,

environmental influences, and behavior all operate in reciprocal determination, each factor

influencing the others in an interlocking fashion" (Kolb, p.36).

According to Felder (1996), the Kolb model is used to examine and classify student preferences on two scales of opposite extremes. These examinations lead to the development by Kolb of the Learning Style Inventory (see Figure 1, p. 45). The Inventory is simply a self-description test, based on the experiential learning theory and is designed to measure the strengths and weaknesses of a learner through his or her preferences. According to Kolb (1984; 2005a), the Experiential Learning Style Model is described as a four-stage cycle:

1) Immediate concrete experiences are the basis for the second stage which includes

2) Observation and reflection

3) Observations are assimilated into recognition from which new implications for action can be deduced by the learner then

4) These implications then serve as a guide toward acting to create new experiences.

The vertical axis of the Kolb learning style model (see Figure 1, p. 45) contains opposite modes that flow from how students take in information – Concrete Experience (CE) to that of Abstract Conceptualization (AC) located on the bottom of the axis. The horizontal axis displays on one end the descriptions of how the student internalizes and reflects on information being received and is labeled on the left side Active Experimentation (AE) and the opposite end is labeled Reflective Observation (RO). According to Kolb (1984), experiential learning is conceived as a cyclical four-stage cycle consisting of and moving through the following modes:

1) Concrete Experience (CE) "feeling" – The concrete experience mode is characterized by an individual's preference to be involved in interpersonal interactions. This learner exhibits strong intuitive decision making as well as functioning well in unstructured situations. These are individuals according to Kolb who are "… concerned with the

uniqueness and complexity of present reality as opposed to theories and generalizations" (Kolb, 1984, p. 68). These are individuals who desire to be involved in new experiences.

2) Reflective Observation (RO) "watching" –The reflective observation mode is characterized by an individual's preference toward reflection, information collection, and careful observation. According to Kolb (1984), this learner is good at examining items and concepts from multiple perspectives in order to formulate multiple perspectives. This learner prefers watching and listening and then relying on their own their observations to formulate a judgment. This individual is often patient, careful, and methodical in evaluation of situations.

3) Abstract conceptualization (AC) "thinking"– This mode is characterized by individual preferences towards the examination of abstract ideas through logic and the breakdown of concepts. Unlike learners who favor concrete experience, the AC learner uses cognitive thought processes instead of relying on conclusions drawn from emotions. The AC individual tends towards scientific approaches and uses "systematic planning, manipulation of abstract symbols and quantitative analysis". (Kolb, 1984, p. 69)

4) Active Experimentation (AE) "doing"– The active experimentation mode is characterized by a learner's preference to be involved in the decision-making process in order to control or influence situations. According to Kobe (1984), this mode "focuses on actively influencing people and changing situations" (p. 69). This individual tends to learn by being actively involved in the learning process by accepting risk. This learner focuses on doing rather than observing. The Active Experimentation learner (AE) places an emphasis on the practical applications of a situation in order to produce productive results instead of engaging in reflective understanding of the situation.

```
                    Concrete Experience (CE)
                          Feeling

                    How we think

         Accomodators          Divergers
         (AE & CE)             (CE & RO)

Active
Experimentation   Processing Axis    How we do things   Reflective
(AE)                                                     Observation
Doing                                                    (RO)
                                                         Watching
         Convergers            Assimilators
         (AC & AE)             (RO & AC)

                    Perception Axis

                    Abstract Conceptualization (AC)
                          Thinking
```
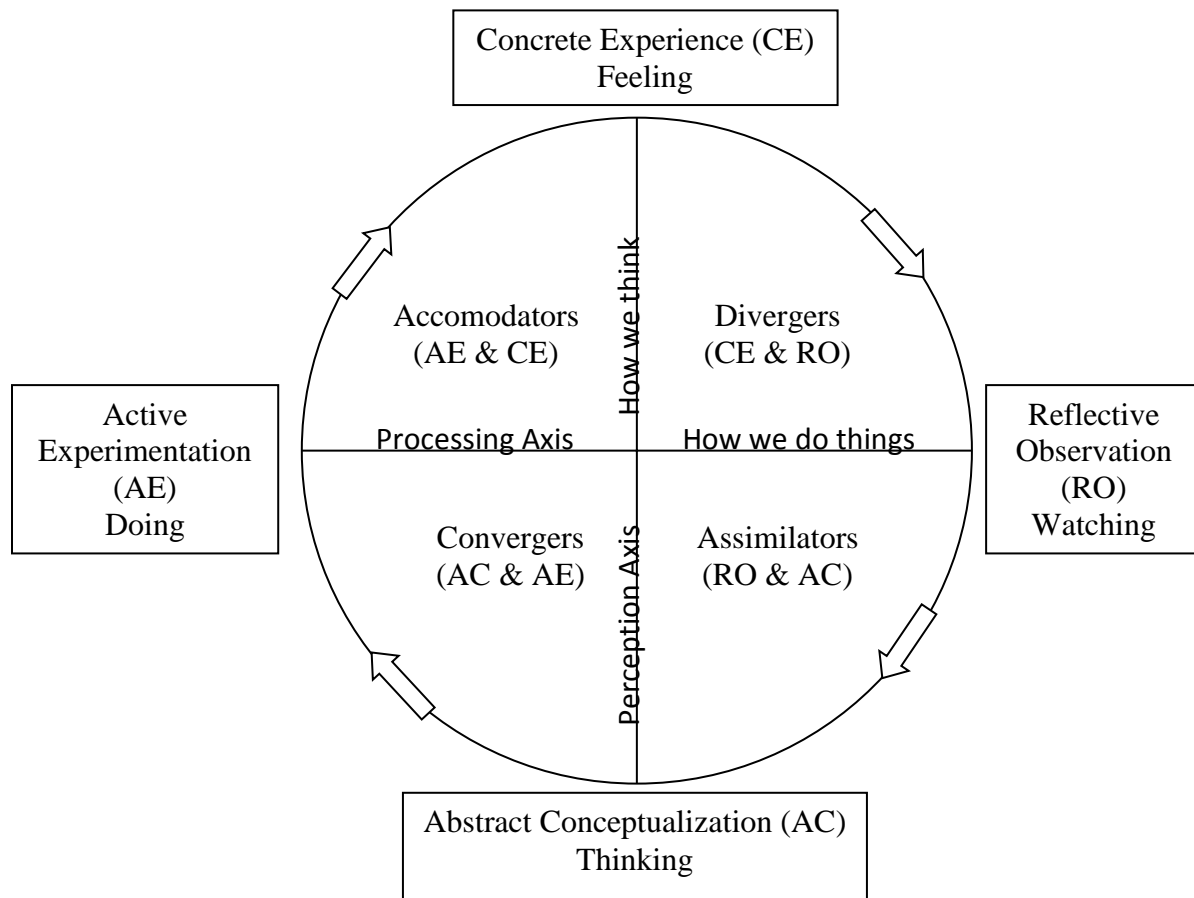
Figure 1 Kolb's Learning Style Model
Note: figure modeled after - Kolb, D. A. (1984) *Experiential Learning*, Englewood Cliffs, NJ.: Prentice Hall. Reprinted with Permission

The four possible learning style combinations derived from these two dimensions are as follows:

1) Diverger – The diverger learning style is created through the combination of the concrete

   experience (CE) and the reflective observation (RO). According to Lamberski (2002) and

   Kolb (1984), these learners' greatest strengths come from their ability to solve problems

   by compiling various perspectives and generating assorted ideas in such a way as to

   arrive at a creative solution. Divergers tend to be strong in brainstorming and

   imagination. They exhibit a tendency towards the arts, humanities, and cultural interests.

2) Assimilator – The assimilator learning style according to Kolb and Kolb (2005a) and Lamberski (2002), is created through the combined modes of reflective observation (RO) and the abstract conceptualization (AC). These learners favor inductive reasoning and abstract concepts. For assimilators it is more important that the theoretical basis of a theory is correct than it is working within a practical situation. Assimilators are less interested in socialization with other individuals and prefer to focus on abstract conceptualization.

3) Converger – The converger learning style is a combination of the abstract conceptualization (AC) and the active experimentation (AE) modes. These individuals, like the assimilators, prefer to deal with ideas and items rather than socialization with others. Convergers prefer to focus on specific problems, looking for answers and solutions. This style excels best, according to Kolb and Kolb (2005a), when there is a single correct answer to a problem. These individuals are often unemotional and commonly choose to specialize in fields such as computer science and engineering.

4) Accommodator – The accommodator learning style exhibits the highest associated scores in concrete experience (CE) and active experimentation (AE) learning style described by Kolb (1984). Individuals with this learning style preference are described as risk-takers who are able to adapt quickly and are able to excel in situations that require rapid decision-making skills. The accommodators, according to Lamberski (2002), are the polar opposite of the assimilator. Accommodators' employment preferences are often found in the practical fields of business, education, medicine, or marketing. Accommodators are often willing to discard a concept instead of working from the facts

in order to solve a problem. They will push others to provide additional information from which to work from (Lamberski, 2002) in order to solve a problem.

Based on clinical observations conducted which examined heredity, age, school, and work, Kolb (1984) proposed that an individual's predominant learning style can be assigned by combining the highest mode preference on each axis (Felder, 1996; Kolb, 1984; Kolb & Kolb, 2005a; Lamberski, 2002).

A multi regression analysis study was conducted by Simpson and Dru (2004). The purpose of the analysis was to examine the effect of learning styles on student online participation and self-reported enjoyment level. The resulting research found that learning styles had a statistically significant impact on the student's participation and enjoyment level. A related study by Fahy (2005) based on the experiential learning theory examined the relationship between the learner's preferences and his or her online communication. Fahy's study found that the converger learning style mode was more likely to devote considerable online time and energy towards communication. According to Lu, Jia, Gong, and Clark (2007), models that focus on learning style preferences in relationship to online education such as Felder and Soloman's (ILS) and Kolb's learning Style Inventory remain "the most influential and widely distributed instruments used to measure individual learning style preferences" (p. 188).

Felder and Soloman Index of Learning Style Model

The Felder and Soloman Index of Learning Style model creates an index that categorizes learning into four bipolar preferences. The original instrument created by Richard Felder and Linda Silverman in 1988 was designed to capture the most important learning style differences among engineering students and to provide a foundation for engineering instructors to design a teaching methodology that would address the learning needs of all students (Felder & Spurlin,

2005). The latest version of the Index of Leaning Styles was modified through the collaborative work of Felder and Barbara Solomon in 1996 (Felder & Spurlin, 2005). The current instrument classifies the students' learning preferences into four learning style dimensions consisting of: sensing/intuitive, active/reflective, visual/verbal, and sequential/global.

Similar to previous learning style models, the ILS reflects the preferences and tendencies of the learner in order to create the learning style dimensions. The origins of the Felder and Soloman Index of Learning Styles uses a combination of elements from past learning style models to capture the various learners' preferences. According to Felder and Spurlin (2005), the parallels to other earlier models consist of the following four preferences:

1. The sensing – intuition learning dimension originated from the work of Jung's theory of psychological types which is also modeled in the work of the MBTI. This dimension is also reflective of Kolb's experiential learning model's description of concrete experiences and abstract conceptualization.

According to Felder and Silverman (1988), sensing and intuition are two ways in which people categorize and perceive the world. Sensing involves observing and gathering data through the senses. The sensing learners like to learn from concrete material consisting of examples involving observations that is, gathering data through the senses. Sensors like facts, data, experimentation, and solving problems by standard methods but dislike surprises. They are patient with detail but do not like complications. Sensors are good at memorizing facts and tend to be careful and slower in completing their work (Felder & Silverman, 1988).

The intuitive learners prefer to learn abstract material such as theories and concepts. These individuals, according to Felder (1988), like challenges and tend to be more innovative than sensing learners. Felder (1988) explains that intuition involves indirect perception by way of

the unconscious: speculation, imagination, and hunches. Intuitors prefer principles, theories, and

innovation but dislike repetition. Detail may bore them, and they welcome complications.

Intuitors are good at grasping new concepts, and they tend to complete tasks quickly, which on

occasion, may lead to carelessness (Felder & Silverman, 1988).

2. The second dimension of active – reflective incorporates the components of Kolb's

    active/reflective descriptions and Myers-Briggs type extraversion and introversion

    indicators.

Active learners are described as individuals who tend to learn by actively engaging in

experiencing the subject matter and prefer to work together with others. These learners exhibit

preferences to understanding information best by discussion or applying it through explanation.

Active learners tend to be experimentalists. According to Felder and Silverman (1988), "Active

Learners do not learn much from lectures because they require them to receive information

passively. They work and learn better in situations that allow for group work and hands on

experimentation" (p. 678). Whereas reflective learners prefer to learn by thinking though items

as well as working alone. They tend to be theoretical in preference and are more likely to favor

materials containing critical analyses.

3. The third dimension visual/verbal – is equivalent to the visual-auditory-kinesthetic

    formulation of the work proposed by Gardner, Kolb, and Fleming's VARK instruments

    which is based in the cognitive studies of information processing.

Visual learners remember best what they have observed, and they may forget information

that is communicated to them verbally. The verbal learner exhibits a learning preference toward

retaining information from auditory and acoustical sounds. These individuals remember and

learn well from discussions, prefer verbal explanation to visual demonstration, and learn

effectively by explaining things to others. Felder and Silverman (1988) explain that the means in which an individual receives information may be divided into three categories: (1) visual consisting of sights, pictures, and symbols; (2) verbal consisting of sounds and words, and (3) kinesthetic consisting of taste, touch, and smell (p. 676). They further explain that visual and auditory learning both pertain to learning processes that perceive information, and kinesthetic learning has to do with both perception such as taste, touch, and smell, and information processing such as moving, relating, or doing something active.

4. The fourth dimension - sequential/global is reflective of Gregorc's (2005) model.

The fourth dimension of the Felder-Soloman ILS model includes the sequential and global learners. This dimension is also referred to as the understanding dimension. The sequential learners display a preference to learn in linear steps with guidance through the learning process. Sequential learners are comfortable with mastering material presented in a logically ordered progression, learning it as the educator presents it. These learners display achievement and learn best when ideas and concepts are presented in progression of complexity and difficulty.

Conversely, global learners prefer to learn in large leaps and prefer more freedom in their learning process. Global learners may exhibit difficulty working with concepts for which they only have a partial or superficial understanding. These individuals, according to Felder and Silverman (1988), may exhibit feelings of frustration, and education is a difficult venture for these individuals until they are able to put the various instructional pieces together to view the whole concept. Even with the new understanding, they tend to make intuitive leaps and then have difficulty explaining how they arrived at the solutions (Felder & Silverman, 1988).

The original Felder-Silverman Index of Learning Styles contained a fifth dimension titled Inductive and Deductive Organization. Induction, according to Felder and Silverman (1988), is the reasoning process that is developed from specific observations in order to generate rules, theories, and laws through a natural learning process. The deduction aspect is the opposite. It is situated in learning that is based on the teaching cycle of first learning the general principals and then deducing consequences from the overall concept. According to Felder (2002), this dimension has been deleted because of the confusion created with educators on the deductive and inductive principals which, in turn, created threats to the integrity of the instrument.

The Felder-Soloman Index of Learning Styles determines an individual's learning preferred dimensions by asking eleven forced choice questions for each of the four dimensions. According to Kinshuk et al. (2009):

> While most learning style models classify learners into a few types, FSLSM is based on the idea that each learner has a preference on each of the four dimensions, measured as values between +11 and -11. By using scales rather than types, the strengths of learning style preferences can be described, enabling the model to distinguish between strong and weak preferences for a particular learning style. (p. 741)

Kinshuk further states that the Felder-Soloman Index of Learning Style instruments is "one of the most often used learning style models in technologically-enhanced learning environments" (p. 742). The current instrument consists of forty-four questions designed to assess preferences on the four dimensions of the original Felder-Silverman model. The current Index of Learning Styles instrument examines the preferred styles of learning across four learning preference dimensions (Felder & Soloman, 2011). Each dimension being based on given preferences of how an individual prefers to engage with communicated information (see Figure 2, p. 52). These four

dimensions in turn reflect how a learner engages with their learning materials, how they retain

information, and how they can apply this information to new tasks. The original model was

updated in 1994 with an online version being created in 1997 (Felder, & Spurlin, 2005).

Active | Reflective
- Prefers to process information while doing something active.
- Likes group work, discussion, and applying or explaining it to others.
- May start a task prematurely.
- "Let's just try it out to see what happens."

Reflective
- Prefers to think about idea first before acting upon task.
- Tends to process information introspectively.
- Likes independent work.
- "Let's make sure we've thought this idea."

Sensing
- Focuses on sensory input - what is seen, heard, touched, etc.
- Prefers concrete information facts and data.

Intuitive
- Focuses on ideas, possibilities, theories.
- Prefers more abstract information: theories and models.

Visual
- Prefers to learn through pictures, diagrams, films, demonstrations.

Verbal
- Prefers words and written or spoken communication.

Sequential
- Gains understanding in linear steps.
- Can function with partial understanding.
- Prefers to understand each part as it is put together in order to understand the whole.

Global
- Learns in large jumps, suddenly "getting it".
- Needs to see the big picture of how all the parts fit together before examining the details in the parts.

Figure 2. Felder-Soloman Index of Learning Style Model (ILS)
Source: Felder and Silverman (1988).

Changing Characteristic of Higher Education Students

Many higher education institutions have focused in the past on the academic and social

attributes of their student populations, but have had little focus on the generational differences

between these student groups (Davis, Pawloski, & Houston, 2006; Hartman, Moskal, & Dziuban,

2005; Howe & Strauss, 2003; Strauss & Howe, 1991a; Twenge, 2006). One such changing

generational characteristic associated with new students now attending higher education is that:

Traditional-age students who are now entering colleges and universities may never have

known life without the internet. They consider the internet essential to life, learning,

work, and leisure and have different behaviors, attitudes, and aptitudes as a result of their exposure to technology. In many cases, the perspective of the Net-generation varies significantly from that of today's college and university administrators and faculty. (Educause, 2010, para 1)

With many of the higher education institutions experiencing sustained distance education growth that is far outpacing the traditional student population (Allen & Seaman, 2008, 2010), educational leaders must focus on designing effective, efficient online programs through the use of identified missions and program implementation (Fortino & Wolf, 2007). Student access to electronic sources allows students as well as instructors to access national as well as international libraries. This world wide access to information has impacted pedagogical styles affecting the role of teacher and student (Gupta, Fadil, & Kale, 2009). Because of this access, "the potential exists to radically alter the context of schooling and the relationship between teacher, student, and knowledge as it never has before with the infusion of computing ubiquity" (Ransom, 2003, p. 260). Pope and Golub (2000) discussed how classrooms "will look very different. No longer will the teacher be disperser of information; teachers and students will be learners together participating actively and directly in their education" (p. 89). The continued expansion and rapid growth into online delivery of instruction threatens to disrupt the historical evolution of the way in which universities address student markets (Christensen & Eyring, 2011). The responding movement by leadership in traditional institutions of higher education has been varied and according to Christensen and Eyring:

Historically, higher education has avoided competitive disruption. One reason for this past immunity is the power of prestige in the higher education marketplace, where the quality of the product is hard to measure. In the absence of comparable measures of what

universities produce for their students, the well-respected institutions have a natural

advantage. A related stabilizing force is the barrier to disruptive innovation created by the

accreditation process, which in the past made conformance to tradition the price of entry

to the industry. (p. 17)

Further implementation of technology within the classroom has created a trend in student

collaboration which may or may not have an effect on student achievement (Honey, Culp, &

Spielvogel, 2005; Cuban 2001; Schrum, 2008). Educators along with the school administrators

must focus on the integration of technology into the classroom curriculum while examining the

pedagogical delivery styles of instructors who are placed with the responsibility of increased

academic achievement of their students (Cuban 2001; Dwyer, 1996; Oppenheimer, 2004;

Schrum, 2008; Small & Vorgan, 2008). This is echoed in in the business sector as a growing

number of business organizations, investors, policy makers, and educators united around the

concept that students need "21st Century skills" integrated into the classroom in order to be

successful in today's world (Christensen & Eyring, 2011; Christensen, Johnson & Horn, 2010;

Rothernam & Willingham, 2009). Beaudoin (2003) further states that it is the responsibility of

educational leaders within higher education "to be informed and enlightened enough to ask

fundamental questions that could well influence the institution's future viability" (p. 1). By

asking such questions as: Will the notion of classrooms survive? Is the present structure of the

institution viable? Will teachers and students need to meet on campus anymore? While also

exploring whether or not the current pedagogical model used within the institutions is viably

effective in the changing field and paradigm of education (Barr & Tagg, 1995; Beaudoin, 2003;

Cahill, 2009; Christensen & Eyring, 2011; Peters, 2004; Schrum et al., 2007).

Generational Theory

The concept of generational theory, which has been extensively advanced by Strauss and Howe (1991a) is that each generation is shaped by its own social environment. This social environment is a collection of social events experienced by individuals who share common birth years. These individuals develop commonly held beliefs and behaviors because of these social events (Strauss & Howe, 1991a, 1991b, 1997). It is from these commonly held beliefs and behaviors that the personality and description of that generational group is formed (Coomes & DeBard, 2004; Glenn, 2005; Strauss & Howe, 1991a).

The cohort, referring to a group of individuals, most often found in the review of literature associated with generational studies is that of the birth cohort describing individuals born during a given year, decade, or period of time (Glenn, 2005). Each of these cohorts is differentiated from all others as each new cohort acquires cohesion and continuality from the distinct developments of its constituents (Coates 2007; Coomes & DeBard, 2004; Glenn, 2005; Twenge, 2006). Distinction is made in the literature between age cohort and birth cohort with age being a changing condition rather than the birth cohort being a fixed year. According to Glenn (2005), these two cohort groups are distinctly different in that individuals born in 1980 are of a given birth cohort where the age of these individuals will be variable dependent upon when they are studied and, thus, make up the age cohort (Glenn, 2005). Strauss and Howe (1991a) describe a generation as a cohort of individuals whose length of time approximates the span of a life phase whose boundaries in time are fixed by peer personality. It is by these peer personalities that the generational characteristics are established.

Jane Twenge who has conducted research on the millennial generation describes

generational cohorts as:

Everyone belongs to a generation. Some people embrace it like a warm familiar blanket,

while others prefer not to be lumped in with their age mates. Yet like it or not, when you

were born dictates the culture you will experience. This includes the highs and lows of

pop culture, as well as world events, social trends, economic realities, behavioral norms,

and ways of seeing the world. The society that molds you when you are young stays with

you the rest of your life. (Twenge, 2006, p. 2)

Generational characteristics are described by Straus and Howe (1991a, 1997) as being

comprised of such characteristics as political, economic, environmental, and social awakenings

within a given time frame for an associated birth year group. They go on to explain that:

A generation can be defined as a society-wide peer group, born over a period roughly the

same length as the passage from youth to adulthood, who collectively possess a common

persona. The length need not be always the same. A generation can be a bit longer or

shorter, depending on its coming-of-age experience and the vagaries of history. Of the

nine American generations born over the past two centuries, none has been less than 17

years or longer than 24 years in length. When drawn correctly, generational birth years

should indicate the boundaries for each generational persona. What is a generational

persona? It is a distinctly human and variable creation embodying attitudes about family

life, gender roles, institutions, politics, religion, culture, lifestyle, and the future. (Howe

& Strauss, 2000, pp. 40-41)

Based on these categorical groupings, useful comparisons for characterizing behaviors

can be made about the generational groups. According to Strauss and Howe (1991a), the living

generational cohorts include the GI Generation with birth years of 1901-1924, Silent Generation 1925-1942, Baby Boomer Generation 1943-1960, the Generation X sometimes referred to as the Thirteenth Generation 1961-1981, and the Millennial Generation 1982-2001. Howe and Strauss (2003) have used political, economical, and social events to identify generational groupings. Each of these events according to Howe and Strauss are described as awakenings lending towards the development of distinct generational characteristics and traits associated with groupings of individuals found in seventeen to twenty-four year periods.

Opposing viewpoints on generational research are limited in the literature. One such researcher is Peter Savich (2003) who argues that in his examination of the social awakenings laid out by Howe and Strauss, a flawed organizational framework is created. However, no supporting evidence to these claims made by Savich has been found in the literature. The given classification dates have also been argued as being arbitrary by researchers Meredith, Schewe, and Karlovich (2002) but are widely accepted in the literature that each of these generational cohorts exhibits its own unique set of characteristics that have been shaped by societal values, trends, and historical events (Strauss & Howe, 1991a; Howe & Strauss, 2000; Coomes & DeBard, 2004; Coates 2007; Glenn, 2005).

Generational Groups in Higher Education

Institutions of higher education are facing changing demographics as the age of the student population becomes more diverse. No longer are the institutions faced with educating a majority of students from one generation, but rather institutions are faced with educating three main separate generational groups. These groups are comprised of individuals from the Baby Boomers 1943-1960, Generation X 1961-1981, and the Millennial Generation 1982-2001 (Strauss & Howe, 1991a; Howe & Strauss, 2000). As these diverse generational groups engage

in higher education, each brings with it different cultural attributes, career expectations,

educational backgrounds, and learning styles (Strauss & Howe, 1991a; Coates 2007). A

summarization of these cohorts values which according to Debard (2004) may have implications

for higher education administrators and faculty is presented in the following Table 2.

Table 2

Generational Comparison of Characteristics

Generational Characteristic Differences on 12 Criteria			
View Toward	Baby Boomers	Generation X	Millennial Generation
Level of trust	Confident of self, not authority	Low toward authority	High toward authority
Loyalty to institution	Cynical	Considered naïve	Committed
Most admire	Taking charge	Creating enterprise	Following a hero of integrity
Career Goals	Build a stellar career	Build a portable career	Build parallel careers
Rewards	Title and corner office	Freedom not to do	Meaningful work
Parent Child Involvement	Receding	Distant	Intruding
Having Children	Controlled	Doubtful	Definite
Family Life	Indulged as children	Alienated as children	Protected as children
Education	Freedom of expression	Pragmatic	Structure of accountability
Evaluation	Once a year with documentation	"Sorry, but how am I doing?"	Feedback whenever I want it
Political Orientation	Attack oppression	Apathetic, individual	Crave community
The Big Question	What does it mean?	Does it work?	How do we build it?

Note: modeled after Debard, R. D. (2004). Millennials coming to college. *In serving the millennial generation: new directions for student services*, edited by R. D. Debard and M. D. Coomes, San Francisco, CA: Jossey Bass., 33-45. Reprinted with Permission

The review of the literature suggests that there is a need to understand each of these

generational student populations (Barnes, Preziosi, & Gooden, 2004) and each group's inherent

difference. Further, these generational differences provide a comparison of variables such as

learning style differences which may impact the instructional modality of distance education

(Barnes, Preziosi, & Gooden, 2004;Yang & Tsai, 2008; Zhang, 2005).

The challenge that educational leaders in institutions of higher education face is the changing student population demographic. This demographic is further expanded upon by Wotring (2007):

> In order to serve effectively in higher education, leaders must understand the institution, its history and current place in society, its faculty and staff, its funding sources and its facilities and technologies. At the very core of the institution, however, are its students. The more deeply and richly college leaders understand their students' knowledge, skills, abilities, beliefs, and values, the better prepared they will be to promote and enhance their success. (p. 1)

Research conducted by Cassidy (2004), Kolb and Kolb (2005) and Felder and Silverman (1988) demonstrate that increasing the understanding of the educational practitioner to the varied student population entering higher education provides for the establishment of stronger educational practices. The basis of which is the understanding that the students have been conditioned by their previous learning experiences in both educational as well as environmental settings. The student's ability to construct a developmental perspective of learning is a theory presented by Robert Kegan (1982; 1994) and expanded upon by Marcia Baxter Magolda (1999) to include the context of higher education. Their research can be summarized to suggest that a) "students construct knowledge by organizing and making meaning of their experiences," and b) "that this construction takes place in the context of their evolving assumptions about knowledge itself and the students' role in creating it" (Baxter Magolda, 1999, p. 6). It is through these "Self Authoring" (Kolb & Kolb, 2005, p. 209) experiences that each of these generational groups has distinctions from other generational groups. Generational self-authoring shapes and affects individual preferences within each generational group and creates an importance for educators to

understand not only what a student understands, but also how he or she understands (Heller & d'Ambrosio, 2009; Kegan, 1994; Kolb & Kolb, 2005).

Students currently enrolled in higher education represent three primary generations, and their generational descriptions have been found to be beneficial in examining their interactions within a variety of educational settings (Barnes, Preziosi, & Gooden, 2004; Goodwin-Jones, 2005; Meredith, Schewe, & Karlovich, 2002; Theil, 2003). In examining the current literature there are minor variations associated with the overlying birth year periods and name designations associated with these generational groups.

For the purpose of this study, the descriptions provided by Howe and Strauss (2003) are used to describe the three predominant generational groups currently in higher education. Again, these generations are the Baby Boomer Generation 1943-1960, Generation X 1961-1981, and Millennial Generation 1982-2001 (Howe & Strauss, 2003; Heller & d'Ambrosio, 2009).

Baby Boomer Generation

The Baby Boomer Generation, with birth years of 1943 to 1960, includes individuals born of the later GI Generation (1901 – 1924) and the early Silent Generational (1925 – 1942) parents. The population size in this generational group became the largest because of the return of economic prosperity. According to Coates (2007), "Their sheer numbers motivated them to do whatever they could to become successful and to stand out from the crowd" (p. 85). In their youth, individuals of the Baby Boomer Generation were highly nurtured as children. They were the first generation to experience a dramatic decrease in childhood illnesses, such as polio and diphtheria, which plagued prior generations of youth. Because they were raised by the Silent and GI generations, they were taught to never follow people such as Stalin, Hitler, or Big Brother (Howe & Strauss, 2007).

The Boomers' youth also encompassed a time of dramatic social change and a generational split. This generation's values were shaped by such events as the Civil Rights Movement, Korean and Vietnam Wars, Woodstock, invention of the birth control pill, and the assassination of a president. These experiences in their formative years impacted their lives, so a majority of Boomers hold absolute belief in absolute values, and they have sought to infuse the societal culture with their values. This has been prevalent in an interesting divide within this generation that is split between conservative and liberal values. This divide has not been one in which disagreement is on organization or process but rather on their key values shaping society (Coates, 2007; Howe & Strauss, 2003; Heller & d'Ambrosio, 2009). "As Boomers have charted their life's voyage, they have metamorphosed from Beaver Cleaver to hippie to bran eater to yuppie to what some call 'Neo-Puritan'" (Strauss & Howe, 1991a, p. 299).

Baby Boomer students display strong work ethics in the classroom, but become frustrated when dealing with younger generational students who demonstrate different values than those of the Baby Boomer. Baby Boomers arrive on time to their courses and prepared for class (Coates, 2007).

The Baby Boomer Generation has adapted to technology due to its generational characteristic of striving for high productivity along with desiring increased leisure time. This generational cohort group has been described as preferring traditional pedagogy with its associated lecture, note taking, and handout format while also engaging in group discussions and interactive activities (Coates 2007; Johnson & Romanello, 2005; Heller & d'Ambrosio, 2009).

Generation X

The Generation X cohort, with birth years of 1961 to 1981, is sometimes referred to in the literature as the Thirteenth Generation or the Slacker Generation. This cohort is also according to Strauss and Howe (1991a) the smallest generational cohort in recent history. This generation has experienced social change much different than the previous Baby Boomer Generation. This generational cohort came of age following the conclusion of the Vietnam War, and the social events often related to shaping their generational characteristics include the oil and energy crisis of the 1970's, the fall of the Berlin Wall, the end of the Cold War, the economic uncertainties of long-term employment with the same company, and the increased inflation of the 1980's.

Generation X experienced a childhood of increased divorce rates often bringing with it a childhood of being a latchkey child with less parental supervision than the previous generation. Kupperschmidt (2000) states that Generation Xers "inherited Boomers' social debris: self-absorbed parents, divorce, latchkey kids, soaring national debt, an educational system that emphasized social skills and self-esteem rather than academic achievement, an anti-child society, and reality driven television shows and movies" (p. 69).

The educational achievements of Generation X declined from that of the Baby Boomer Generation. Strauss and Howe (1997) describe how individuals who were born in 1961 earned ten percent fewer A's and ten percent more C's in their high school setting than the previous generation. According to Kerr and Gascoigne (1996), this generational cohort group expresses nine characteristics that represent their learning needs: (a) a need for personal contact; (b) a desire for learning leading edge technology; (c) a craving for stimulation; (d) a preference for concrete, specific information; (e) a preference to keep their options open; (f) a resentment of

lecturing; (g) a repression of emotions; (h) a search for traditional jobs. Generation Xers have grown up with technology and are technologically literate. Johnson and Romanello (2005) describe Generation X as being good at multi-tasking, using technology on a daily basis, and expecting to use technology in the classroom.

In examining Generation Xers' association with training and the workplace, the members of this generational cohort are often to be described as mobile free agents of employment, rather than the commitments made by past generations to long-term employment with a single employer. Generation Xers do not hold to the same commitment to companies or organizations as previous generations. They prefer to have freedom to work independently with less bureaucracy and expect fair compensation along with the opportunity to earn more for increased productivity (Coates, 2007; Hart, 2006; Howe & Strauss, 1993). The Generation X cohort group who were the first "latch key kids" have learned to become self-reliant adults. In their transition to adulthood, they experienced new child-rearing styles that led to a generational characteristic of entitlement to high self-esteem and as parents becoming both friends and authority figures to their children. Thus, these Generation X leaders yearn for greater recognition from, as well as a more equal relationship with, their bosses than did their predecessors (Coates, 2007; Hart, 2006; Heller & d'Ambrosio, 2009; Howe & Strauss, 1993).

Millennial Generation

The Millennial Generation, with birth years of 1982 to 2001, is also referred to in the literature as the Net Generation or Generation Y, and according to Howe and Strauss (2003) is the most diverse generation to date. The Millennials have been shaped by rapidly changing social events such as school shootings, unprecedented acceleration of technology, the terrorist attacks of 9/11, and the wars in Iraq and Afghanistan. Unlike the children of Generation X, the

Millennials experienced a much different upbringing than their latch-key parents. With the increased violence within the schools and world setting, the Millennials according to Coates (2007) and Strauss and Howe (2003) have been pulled in close to their parents for safety concerns. This concern for safety and closeness according to Coates (2007) has created "a very structured, busy and over planned world" (p. 113). This structured planning by their parents has created the generational characteristic of Millennials struggling with organization and dealing with conflict because in their childhood this has been taken care of by their parents (Coates, 2007). The Millennial Generation according to Oblinger and Oblinger (2005) enjoy group interaction, attempt greater educational endeavors, pride themselves on being educated, enjoy homework and housework, watch less TV, take pride in being smart, are attracted to technology, and are more ethnically diverse than the previous generations.

The Millennial Generation has become accustomed to technology in the educational setting and expects immediate access to information and media. This has led to another generational trait: a shorter attention span (Johnson & Romanello, 2005; Oblinger, 2008; Dede, 2006). This generation is described in the literature as highly dependent upon technology, perhaps at the expense of basic educational skills such as reading, writing, and mathematics (Howe & Strauss, 2003, Coats, 2007). Educational leaders and instructors may find the Millennial Generation's reliance on and expectance for technology difficult to understand as many of those leaders and instructors are still trying to adapt to the new technology in their own lives (Oblinger, 2008).

Summary

Students arriving on higher education campuses prior to the mid-1990s applied technology to the outer layers of their education by means of searching library databases, using word processing software, and exchanging emails (Cuban, 2001; Palloff & Pratt, 2007). Students of the new millennium have been exposed to the integration of technology into their everyday academic lives. Through using learning management systems such as Blackboard, Desire to Learn, and Moodle, these students easily adjust to their courses being taught completely though the modality of technology (Oblinger & Oblinger, 2005). Because of the increased integration of instructing diverse generational groups through online technologic mediums, the educational system is in the process of a fundamental change. This transition from the traditional classroom environment to the online delivery environment has drastically changed the interaction between instructors and students (Theil, 2003; Peters, 2004; Yang & Cornelius, 2005). This transition has also been one in which the student populations as a whole are becoming more diverse in age, educational background, and cultural traits (Dabbagh & Bannan-Ritland, 2005). This changing and often overlooked generational demographic associated with the 17 percent increase in student enrollment in online courses since 2007 has brought about uncertainty for educational leadership and instructional faculty (Calis, 2008; Cohen & Brawer, 2008; Greer, 2010).

Educators as well as school administrators have expressed agreement that individual differences and the changing demographical characteristics of learners play an important role in learning (Felder & Silverman, 1988; Dede, 2006; Sims, 1995). Thus, it is important to investigate the learning styles and preferences of the generations currently enrolled in higher education. Prezios, Barnes, and Gooden (2004) based on the earlier work of Prensky (1998) suggest that "learning styles change from generation to generation, requiring faster speed, a more

visual approach and greater active engagement" (p. 21). Because of the increased use of online education courses, Theil (2003) believes a need and a responsibility exists to examine student learning styles in relationship to online education. Researchers Maddux et al., (2002), Thiele, (2003), and Little (2010) have noted that with the growth in distance education it is increasingly important to identify student learning styles and adapt online course design to accommodate these learning styles.

Found within the literature are a wider variety of learning style instruments and models ranging from the Myers-Briggs Type Indicator (1956), Dunn and Dunn Learning Style (1979), Gardner's Multiple Intelligences (1983), Kolb's (1984) experiential learning style inventory, and Felder and Soloman (1991) Index of Learning Styles. Each of these learning style models describes varying differences in individual learning preferences, but all are in agreement that learners display preferences within which to learn. This agreement is based on the premise that experiential learning inventory assessments assert that individual learning styles build upon previous experience preferences. Each subsequent experience by the learner is then building upon how future experiences will affect the learner (Felder, 1996; Kolb, 1984; Felder and Soloman 1991, 1994).

According to Kolb and Kolb (2005), and Lang (2004) individuals develop a preference for how they perceive as well as how they process information, thus, developing one learning style preference over another preference. Felder (1993) states that "Students whose learning styles are compatible with the teaching style of a course instructor tend to retain information longer, apply it more effectively, and have more positive post-course attitudes toward the subject than do their counterparts who experience learning/teaching styles mismatches" (p. 286). This premise in conjunction with the generational theories of Howe and Straus (2000) who contend

generational groupings arrive from perceptions of societal events, may lead to a change in the learning style preferences from one generation to the next. With the current accelerated growth of online education courses, Cassidy (2004), Little (2010), and Maddux, Ewing-Taylor, and Johnson (2002) have suggested it must be insured that positive student outcomes are as likely in an online course as in an equivalent traditional course. Thus, positive student outcomes should consider the relevance of student learning styles.

CHAPTER 3

Methodology

Introduction

Chapter Three focuses on the methodology used within the study. This includes the study's purpose, research question, hypothesis, and an examination of the research design and procedures. It also includes the description of the population, delineates the research methodology, describes the instrumentation, details the data collection procedures, and explains the data analysis procedures.

The purpose of this study was to determine if students associated with a generational group as described by Strauss and Howe (1991a), exhibit different learning styles as identified through the use of the Felder and Soloman Index of Learning Styles. The secondary purpose was to determine to what degree these generational groups rate their satisfaction with online education.

Research Question

This research addressed the following research question:

What, if any, relationships exist among learning styles, generational groups, and satisfaction with online learning?

Hypotheses

The specific hypotheses addressed by this study include:

H_1) There is a difference in perceived learning style based on Felder and Soloman ILS in online courses reported among Baby Boomer, Generation X, and Millennial Generation students.

$H1_0$) There is no difference in perceived learning style based on Felder and Soloman ILS in online courses reported among Baby Boomer, Generation X, and Millennial Generation students.

$H2_1$) There is a difference in overall satisfaction in online courses reported among Baby Boomer, Generation X, and Millennial Generation students.

$H2_0$ There is no difference in overall satisfaction in online courses reported among Baby Boomer, Generation X, and Millennial Generation students.

Research Design

The research design used in this study is based in quantitative methodology. Quantitative research is objective and uses such research instruments as surveys and numerical collection to gather and gain data to be examined statistically (Creswell, 2003; Cozby, 2007). Assumptions associated with the quantitative design according to Cozby (2007) include the researcher being detached and impartial to the population. Quantitative research is rigorous according to Burns and Groves (1997) with rigor being described as: "The striving for excellence in research through the use of discipline, scrupulous adherence to detail and strict accuracy" (p. 793). Quantitative research is designed so that the researcher understands what he or she is looking for in advance of the study. This is because the variables are identified and measurable. This lends to a method that supports the purpose of generalizability and is deductive in nature (Creswell, 2003; Cozby, 2007). Dunn (1999) suggested that the advantage of the quantitative research design is "that numbers are easy to work with – data are readily collected, coded, summarized, and analyzed" (p. 37).

This study is based on the design of correlational research. It is through the use of correlational research that the study seeks to "determine whether, [sic] and to what degree a

relationship exists between two or more variables" (Gay & Airasian, 1999, p. 12). It is important to note that establishing a correlation between variables does not define the causal factors. Correlational research attempts to determine whether and to what degree, a relationship exists between two or more quantifiable numerical variables (Creswell, 2003; Cozby, 2007; Gay & Airasian, 1999). If a strong relationship is found among variables, causality can be further determined by additional research using an experimental approach. A correlation design was selected for this study in order to quantify a relationship between learning styles and that of generational-age cohorts found within higher education distance education courses. The learning styles associated with the individuals found in each of the three age-cohort generational groups was assessed using Felder and Soloman's Index of Learning Style instrument.

Description of Variables

Variables are characteristics or properties of events, demographic data, or persons that can take on different values or amounts. The purpose of this study was to determine if students associated with a generational group as described by Strauss and Howe (1991a) exhibit different learning styles as identified through the use of the Felder and Soloman Index of Learning Style instrument. The secondary purpose was to determine to what degree these generational groups rate their satisfaction with online education. The variables identified as associated with this study are listed below.

The independent variables include each respondent's reported generational demographics. These groups consist of students from the Baby Boomers 1943-1960, Generation X 1961-1981, and the Millennial Generation 1982-2001 (Strauss & Howe, 1991a). Additionally, independent variables associated with student learning styles were identified through the use of the Felder and Soloman Index of Learning Style instrument originally developed by Felder and

Silverman in 1988. The independent variables identified in this research include the four learning styles as described in the ILS and include: (a) active and reflective; (b) sensing and intuitive; (c) visual and verbal; and (d) the sequential and global dimensions.

Dependent variables identified within the study include student satisfaction scores reported through the use of the Distance Education Learning Environment Survey (DELES) Instrument. The satisfaction scores were measured and identified for each respondent by taking the mean of the eight items found on the DELES instrument. Student satisfaction as reported through the use of the survey instrument was the dependent variable of this study and has been established by the Sloan Consortium as one of the five pillars of quality online education (Sloan-C, 2002).

Non-Probability Sampling

Non-probability sampling includes participants based on their availability at the time the data is collected. It is the process whereby the researcher selects a sample primarily because it is assessable and reasonably reflective of the population of interest (Gravetter & Forzano, 2006; Harris, 1998). According to Gall, Gall, and Borg (2007), the use of a non-probability sampling provides a good representation of a homogeneous group. It is acknowledged that the use of non-probability sampling methodology is an external validity weakness in this study and that the sampling of participants from one geographic area or county means the results will not be generalizable to the whole population (Gravetter & Forzano, 2006; Neuman, 2006). According to Gravetter and Forzano (2003):

The most commonly used sampling method in psychological research is non-probability convenience sampling. In convenience sampling, researchers simply use as respondents

those individuals who are easy to contact. People are selected on the basis of their

availability and willingness to respond. (p. 125)

For this study the use of a non-probability sample was used.

<div align="center">**Population**</div>

As of 2007, over 20 percent of all higher education students in the U.S took at least one

online course (Allen & Seaman, 2008). The target population for this study was the Montana

University System higher education undergraduate and graduate students who were enrolled in

fully online courses. In order to control against potential bias, the questionnaire was administered

to different student populations on multiple campuses within the Montana University System

(see Table 3). The population enrolled in the online course was not limited to any specific

educational track of study or discipline within the higher education institutions.

Table 3

Montana University System Students Enrolled in at Least One Online[1] Course.

MUS Campus	Fall 2009	Spring 2010	Fall 2010	Spring 2011	Fall 2011	Spring 2012
Flathead Valley C.C	412	500	535	590	576	634
MSU Bozeman	583	704	601	1453	649	731
MSU Billings	1532	1711	1785	1950	1965	2066
MSU Billings COT	388	452	449	521	466	479
MSU Northern	416	447	526	455	564	569
MSU Great Falls - COT	1074	1113	1056	1155	1149	1169
UM Missoula	1597	1802	1873	1973	1859	2173
UM Missoula COT	609	693	693	831	762	843
UM Montana Tech	281	354	329	353	306	370
UM Montana Tech - COT	174	150	191	153	185	162
UM Western	335	425	381	417	377	412
UM Helena - COT	253	154	301	285	374	460
Total	7654	8505	8720	10136	9232	10068

Source: Montana University System Data Warehouse, 2012.

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[1] Note: Courses where instruction is delivered entirely outside of the traditional classroom setting and there is no "in-person" contact between student and teacher (state supported courses only).

Data Collection Procedure

The data collection for this study followed a rigid, organized procedure. Survey information was collected through the use of a web-based survey design. This design was chosen for the convenience of the participants so that they were able to access the survey at any time of their choosing. Online surveys further assisted this research study by obtaining an increased response rate from surveyed participants (Sax, Gilmartin, & Bryant, 2003). Within the literature, concerns have been expressed with regard to how data collected in a traditional format may compare to that of an online survey format. Studies conducted by Krantz, Ballard, and Scher (1997) and Stanton (1998) have however shown that the "internet results are in fact comparable" (Cozby, 2007, p. 135) to data collected using traditional procedures. A study conducted by Fleming and Bowden (2009), identified no statistically significant differences between mail based surveys in terms of income, education, gender and age while substantially lowering survey distributing costs. Further findings by (Barrios, Villarroya, Borrego, & Olle, 2011) indicate that web based surveys provided fewer mistakes associated with data collection and longer open-ended question response rates than recorded with mail based surveys.

Prior to contact with any higher education students enrolled in online courses in the Montana University System, the chief academic officer of each Montana higher education institution was contacted (Appendix A). This correspondence explained the research project and asked permission to conduct research within the institution via a disseminated online survey. Once participation for the study was approved, an electronic invitation was sent to each of the students who were enrolled in an online education course (Appendix B). During the initial contact, the participants were provided with the rational for the study. This information explained that participation is voluntary, data collected is anonymous, and participation in the

survey would take approximately ten to twelve minutes of their time. Further, participants were informed that their confidentiality was protected as well as that of the school in which they were associated, and results would be calculated only in an aggregated form. Return of the survey was accomplished through the use of electronic submissions. Upon acceptance of the survey invitation the participants were asked to complete the online survey, which was described within the electronic invitation. A week to ten days after the initial invitation was sent, a second reminder was emailed to potential students who had not responded to the survey inviting their participation in the study (Appendix C). On the fourteenth to eighteenth day a final email invitation (Appendix D) was disseminated to those potential students in the population who had yet to respond in order to secure additional survey responses. According to Nardi (2003), the use of a survey is an effective and efficient means to measure specific beliefs and attitudes of a selected population in a way that the researcher may not otherwise be able to observe.

The participant's electronic survey responses were collected through the use of web survey software created by Zoomerang.com®. The initial component of the online survey was a disclosure and consent form. Participants were not able to proceed with the survey until they had acknowledged consent of participation by electronically opening the survey and acknowledgement of being eighteen years of age or older. The initial section of this survey included general demographic information (Appendix E). The second section was the Felder and Soloman Index of Learning Style instrument (ILS) (Appendix F), and the Distance Education Learning Environments survey (DELES) (Appendix G). These tools were used to identify the learners' preferred learning style and perspective preferences associated within their learning environment.

This information was coded to an assigned alphanumeric code provided in the correspondence inviting the participants into the research study so as to protect the participant's confidentiality. At any time during the survey, participants were able to exit the survey. Upon completion of the survey, collected data were transmitted to the researcher via Zoomerang.com software into the researcher's purchased secure data account.

The researcher further informed and recorded each participant's consent through an electronic signature based on their opening of the survey and acknowledgement of participation consent. This consent protected the confidentiality of the participants as well as the Montana University Campus where the participants were enrolled in the online course. The use of debriefing was not involved in this study.

Instruments

In order to gather the desired data the instruments associated with this study were divided into two main survey instruments: Section 1 included a brief survey in which to gather demographic characteristics and the Felder and Soloman Index of Learning Style instrument. Section 2 was comprised of the Distance Education Learning Environment survey instrument (DELES).

Student Demographic Characteristics Survey

In order to identify and categorize the individual into one of the generational cohorts as described by Straus and Howe (1991a, 2000), the student's generational birth cohort group was requested. Additionally the student's educational level of study certificate, associate, bachelor, masters, or doctoral was requested. The number of online courses taken was requested. The self-reported GPA, classified as 1.00 and under, 1.00 to 1.49, 1.50 to 1.99, 2.00 to 2.49, 2.50 to 2.99, 3.00 to 3.49 and 3.50 to 4.00 was requested. In addition, the student's ethnicity was requested in

order to classify the students as White Caucasian, Black or African American, Hispanic, American Indian or Alaskan Native, Asian, Hawaiian or Pacific Islander or Other. The demographic of gender was also requested.

Felder and Soloman Index of Learning Style

The Index of Learning Style questionnaire (ILS) (1991), developed originally by Richard Felder and Linda Silverman in 1988 and altered in association with Barbara Soloman in 1991 was selected to categorize the generational cohort's learning styles. To meet the purpose of this research the Felder and Soloman Index of Learning Styles (ILS), web-based version, was selected. This instrument in comparison to other instruments has provided ease of delivery, assessment of multiple learning style dimensions, self-scoring capability, and successful use in both paper and web based formats (Cook, 2005; Felder & Soloman, 2011). The ILS has been developed with two purposes: to provide guidance to instructors on the diversity of learning styles within their classroom and second to give individual students insights into possible learning strengths and weaknesses (Felder & Spurlin, 2005; Litzinger, Lee, Wise, & Felder, 2007). According to Viola et. al. (2006) the:

Felder-Silverman Learning Styles Model (FSLSM) is often used for providing adaptivity regarding learning styles in Electronic Learning Environments (ELEs) thanks to the detailed description of the different dimensions of the style of a learner given by the model and to the attention to the strength of preference. (p. 959)

The ILS can be classified as resting within the Coffield et. al. (2004) Category of Learning Styles. This category was developed by Coffield and his colleges after examination of over seventy-one different learning style models. Of the seventy-one models, thirty key learning style models were included into the category of learning styles as being the most influential

models. Coffield et al. writes about Index of Learning Styles which is found in this categorical

breakdown by stating that:

> A reliable and valid instrument which measures learning styles and approaches could be
>
> used as a tool to encourage self-development, not only by diagnosing how people learn,
>
> but by showing them how to enhance their learning. (p. 145)

The current Index of Learning Styles, ILS, is a 44 question instrument designed to assess

preferences in eight categories across four dimensions of learning styles. These four dimensions

are associated with active or reflective, sensing or intuitive, visual or verbal, and sequential or

global. According to Felder and Brent (2005) the four learning style dimensions described by the

Felder-Soloman Index of Learning Style model correspond to the four core questions revolving

around learning preferences which include:

1. What is the preference in information processing? (Active – Reflective)

2. What is the preference in information perception? (Sensing – Intuitive)

3. What is the preference in information reception? (Visual – Verbal)

4. How does a person work toward understanding? (Sequential – Global)

The Felder-Soloman Index of Learning Styles determines an individual's learning

preferred dimensions by asking 11 forced choice questions for each of the four dimensions. Each

question is associated with a choice option of (a or b). The selection of (a) by a participant

represents an association with the learning style dimensions of active, sensing, visual and

sequential. The selection of (b) represents the dimension of reflective, intuitive, verbal and global

learners (Appendix H).

The learning preferences are assigned numerical values on a scale of -11 to +11 for each

item in the dimensions. For each item choice, there is one answer (*a*) that is associated with a

positive number score of (+1) while the other choice (*b*) is scored by a negative number (-1). The ILS has no option for a third choice; thus, a score of zero is not a choice, which therefore causes the results to lean one way or the other (Converse & Presser, 1986; Felder & Brent, 2005).

Felder (1993) explains that the difference between the numerical responses for each item defines both the learning preference and the degree to which the preference is held by the learner. He further continues to explain that:

> The dichotomous learning style dimensions of this model are continual and not either / or categories. A student's preference on a given scale (e.g. for inductive or deductive presentation) may be strong, moderate, or almost nonexistent, may change with time, and may vary from one subject or learning environment to another. (Felder, 1993, p. 7)

Figure 3, Index of Learning Styles Dimensional Report.
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The following table (Table 4) by Felder and Silverman (1988) describes the distribution of ILS items according to learning style dimensions.

Table 4

Distribution of Index of Learning Style Questions According to Dimensions

Preference	Dimension	Associated Question Items
Process	Active	1a, 5a, 9a, 13a, 17a, 21a, 25a, 29a, 33a, 37a, 41a
	Reflective	1b, 5b, 9b, 13b, 17b, 21b, 25b, 29b, 33b, 37b, 41b
Perception	Sensing	2a, 6a, 10a, 14a, 18a, 22a, 26a, 30a, 34a, 38a, 42a
	Intuitive	2b, 6b, 10b, 14b, 18b, 22b, 26b, 30b, 34b, 38b, 42b
Input	Visual	3a, 7a, 11a, 15a, 19a, 23a, 27a, 31a, 35a, 39a, 43a
	Verbal	3b, 7b, 11b, 15b, 19b, 23b, 27b, 31b, 35b, 39b, 43b
Understanding	Sequential	4a, 8a, 12a, 16a, 20a, 24a, 28a, 32a, 36a, 40a, 44a
	Global	4b, 8b, 12b, 16b, 20b, 24b, 28b, 32b, 36b, 40b, 44b

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ILS Instrument Reliability and Validity

The validity of an instrument refers to the meaningfulness, appropriateness, and usefulness of specific inferences made from obtained scores (Gall, Borg, & Gall, 1996). According to Gall, Gall, and Borg (2007), they further explain that in the reliability of an instrument is "the extent to which other researchers would arrive at similar results if they studied the same case using exactly the same procedures as the first researcher" (p. 651). The reliability of the Felder and Soloman Index of Learning Styles is measured by utilizing various procedures including test-retest or stability, internal consistency, and equivalence (MacMillan & Schumacher, 2006). Each of the procedures is related to the control of a particular error and is then recorded in terms of the error coefficient on a scale of .00 to .99. The higher a recorded coefficient representing a higher degree of reliability associated with the instrument (Macmillan & Schumacher, 2006, p. 183).

The Index of Learning Styles has undergone scrutiny by researchers examining the validity and reliability of the ILS instrument. In the review of literature the Index of Learning Styles has been examined by a variety of researchers including Felder and Spurlin,(2005), Graf and Kinshuk, (2007), Viola et al (2006), MacMillan and Schumacher, (2006) in order to establish the validity, reliability, and consistency of the survey instrument.

Tests performed on the reliability of the Index of Learning Styles using a Cronbach's alpha by Cook (2005), support the instrument's internal consistency. In the study conducted by Cook, the Cronbach's alpha and test-retest correlation for ILS scores were 0.61 and 0.75 (active-reflective dimension), 0.78 and 0.81 (sensing-intuitive), 0.70 and 0.60 (visual-verbal), and 0.67 and 0.81 (sequential-global).

Felder and Spurlin in an examination of the ILS further addressed the reliability and validity of the instrument by establishing estimates of reliability score from 0.56 to 0.77 (Felder & Spurlin, 2005) . The work of Livesay, Dee, Felder, Hites, Nauman, and O'Neal (2002) examined the responses of 584 learners from North Carolina State University and recorded a Cronbach's alpha coefficients to be in the range of 0.55 to 0.76. Based on this previous research and support of the Felder and Soloman Index of Learning Styles, it is viewed as an appropriate instrument for use in this dissertation study.

Distance Education Learning Environment Survey (DELES) Instrument

In order to gain a clearer understanding of the participants associated with online environmental preferences, the Distance Education Learning Environment Survey (DELES) Instrument was used. This survey instrument allowed the researcher to examine students' preferential perceptions associated with their identified learning styles which are strongly influenced by factors such as preferences for filtering instruction, manipulating importance of

concepts, and forming understanding at different rates as well as in differing learning environments (Dunn & Dunn, 2003, 2008; Felder & Silverman, 1988; Kolb, 1986; Little, 2010; Richmond & Cummings, 2005). The theoretical underpinning of the DELES is based on Moore's (1974) work which identified three social organizational dimensions. These psychosocial dimensions include Relationships, Personal Development, and System Maintenance and Change. It is from the theoretical basis of the three psychosocial dimensions that the survey instrument was developed using a three-stage instrument-development process (Walker, 2003).

Walker's first developmental stage began with the identification of significant or salient scales by reviewing key aspects associated with the distance learning environment and reviewing previously developed learning environment instruments. The second stage conducted by Walker was developing and writing survey questions along with obtaining previously developed and validated questions from earlier survey instruments. The third stage consisted of field testing and analyzing data using item analysis and validation procedures (Walker 2003; Walker & Fraser, 2005).

The current DELES is an online survey instrument based on six identified salient scales used to measure distance education learning environment characteristics including: a) active learning; b) student autonomy; c) instructor support; d) personal relevance; e) authentic learning; and f) student satisfaction within the distance education environment (Walker, 2003; Walker & Fraser, 2005). This survey format contains 34 statements about practices that take place in the class, followed by eight statements regarding the individual's perception about distance education. Each of the survey's statements uses a Likert scale with a range set of five ordered alternatives consisting of never, seldom, sometimes, often, and always. According to Walker and Fraser (2005, p. 1), "each learning environment item has a factor loading of at least 0.50 with its

own scale, and less than 0.50 with all other scales. The alpha reliability coefficient for each scale ranged from 0.75 to 0.94." Factor analysis is used in the DELES to identify and describe patterns of co-relationship between variables or the identified scales. A further explanation is that an item or question found within the salient scale of active learning would require a factor loading of 0.50 in order to be included in that scale. Items with less than a 0.50 factor loading would be considered "flawed" and not be included in that scale. The factor analysis according to Walker and Fraser (2005) and substantiated through a study conducted by Sahin (2008) allows the researcher to evaluate whether an item in a given scale measures only that scale, further validating the DELES instrument.

Distance Education Learning Environment Survey Validity and Reliability

Although the DELES instrument is a relatively new survey instrument, it use has been examined through extensive validity and reliability evaluations. In the review of literature, the DELES is described as a "validated instrument for post-secondary distance education" (Biggs, 2006, p. 46). A Cronbach's alpha was used to evaluate the internal consistency of the DELES instrument. Walker (2003) and Walker and Fraser (2005) report Cronbach alpha coefficients of each scale as being the following: Instructor support, .89; Active learning, .75; Student autonomy, .79, and Student satisfaction, .79. Based on the provided Cronbach alpha scores being close to an alpha rating of .80, they are considered good to excellent reliability indicators (Field, 2005; Gliem & Gliem, 2003; Walker, 2003; Walker & Fraser, 2005).

Based on the fact that the Distance Education Learning Environment Survey uses a Likert-type scale, Gliem and Gliem (2003) provide support for the reliability of the instrument by stating:

When using Likert-type scales [sic] it is imperative to calculate and report Cronbach's

alpha coefficient for internal consistency reliability for any scales or subscales one may

be using. The analysis of the data then must use these summated scales or subscales and

not individual items. If one does otherwise, the reliability of the items is at best probably

low and at worst unknown. Cronbach's alpha does not provide reliability estimates for

single items. (p. 88)

According to Walker and Fraser (2005, p. 1) "each learning environment item has a

factor loading of at least 0.50 with its own scale,[sic] and less than 0.50 with all other scales. The

alpha reliability coefficient for each scale ranged from 0.75 to 0.94." Factor analysis is used in

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identified scales. A further explanation of this is that items or questions found within the salient

scale of active learning would require having a factor loading of 0.50 in order to be included in

that scale. Items with less than a 0.50 factor loading would be considered "flawed" and not be

included in that scale. The factor analysis according to Walker and Fraser (2005) and

substantiated through a study conducted by Sahin (2008) allows the researcher to evaluate

whether an item in a given scale measures only that scale, further validating the validity and

reliability of the DELES instrument.

Data Analysis

Descriptive and inferential statistics were used to analyze the data returned from survey

forms submitted to Montana University System higher education students who were enrolled in

fully online courses. The program Statistical Package for Social Sciences (SPSS) was used in the

analysis of the data in this research study. A linear regression analysis was completed to

determine whether any of the ILS learning style variables as identified by Felder and Soloman

(1991) were significant predictors of the data obtained from the DELES survey. Through the use of the linear regression model, a linear equation was used to predict the value of the dependent variables, based on the identified value of the predictor variable associated with the DELES survey (Field, 2005; Mertler & Vannata, 2002).

   To address the research questions for this study, data was analyzed using descriptive statistics, Chi-square analysis, and the analysis of variance (ANOVA). Descriptive statistics were used to describe the participants. Gall, Gall, and Borg (2007) explain that the use of a chi-square test is "a nonparametric test of statistical significance that is used when the research data are in a form of frequency counts for two or more categories" (p. 634). Gall, Gall, and Borg (2007) also defined descriptive statistics as "mathematical techniques for organizing, summarizing, and displaying a set of numerical data" (p. 638). Using descriptive statistics will allow the sample characteristics to be described through the use of using standard deviation, means, and frequency (Salkind, 2000).

   A one-way analysis of variance (ANOVA) was conducted to examine student attitudes associated with the use of their learning styles in the online education environment. Analysis of participants generational placement on the learning style dimensions described by Felder and Soloman was analyzed statistically using an ANOVA value with an alpha = .05 to determine differences among generations. Gall, Gall, and Borg (2007) described an ANOVA as "a procedure for determining whether the difference between the mean scores of two or more groups on a dependent variable is statistically significant" (p. 632). The use of an ANOVA is further described by Nicol and Pexman (1999) by stating that it "is used when there is one independent variable and one dependent variable and is used to assess the differences between two or more group means" (p. 15). Following the analysis of variance (ANOVA) calculations

being conducted, a Scheffe post-hoc comparison analysis test was used to determine the variable grouping differences.

The use of a multiple linear regression analysis method was chosen in order to examine the data collected from the DELES survey instrument. Through the use of the linear analysis, the relationships between the dependent variable, the student and the six DELES predictor variables: (a) instructor support, (b) student interaction and collaboration, (c) authentic learning, (d) personal relevance, (e) active learning, and (f) student autonomy were analyzed. The use of the linear regression analysis establishes a linear equation to predict the value of the dependent variable, based on the established value of the predictor (Mertler & Vannata, 2000). According to Tabachnick and Fidell (2007), multiple regression enables the researcher to evaluate the "relationship between one DV and several IVs" (p. 117). The rationale for using multiple linear regression was that the researcher had only one dependent variable of the student satisfaction scores, and 11 independent variables (Field, 2005; Tabachnick & Fidell, 2007). The gathered variables were standardized in order to make the beta weights comparable to each other. To standardize the variables, the researcher converted the mean scores into a z-score, which created a mean of zero and a standard deviation of 1 (Field, 2005).

Chi-square tests for independence were used to measure demographic variables of gender, race/ethnicity, and differences in preferred learning style distributions among and between the generational cohort groupings. According to Gall, Gall, and Borg (2007) a chi-square test is "a nonparametric test of statistical significance that is used when the research data are in the form of frequency counts for two or more categories" (p. 634). The chi-square test is further described by Nicol and Pexman (1999) as a means to determine "whether differences between observed and expected frequencies are statistically significant" (p. 43).

Through the use of inferential statistics, the researcher was able to make inferences about actual differences in the population in comparison to the sampled population (Cozby, 2007). A correlation analysis between the collected variable groups was used to assess the strength of association. This form of analysis was not meant to outline a causal relationship between the variables but only to show an association between the variables (Cozby, 2007). All the research instruments and other testing procedures were scored according to their validated instructions or general recommendations accepted as common practice in the field.

A Priori Assumption

The assumption of normality was met through the use of a purposeful non-probability sample to create sufficient sample size. The alpha level of 0.05 was set a priori and used for all statistical tests and procedures. As Cozby observed, "A .05 significance level says you are 95% sure of the reliability of your findings; however, there is a 5% chance you could be wrong" (p. 258). The Felder and Soloman Index of Learning Styles instrument (ILS) as well as the Distance Education Learning Environment Survey (DELES) Instrument distributed to Montana University System higher education students who are enrolled in at least one fully online course had reliability and validity calculated by SPSS software and is reported in Chapter Four under results.

Limitations of the Study

The following limitations apply to this research:

1. This study was limited to a non-probability sample of Montana University System online students and, consequently, student responses may not be representative of other institutions.

2. Data was collected from the spring 2011 cohort of students. As a result, the participants in this sample may not have been representative of the entire student body.

3. The results of this study to be directly generalized to other higher-education institutions offering online courses is noted as it may be difficult to account for the differences caused by varying online course structures, course content, learning management systems, and instructors.

4. Student learning styles are measured at one time, but may change over the course of time, program, or specific class within which they are involved.

5. The participants self-reported their reaction to online distance learning, demographic questions, and learning style assessments which could result in participant bias if certain questions are misunderstood and/or responses are insincere.

Delimitations

The following delimitations applied to this research:

1. This study was delimited to students enrolled within a minimum of one online course being offered through the Montana University System.

2. This study was delimited to students engaged in courses offered fully through an online delivery system.

Summary

Chapter Three explains the methodology for researching the study. It includes a description of the sample population, design of the survey instrument – Index of Learning Styles instrument and Distance Education Learning Environment Survey instrument, data collection procedures, data analysis procedures, means of data verification, and the role of the researcher. The presentation of the data and analysis results appear in Chapter Four.

CHAPTER 4

Analysis of Results

Chapter Four focuses on analysis and explores the association between generational learning styles and results produced from the ILS and DELES instruments used in the study. Reviewing the ILS developed by Felder and Soloman includes four learning styles: (a) active and reflective; (b) sensing and intuitive; (c) visual and verbal; and (d) sequential and global dimensions. Learning styles results were presented on four scales with each scale using the odd numbers 1 through 11 and running from negative eleven to positive eleven. A score of three or less indicated that the student was fairly well-balanced on the two-dimensional scale. A score of 5-7 suggested a moderate preference of one-dimension, and a score above nine reflected a strong preference for one dimension. The DELES instrument developed by Scott Walker (2003) is a survey instrument based on six identified salient scales used to measure distance education learning environment characteristics including: a) instructor support; b) student autonomy and interaction; c) personal relevance; d) authentic learning; e) active learning; and f) student satisfaction within the distance education environment. The DELES survey consisted of 42 questions and used the following 5-point Likert-type scale: never, seldom, sometimes, often, and always for the seven scales (Walker, 2003; Walker & Fraser, 2005). The independent variables include each respondent's reported generational demographics. These groups consist of students from the Baby Boomers 1943-1960, Generation X 1961-1981, and the Millennial Generation 1982-2001 (Strauss & Howe, 1991).

Descriptive statistics were employed to determine potential relationships between these variables and frequency tables were constructed for categorical variables of interest. A series of ANOVAs was completed to determine whether any of the ILS learning style variables as

identified by Felder and Soloman (1991) and the Distance Education Leaning Environment Survey as identified by Walker (2003) were predictors of statistically significant relationships. This enabled the researcher to determine whether or not statistically significant group difference based on generation, existed with regard to the Distance Education Leaning Environment Survey subscales (Field, 2005; Tabachnick & Fidell, 2007).

Survey data was collected using Zoomerang.com®, a survey software tool. As determined in the methodology section of this study, which was based on the total available population of 9,938 out of a total 10,068 students, 370 was the required minimum number of responses for a response rate. At the conclusion of the data collection period, a total sample collection of 1426 (n) was achieved. The data was transferred for analysis into Statistical Program for Social Science 20.0 a statistical software package that examined data for missing values and outliers. Data analysis was held to the 95% level of confidence.

The data was then analyzed and placed into sections outlined in this chapter. The demographic section provides descriptive data broken down into characteristics associated with the generational groupings. Additional analyses resulted in sections which include examination of relationships among generational groupings, student generational groups identified learning styles, and participants' perceptions associated with factors that influence their satisfaction with distance education courses. The remainder of this chapter includes the results and analysis from the statistical analyses using the SPSS 20.0 software.

Population

The population was surveyed through the use of non-probability sampling from twelve institutions across Montana ranging from community colleges to small and large public colleges and universities. These undergraduate and graduate students were enrolled in institutions

offering degrees from certificates to doctoral programs. Control against potential population bias

was addressed by administering the questionnaire to different student populations on multiple

campuses within the Montana University System. Students associated with these institutions

were enrolled in one or more fully online courses during the 2012 academic spring semester. The

Montana University System data warehouse reported an available population of 10,068 students.

This population is delineated by campus in Table 5.

Table 5

Students Enrolled Spring 2012 in at Least One Online[a] Course

MUS Campus	Spring 2012
Flathead Valley C.C	634
MSU Bozeman	731
MSU Billings	2066
MSU Billings COT	479
MSU Northern	569
MSU Great Falls - COT	1169
UM Missoula	2173
UM Missoula COT	843
UM Montana Tech	370
UM Montana Tech - COT	162
UM Western	412
UM Helena - COT	460
Total	10068

Source: Montana University System Data Warehouse, 2012.
[a]Note: Courses where instruction is delivered entirely outside the traditional classroom setting, and no "in-person" contact exists between student and teacher (state supported courses only).

Population enrolled in the online course was not limited to any specific educational track

of study or discipline within these assorted higher education institutions. This available

population was reduced to 9,938 after university and college registrars' offices removed students

who had requested contact information not be released and filtered and removed students

younger than 18 years old. Upon approval from each campus, the 9,938 registered online

students were sent an email invitation to participate in the study. Due to various institutional and campus policies, a combined approach of distribution was used in distributing the email invitations. These approaches included the researcher sending the survey directly to online student populations at nine of the twelve intuitions, and sending the survey directly to three institutions for distribution to online student email accounts. The initial invitation was then followed up by a secondary reminder email invitation following a two week open collection period for those students that had not responded to the first invitation. The surveys were electronically monitored in order to ensure that all survey questions were answered before submission of the survey was enabled. Data collection resulted in a total of 1426 (n) completed survey returns, a 14% return rate. The abandonment rate of those who opened the survey but did not either initiate or complete the survey totaled 63 individuals. An additional 26 individuals were screened out of the survey based on their self-identification of being under eighteen years old resulting in a total non-included population comprising.008% of the total invited population.

Demographics

Demographic characteristics of the population consisted of gender, generational birth year grouping, number of online education classes taken, ethnicity, level of educational study, and reported overall grade point average. Frequency tables were constructed for categorical variables of interest. The data provided in Table 6 focuses upon respondent gender. As shown, slightly over 75% of respondents in the sample were female, with slightly under 25% being male. Students under 18 years old were directed to the end of the survey.

Table 6

Descriptive Statistics: Gender

Category	N	%	Valid %	Cum. %
Female	1093	75.3	76.6	76.6
Male	333	22.9	23.4	100.0
Total	1426	98.3	100.0	
Under 18 yrs. Old	25	1.7		
Total	1451	100.0		

Table 7 summarizes the population with regard to birth year or generational status. As indicated, slightly over 50% were millennial generation members, slightly over one third were members of Generation X, and close to 15% were Baby Boomers. The break down by gender and generational grouping (Table 7) included a total of 717 respondents being identified in the Millennial grouping with 558 (77.8%) females and 159 (22.2%) males. Generation X respondents comprised a group of 393 (75.7%) females and 126 (24.3%) males. The remaining response group consisted of the Baby Boomers with 142 (74.7%) females and 48 (25.3%) males. Additionally, a chi-square analysis was conducted in order to determine whether there were statistically significant associations between generational status and gender. The chi-square analysis conducted between generational status and gender was not found to achieve statistical significance, $\chi^2(2) = 1.190$, $p = .551$.

Table 7

Descriptive Statistics: Birth Year

Category	N	%	Valid %	Cum. %
Millennial	717	49.4	50.3	50.3
Generation X	519	35.8	36.4	86.7
Baby Boomers	190	13.1	13.3	100.0
Total	1426	98.3	100.0	
Under 18 yrs. old	25	1.7		
Total	1451	100.0		

Examination of respondents' ethnicity is summarized in Table 8. Nearly 90% of the sample consisted of Caucasian respondents, with all other races combined constituting approximately 10% of the sample.

Table 8

Descriptive Statistics: Ethnicity

Category	N	%	Valid %	Cum. %
Other	20	1.4	1.4	1.4
Native American	46	3.2	3.2	4.6
Asian	20	1.4	1.4	6
Black	13	0.9	0.9	6.9
Hispanic	46	3.2	3.2	10.2
Caucasian	1281	88.3	89.8	100.0
Total	1426	98.3	100.0	
Under 18 yrs. old	25	1.7		
Total	1451	100.0		

The student level of educational study was examined by classifying these levels into certificate program, associate degree, bachelor degree, master degree and doctoral degree programs. By percentage the largest of these educational groups was represented by the Millennial Generation with a bachelor educational level of study consisting of 406 (56.6%) students with a total of 717 millennial students. Generation X students reported being enrolled in master degree programs 202 (28.9%) with a total of 519 students, and Baby Boomers pursuing master degree 67 (35.3%) with a total of 190 students. Generational grouping to level of educational study is described in Table 9.

Table 9

Distribution of generational students based on level of educational study

	Certificate Program	Associate Program	Bachelor Program	Master Program	Doctoral Program	Total
Millennial	29	187	406	88	7	717
% generational group	4.0%	26.1%	56.6%	12.3%	1.0%	100.0%
% of Education level	46.8%	49.0%	60.0%	31.0%	26.9%	50.3%
Generation X	25	154	202	129	9	519
% generational group	4.8%	29.7%	38.9%	24.9%	1.7%	100.0%
% of Education level	40.3%	40.3%	30.1%	45.4%	34.6%	36.4%
Baby Boomer	8	41	64	67	10	190
% generational group	4.2%	21.6%	33.7%	35.3%	5.3%	100.0%
% of Education level	12.9%	10.7%	9.5%	23.6%	38.5%	13.3%
Total program count	62	382	672	284	26	1426
	4.3%	26.8%	47.1%	19.9%	1.8%	100.0%

Number of online education courses taken by respondents was next analyzed. Most commonly, respondents reported having taken six or more online education courses, with approximately 10% of respondents falling into each of the remaining categories.

Table 10

Descriptive Statistics: Online Education Courses

Number of Online Courses	N	%	Valid %	Cum. %
1	176	12.1	12.3	12.3
2	175	12.1	12.3	24.6
3	156	10.8	10.9	35.6
4	172	11.9	12.1	47.6
5	122	8.4	8.6	56.2
6+	625	43.1	43.8	100.0
Total	1426	98.3	100.0	
Under 18 yrs. old	25	1.7		
Total	1451	100.0		

Student generational groups were also examined by number of online courses taken. The reported number of online education classes taken by generational groupings is presented in Table 11.

Table 11

Distribution of generational student enrollment in online classes

	Number of Online Courses						
	1	2	3	4	5	6+	
Millennial	118	102	96	85	58	268	717
	16.5%	14.2%	13.4%	11.9%	8.1%	36.0%	100.0%
Generation X	45	52	43	62	47	270	519
	8.7%	10.0%	8.3%	11.9%	9.1%	52.0%	100.0%
Baby Boomer	13	21	17	25	17	97	190
	6.8%	11.1%	8.9%	13.2%	8.9%	51.1%	100.0%
Total	176	175	156	172	122	625	1426
	12.3%	12.3%	10.9%	12.1%	8.6%	43.8%	100.0%

Index of Learning Styles: Analyses of Variance

In this section, descriptive statistics were used to analyze results associated with the ILS instruments. A series of ANOVAs were conducted in order to determine whether statistically significant group differences, based upon generation, exist with regard to the Index of Learning Styles (ILS) subscales. ILS uses a forced choice model where participants are asked to choose between two alternatives to complete a provided sentence. ILS subscales, scored on a -11 to 11 scale, are scored so that negative scores tend toward the first learning style listed (active, sensing, visual, or sequential). Students earning a negative score associated with the ILS construct demonstrate a preference toward the active, sensing, visual, or sequential constructs of the ILS. If participants earn a positive score, this indicates that they would tend more towards the reflective, intuitive, verbal, and global construct. Answer choices provided an analysis for determining preferences in learning styles through the use of a dichotomous format which negates the possibility of a "no opinion" response (Converse & Presser, 1986). These alternative choices

represent opposite ends of the individual ILS constructs and are scored on a scale of negative

eleven to a positive eleven (Felder, 2007; Felder & Brent, 2005; MacMillan & Schumacher,

2006).

Descriptive statistics associated with the generational subsets Millennial, Generation X,

and Baby Boomer related to the ILS survey instrument learning styles (a) active (ACT) and

reflective (REF); (b) sensing (SEN) and intuitive (INT); (c) visual (VIS) and verbal (VRB); and

(d) the sequential (SEQ) and global (GLO) dimensions are presented.

Table 12 presents descriptive statistics associated with these measures based on the ILS

subscale. Some differences were found in mean scores for these items based upon generation

grouping.

Table 12

Descriptive Statistics: ILS Subscales

Measure	n	Mean	Std. Dev.	Std. Err.	95% C.I. Upper	95% C.I. Lower	Min.	Max.
Active-Reflective (ACT - REF)								
Millennial	717	5.84	1.888	0.071	5.7	5.98	0	11
Generation X	519	5.83	1.858	0.082	5.67	5.99	1	11
Baby Boomers	190	5.97	2.120	0.154	5.66	6.27	0	11
Total	1426	5.85	1.909	0.051	5.75	5.95	0	11
Sensing-Intuitive (SEN - INT)								
Millennial	717	5.77	1.893	0.071	5.63	5.90	0	11
Generation X	519	5.68	1.951	0.086	5.51	5.85	1	11
Baby Boomers	190	5.56	2.378	0.173	5.22	5.90	0	11
Total	1426	5.71	1.985	0.053	5.60	5.81	0	11
Visual-Verbal (VIS - VRB)								
Millennial	717	7.13	2.239	0.084	6.96	7.29	0	11
Generation X	519	7.02	2.325	0.102	6.82	7.22	0	11
Baby Boomers	190	6.32	2.481	0.180	5.96	6.67	0	11
Total	1426	6.98	2.317	0.061	6.86	7.10	0	11
Sequential-Global (SEQ - GLO)								
Millennial	717	6.44	2.174	0.081	6.28	6.60	1	11
Generation X	519	6.44	2.206	0.097	6.25	6.63	0	11
Baby Boomers	190	6.34	2.233	0.162	6.02	6.66	0	11
Total	1426	6.43	2.192	0.058	6.31	6.54	0	11

The values of the active-reflective (ACT- REF) learning style subscale were obtained

from the eleven forced choice items, with each option corresponding to one or another category

of the dimension (e.g., active or reflective). These values were averaged to produce an overall

mean for each generational cohort group. Using the first ACT - REF grouping, a value of 0 or 1

represents a strong preference towards active learning, a 2 or 3 a moderate preference for active

learning, a 4 or 5 a mild preference toward active learning, a 6 or 7 a mild preference towards

reflective learning, a 8 or 9 a moderate preference for reflective learning, and 10 or 11 a strong

preference for reflective learning. This method of analysis was used for all statistics associated

with the ILS learning style subsets.

ACT - REF was the first ILS domain examined. In this analysis, the Baby Boomer

Generation ($M = 5.97$) and standard deviation ($SD =2.1, N = 190$) indicated a slightly increased

preference toward reflective learning in comparison to the Millennial Generation (M=5.84) and

Generation X (M=5.83).

Sensing – Intuitive (SEN – INT) was the second ILS domain examined. In this analysis,

the Millennial Generation ($M = 5.77$) and the standard deviation ($SD =1.89, N = 717$) indicated a

slightly increased preference toward intuitive learning over Generation X (M=568) and Baby

Boomers (M=5.56).

The third ILS domain examined was that of Visual – Verbal (VIS – VRB). In this

analysis, Baby Boomers ($M = 6.32$) and standard deviation ($SD =2.48, N = 190$) indicated a mild

preference toward verbal learning in comparison to Generation X (M= 7.02) and Millennial (M=

7.13) with a mild preference toward visual learning. A statistically significant difference was

also found and noted within this learning style preference.

The fourth ILS domain examined was Sequential – Global (SEQ – GLO). In this analysis,

SEQ – GLO found strikingly similar preferences. Millennial Generation ($M = 6.44$) and

Generation X (M=6.44) indicated the same mild preference toward global learning. Baby

Boomer Generation results (M=6.34) indicated a slightly less mild preference towards global

learning.

ANOVA results are indicated in the following table. As shown, statistically significant

differences on the basis of generation were only found with regard to the Visual-Verbal subscale.

Table 13

Results of ANOVAs on ILS Subscales

Measure	S.S	df	M.S.	F	Sig.
Active-Reflective (ACT - REF)					
Between Groups	2.924	2	1.462	0.4	0.67
Within Groups	5191.445	1423	3.648		
Total	5194.368	1425			
Sensing-Intuitive (SEN - INT)					
Between Groups	7.068	2	3.534	0.9	0.41
Within Groups	5606.405	1423	3.940		
Total	5613.473	1425			
Visual-Verbal (VIS - VRB)					
Between Groups	100.022	2	50.011	9.42	0.00
Within Groups	7553.347	1423	5.308		
Total	7653.369	1425			
Sequential-Global (SEQ - GLO)					
Between Groups	1.818	2	0.909	0.19	0.83
Within Groups	6845.243	1423	4.810		
Total	6847.06	1425			

Scheffe post hoc results associated with each of the four ANOVAs performed on the measures relating to Index of Learning Style are presented in Table 14. Only the analysis conducted on the Visual-Verbal scale was found to achieve significance. The * found in Table 14 represents the probability that the mean difference is significantly different from zero and is below .05. Essentially, this indicates that the possibility that there is a true difference between the mean scores is statistically significant at the .05 probability level. Within these multiple comparison tests, statistical significance was only achieved in the post hoc analyses conducted on the Visual-Verbal scale. Within this analysis, Baby Boomers were found to have significantly lower scores on the Visual-Verbal scale as compared with both individuals of the Millennial generation as well as Generation X respondents. No other statistically significant results were found within this set of analyses.

Table 14

Scheffe Post Hoc Comparisons: Index of Learning Style Measures

	Comparison Group	Mean Dif	Std. Error	Sig.	95% C.I. *Lower*	Upper
Measure of Active–Reflective						
Millennial	Generation X	0.009	0.11	0.997	-0.26	0.28
	Baby Boomers	-0.129	0.156	0.711	-0.51	0.25
Generation X	Millennial	-0.009	0.11	0.997	-0.28	0.26
	Baby Boomers	-0.138	0.162	0.696	-0.53	0.26
Baby Boomers	Millennial	0.129	0.156	0.711	-0.25	0.51
	Generation X	0.138	0.162	0.696	-0.26	0.53
Measure of Sensing–Intuitive						
Millennial	Generation X	0.086	0.114	0.756	-0.19	0.37
	Baby Boomers	0.208	0.162	0.439	-0.19	0.6
Generation X	Millennial	-0.086	0.114	0.756	-0.37	0.19
	Baby Boomers	0.122	0.168	0.768	-0.29	0.53
Baby Boomers	Millennial	-0.208	0.162	0.439	-0.6	0.19
	Generation X	-0.122	0.168	0.768	-0.53	0.29

Measure of Visual–Verbal

Millennial	Generation X	0.11	0.133	0.711	-0.22	0.43
	Baby Boomers	.811*	0.188	0	0.35	1.27
Generation X	Millennial	-0.11	0.133	0.711	-0.43	0.22
	Baby Boomers	.702*	0.195	0.002	0.22	1.18
Baby Boomers	Millennial	-.811*	0.188	0	-1.27	-0.35
	Generation X	-.702*	0.195	0.002	-1.18	-0.22

Measure of Sequential–Global

Millennial	Generation X	0.004	0.126	0.999	-0.31	0.31
	Baby Boomers	0.107	0.179	0.837	-0.33	0.55
Generation X	Millennial	-0.004	0.126	0.999	-0.31	0.31
	Baby Boomers	0.102	0.186	0.859	-0.35	0.56
Baby Boomers	Millennial	-0.107	0.179	0.837	-0.55	0.33
	Generation X	-0.102	0.186	0.859	-0.56	0.35

Notes: *p<.05.

A Chi-square test was conducted to address the research question associated with the relationship between the participants' identified generational group and associated learning style dimensions as identified by the ILS. A subsequent series of box plots were constructed focusing on the four ILS scales on the basis of birth year/generational status. These box plots illustrate generally modest differences between these measures on the basis of generational status. Tables 15 through 18 provide the detailed generational chi-square test analysis associated within each ILS dimension conducted. Figures 4 through 7 are boxplot analysis, detailing each of the ILS dimensions examined.

Table 15

Chi-square (χ²) and analysis of variance for ILS dimensional scale ACT – REF

ACT - REF ILS Dimension	Millennial	Generation X	Baby Boomer
11a-ACT	1.80	0.94	17.72
9a-ACT	0.15	0.08	0.08
7a-ACT	0.02	0.30	0.36
5a-ACT	0.10	0.32	0.10
3a-ACT	2.03	1.62	0.44
1a-ACT	0.56	0.53	0.06
1b-REF	0.02	0.01	0.02
3b-REF	0.22	0.84	0.38
5b-REF	0.84	0.70	0.16
7b-REF	0.23	0.72	0.22
9b-REF	0.25	0.23	0.03
11b-REF	0.10	1.82	8.17
Sum	p-value	df	
42.2	0.0017	22	
Conclusion:	Statistically Significant Difference p<0.05		

Figure 4, Boxplot analysis generational ACT – REF ILS Dimensions

Table 16

Chi-square (χ^2) and analysis of variance for ILS dimensional scale SEN – INT

SEN - INT ILS Dimension	Millennial	Generation X	Baby Boomer
11a-SEN	1.81	0.12	17.72
9a-SEN	5.56	0.76	0.45
7a-SEN	10.16	3.14	3.98
5a-SEN	0.58	0.70	2.52
3a-SEN	1.25	2.83	0.70
1a-SEN	0.00	2.42	3.81
1b-INT	0.06	1.48	0.10
3b-INT	0.61	0.45	0.17
5b-INT	1.11	7.68	2.53
7b-INT	3.25	1.25	6.95
9b-INT	1.48	0.23	0.24
11b-INT	0.91	1.82	28.17
Sum	p-value	df	
42.2	0.0017	22	
Conclusion:	Statistically Significant Difference p<0.05		
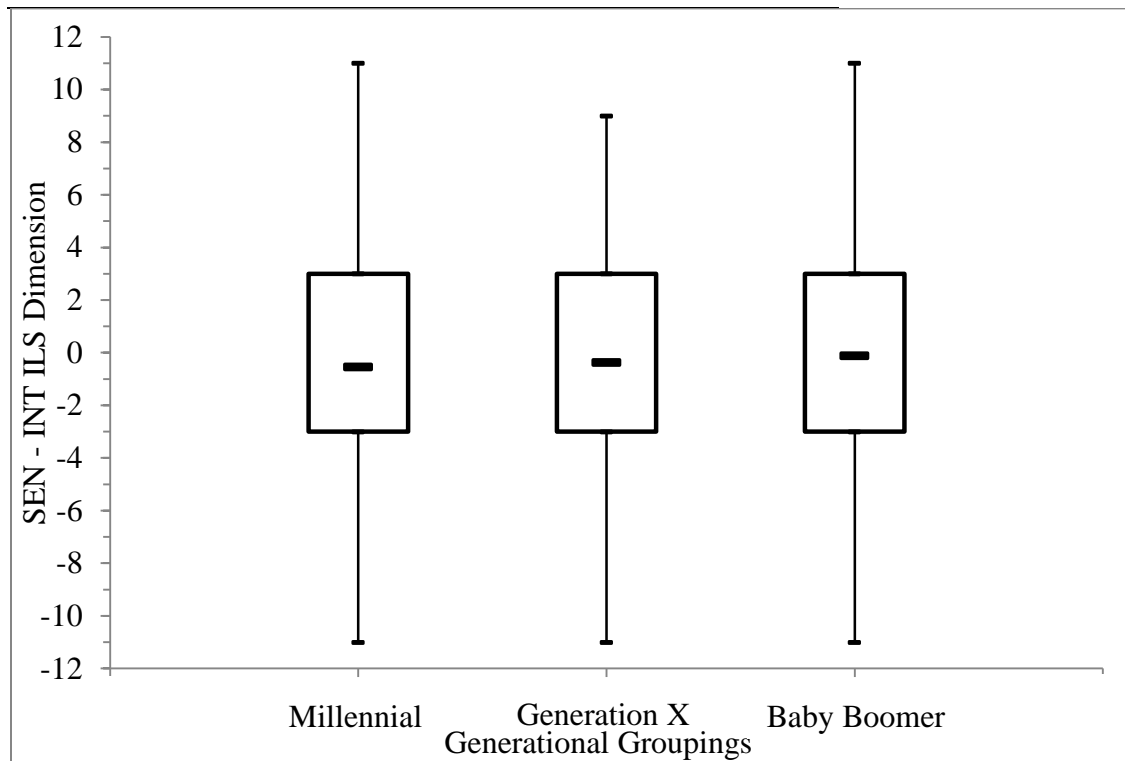
Figure 5, Boxplot analysis generational SEN – INT ILS Dimensions

Table 17

Chi-square (χ^2) and analysis of variance for ILS dimensional scale VIS – VRB

VIS - VRB ILS Dimension	Millennial	Generation X	Baby Boomer
11a-VIS	184.30	133.53	10.08
9a-VIS	249.74	183.64	7.13
7a-VIS	134.62	95.42	26.26
5a-VIS	34.25	9.71	3.98
3a-VIS	1.90	0.43	0.44
1a-VIS	20.91	14.76	5.13
1b-VRB	40.03	30.40	5.05
3b-VRB	16.42	7.76	7.04
5b-VRB	6.77	4.16	1.71
7b-VRB	0.51	0.05	3.05
9b-VRB	1.48	0.23	0.03
11b-VRB	0.91	0.02	16.67
Sum	p-value	df	
42.2	0.0017	22	

Conclusion: Statistically Significant Difference p<0.05
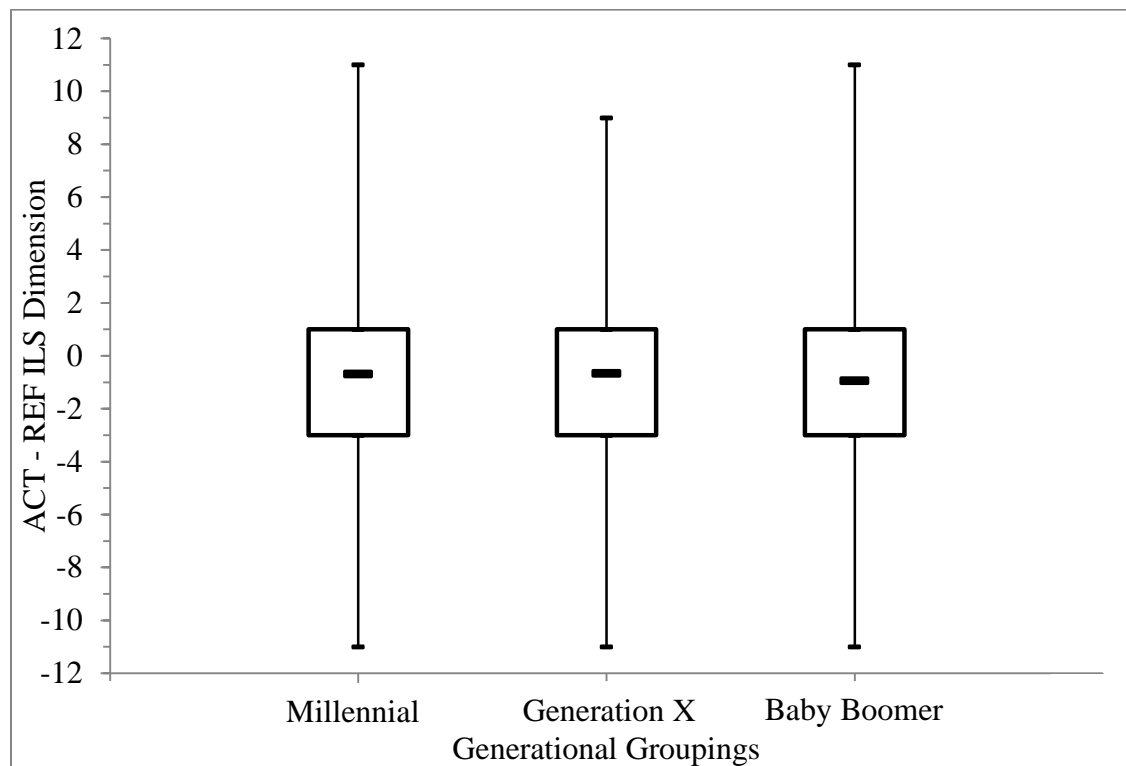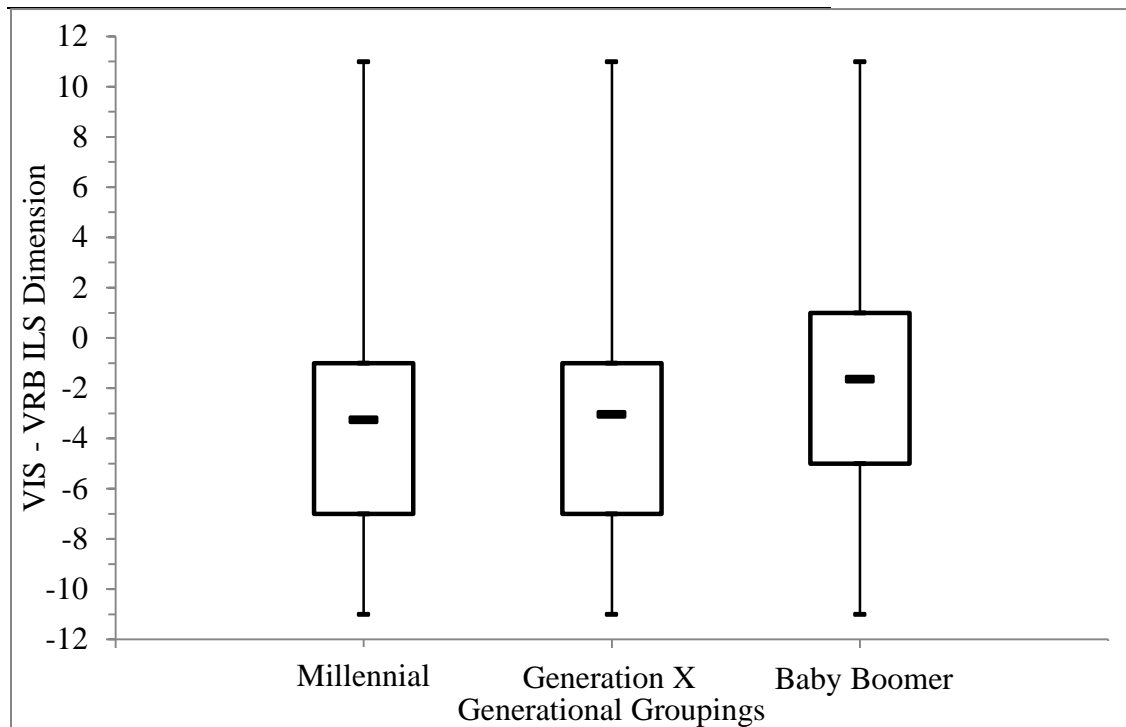

Figure 6, Boxplot analysis generational VIS – VRB ILS Dimensions

Table 18

Chi-square (χ^2) and analysis of variance for ILS dimensional scale SEQ – GLO

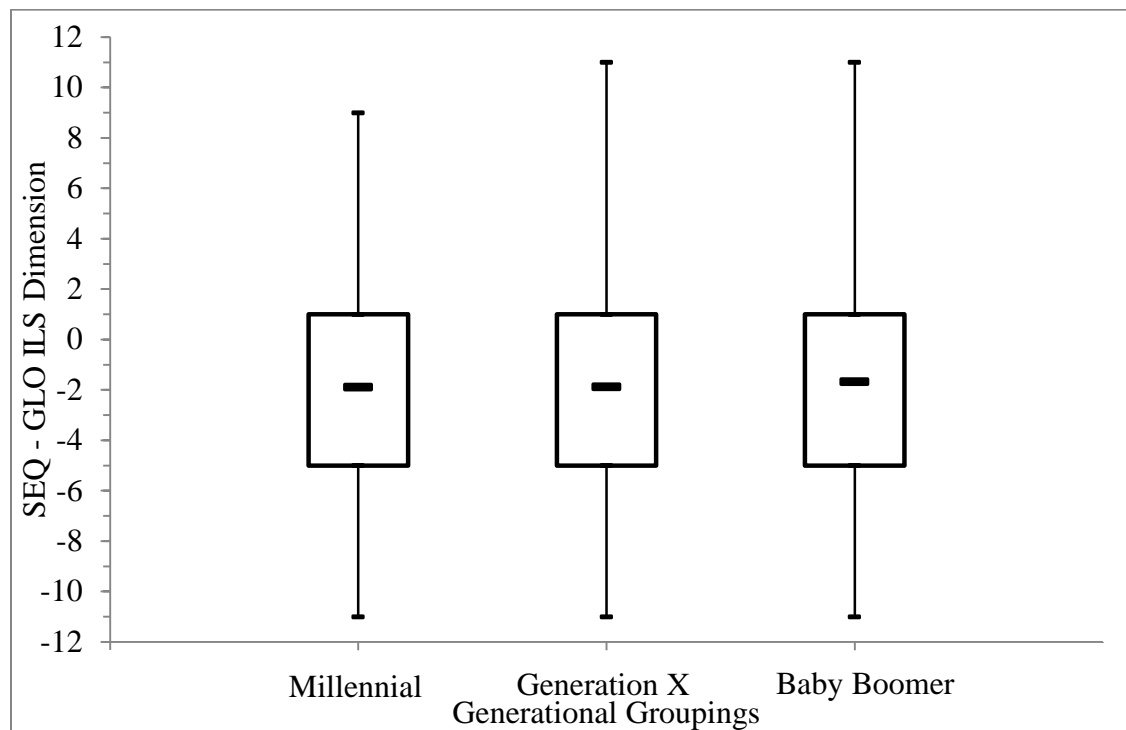| SEQ - GLB ILS Dimension	Millennial	Generation X	Baby Boomer
11a-SEQ	1.80	0.94	17.72
9a-SEQ	0.15	0.08	0.08
7a-SEQ	0.02	0.30	0.36
5a-SEQ	0.10	0.32	0.10
3a-SEQ	2.03	1.62	0.44
1a-SEQ	0.56	0.53	0.06
1b-GLO	0.02	0.01	0.02
3b-GLO	0.22	0.84	0.38
5b-GLO	0.84	0.70	0.16
7b-GLO	0.23	0.72	0.22
9b-GLO	0.25	0.23	0.03
11b-GLO	0.10	1.82	8.17
Sum	p-value	df	
42.2	0.0017	22	
Conclusion:	Statistically Significant Difference p<0.05		

Figure 7, Boxplot analysis generational SEQ – GLO ILS Dimensions

In the analysis, Generational grouping was associated with the independent variable and the identified dimensional learning style as the dependent variable. Using an alpha level of 0.05, Levine's test was used and indicated that the assumption of homogeneity of variance was not violated. An analysis of variance (ANOVA) was done to evaluate the mean differences between the dependent variable (generational groups) and the independent variable (identified learning styles). Analysis of variance is a statistical procedure that compares the number of degrees of freedom (df) being different or similar between two or more groups of data. The analysis for each generational group's association with each ILS dimensional scale showed no significance of preference for one learning style over another learning style among generational groups other than what was associated with the Visual –Verbal which provided generally modest statistically significant differences. While the collected results displaying a diverse assortment of learning styles within each generational group, the reported difference in Visual – Verbal learning style preference among groups established the failure of the null hypothesis. The null hypothesis states that there is no difference in perceived learning style based on Felder and Soloman ILS in online courses reported among Baby Boomer, Generation X, and Millennial Generation students.

Analysis of DELES Generational Survey Results

As reported in the DELES results, the analyses examined potential relationships between generational groups and reported satisfaction with distance education. DELES subscales examined included; (a) instructor support for perceived learning, (b) student autonomy and interaction, (c) personal relevance, (d) authentic learning, (e) active learning, and (f) identified student satisfaction with the distance education environment. For each of the DELES scales, the measure of central tendency (Mean) and the standard deviation was calculated for all values of items contained in the six overarching subscales. The values of each of the 5 item DELES scales

(1.0 = never, 2.0 = seldom, 3.0 = sometimes, 4.0 = often, and 5.0 = always) were averaged to produce an overall learner group mean score and a standard deviation.

The research question asked was if there was a difference in overall satisfaction in online courses reported among Baby Boomer, Generation X, and Millennial Generation students. The null hypothesis stated that no difference in overall satisfaction in online courses was reported among Baby Boomer, Generation X, and Millennial Generation students.

DELES Subscales: Instructor Support

A series of descriptive statistics as well as analyses of variance were conducted on all Distance Education Learning Environment Survey (DELES) subscales. The first such analysis focused upon the instructor support subscale. Table 19 indicates some differences in instructor support averages based upon generation. Values of the five-item DELES instructor support scale were averaged to produce an overall learner-autonomy mean for the Millennial generation ($M =$ 4.09) and standard deviation ($SD = .79$, $N = 717$). A scale mean of 4.09 (4.0 = *often,* and 5.0 = *always*) demonstrated that Millenials in this study indicated there was less satisfaction with instructor support than with those of Generation X (M=4.15) and Baby Boomers (M=4.13).

Table 19

Descriptive Statistics: Instructor Support

Generation	N	Mean	Std. Dev.	Std. Err.	95% C.I. Lower	95% C.I. Upper	Min.	Max.
Millennial	717	4.0915	0.79873	0.02983	4.033	4.1501	1	5
Generation X	519	4.1592	0.75814	0.03328	4.0938	4.2246	1	5
Baby Boomers	190	4.1303	0.79524	0.05769	4.0165	4.2441	1.38	5
Total	1426	4.1213	0.78381	0.02076	4.0806	4.162	1	5

Table 20 presents results of the ANOVA conducted. As shown based upon generation, no statistically significant differences in instructor support were found.

Table 20

Results of ANOVA: Instructor Support

Generational comparisons	S.S.	df	M.S.	F	Sig.
Between Groups	1.396	2	0.698	1.137	0.321
Within Groups	874.053	1423	0.614		
Total	875.449	1425			

DELES Subscales: Student Autonomy and Interaction

Student autonomy and interaction was the next area of focus. Table 21 summarizes descriptive statistics associated with this measure based upon generational status. Some substantial differences were found in mean scores based on generational status. The values of the five-item DELES student autonomy and self-interaction scales were averaged to produce an overall mean for the Baby Boomer generation ($M = 3.00$) and standard deviation ($SD = .80$, $N = 190$). A scale mean of 3.001 (2.0 = *seldom,* and 3.0 = *sometimes*) demonstrates that Baby Boomers in this study indicated more satisfaction with online courses providing student autonomy and self-interaction than with those of Generation X (M=2.71). The Millennial group (M=2.60) were the least satisfied.

Table 21

Descriptive Statistics: Student Autonomy and Interaction

					95% C.I.			
Generation	N	Mean	Std. Dev.	Std. Err.	Lower	Upper	Min.	Max.
Millennial	717	2.6039	0.9283	0.03467	2.5358	2.672	1	5
Generation X	519	2.7177	0.87638	0.03847	2.6422	2.7933	1	5
Baby Boomers	190	3.0026	0.8068	0.05853	2.8872	3.1181	1	5
Total	1426	2.6985	0.90304	0.02391	2.6515	2.7454	1	5

Table 22 below presents the results of the ANOVA conducted on student autonomy and interaction. As shown, statistically significant differences in this measure were found based upon generation.

Table 22

Results of ANOVA: Student Autonomy and Interaction

Generational comparisons	S.S.	df	M.S.	F	Sig.
Between Groups	24.182	2	12.091	15.121	0
Within Groups	1137.877	1423	0.8		
Total	1162.059	1425			

Table 23 summarizes the multiple comparisons tests conducted on this measure. Significant differences were found among the three generations. Specifically, mean scores were found to be significantly higher among Baby Boomers as compared with the Millennial Generation and Generation X.

Table 23

Multiple Comparisons: Student Autonomy and Interaction

	Comparison group	Mean Dif	Std. Error	Sig.	95% C.I. Lower	Upper
Millennial	Generation X	-0.11382	0.05154	0.088	-0.2401	0.0125
	Baby Boomers	-.39873*	0.07296	0	-0.5775	-0.2199
Generation X	Millennial	0.11382	0.05154	0.088	-0.0125	0.2401
	Baby Boomers	-.28491*	0.07582	0.001	-0.4707	-0.0991
Baby Boomers	Millennial	.39873*	0.07296	0	0.2199	0.5775
	Generation X	.28491*	0.07582	0.001	0.0991	0.4707

DELES Subscales: Personal Relevance

Personal relevance scores were focused on next. Descriptive statistics associated with this measure are summarized in the following table. Only slight differences in mean scores of personal relevance were indicated based upon generational status. Values of the five-item DELES personal relevance scales were averaged to produce an overall mean for the Generation X (M = 4.01) and standard deviation (SD = .74, N = 519). A scale mean of 4.014 (4.0 = *often,* and 5.0 = *always*) demonstrates that Generation X in this study indicated there was slightly more satisfaction with a personal relevance and linkage between the student and out of school experiences with online courses than those of the Baby Boomer (M=3.96) and Millennial (M=3.92) populations.

Table 24

Descriptive Statistics: Personal Relevance

Generation	N	Mean	Std. Dev.	Std. Err.	95% C.I. Lower	95% C.I. Upper	Min.	Max.
Millennial	717	3.9277	0.81782	0.03054	3.8677	3.9876	1	5
Generation X	519	4.0143	0.74249	0.03259	3.9503	4.0783	1	5
Baby Boomers	190	3.9639	0.79532	0.0577	3.8501	4.0777	1.43	5
Total	1426	3.964	0.78863	0.02088	3.9231	4.005	1	5

Table 25presents results of the ANOVA conducted on this measure. As shown, no significant differences in the mean score of this measure were found based upon generational status.

Table 25

Results of ANOVA: Personal Relevance

Generational comparisons	S.S.	df	M.S.	F	Sig.
Between Groups	2.260	2	1.130	1.819	0.163
Within Groups	883.998	1423	0.621		
Total	886.258	1425			

DELES Subscales: Authentic Learning

The following table summarizes descriptive statistics associated with authentic learning based upon generational status. Some slight mean differences were found in authentic learning based upon the generation of the respondent. The values of the five-item DELES authentic learning scales were averaged to produce an overall mean for Generation X ($M = 4.06$) and standard deviation ($SD = .68$, $N = 519$). A scale mean of 4.06 (4.0 = *often,* and 5.0 = *always*) demonstrates that Generation X in this study indicate that they were more satisfied with authentic

real life learning within online courses than were those of the Millennial (M=3.98) and Baby

Boomer (M=3.94) populations.

Table 26

Descriptive Statistics: Authentic Learning

Generation	N	Mean	Std. Dev.	Std. Err.	95% C.I. Lower	95% C.I. Upper	Min.	Max.
Millennial	717	3.9501	0.79805	0.02980	3.8916	4.0086	1	5
Generation X	519	4.0694	0.68933	0.03026	4.0099	4.1288	1	5
Baby Boomers	190	3.9463	0.71792	0.05208	3.8436	4.0491	1.6	5
Total	1426	3.9930	0.75129	0.01990	3.9540	4.0320	1	5

Table 27 presents the results of the ANOVA conducted on authentic learning. As shown,

a statistically significant difference in authentic learning was found based upon generational

status.

Table 27

Results of ANOVA: Authentic Learning

Generational comparisons	S.S.	df	M.S.	F	Sig.
Between Groups	4.762	2	2.381	4.238	0.015
Within Groups	799.568	1423	0.562		
Total	804.33	1425			

Table 28 summarizes the multiple comparisons tests conducted on authentic learning.

One significant difference was found, which consisted of the comparison between the Millennial

Generation and the Generation X population. Generation X was found to have a significantly

higher mean score on authentic learning as compared with the Millennial Generation.

Table 28

Multiple Comparisons: Authentic Learning

	Comparison group	Mean Dif	Std. Error	Sig.	95% C.I. Lower	Upper
<u>Millennial</u>	Generation X	-.11929	0.0432	0.022	-0.2252	-0.0134
	Baby Boomers	0.00375	0.06116	0.998	-0.1461	0.1536
<u>Generation X</u>	Millennial	.11929	0.0432	0.022	0.0134	0.2252
	Baby Boomers	0.12305	0.06356	0.154	-0.0327	0.2788
<u>Baby Boomers</u>	Millennial	-0.00375	0.06116	0.998	-0.1536	0.1461
	Generation X	-0.12305	0.06356	0.154	-0.2788	0.0327

DELES Subscales: Active Learning

Table 29 summarizes descriptive statistics associated with active learning. Values of the five-item DELES active learning scales were averaged for the Millennial Generation to produce an overall mean ($M = 3.76$) and standard deviation ($SD = .80, N = 717$). A scale mean of 3.76 (3.0 = *sometimes,* and 4.0 = *often*) demonstrates that Millennials in this study held slightly lower levels of satisfaction with active learning within online courses than those indicating a slightly higher satisfaction of the Baby Boomer (M=3.83) and Generation X (M=3.85).

Table 29

Descriptive Statistics: Active Learning

Generation	N	Mean	Std. Dev.	Std. Err.	95% C.I. Lower	Upper	Min.	Max.
Millennial	717	3.7615	0.80443	0.03004	3.7025	3.8205	1	5
Generation X	519	3.8548	0.72664	0.03190	3.7922	3.9175	1	5
Baby Boomers	190	3.8351	0.78474	0.05693	3.7228	3.9474	1	5
Total	1426	3.8053	0.77507	0.02052	3.7650	3.8455	1	5

Results of the ANOVA conducted on active learning are presented in the following table. As indicated, no statistically significant difference in active learning was found based on generational status.

Table 30

Results of ANOVA: Authentic Learning

Generational comparisons	S.S.	df	M.S.	F	Sig.
Between Groups	2.818	2	1.409	2.35	0.096
Within Groups	853.227	1423	0.6		
Total	856.045	1425			

DELES Subscales: Student Autonomy

Analyses were then conducted focusing on student autonomy where online courses are considered orientated towards students making their own learning decisions. The following table indicates slight mean differences in student autonomy on the basis of generational status. The values of the five-item DELES student autonomy scales were averaged to produce an overall mean for the Generation X ($M = 4.349$) and standard deviation ($SD = .59$, $N = 519$). A scale mean of 4.349 (4.0 = *often,* and 5.0 = *always*) demonstrates that Generation X in this study indicates that there was an increased satisfaction level with student autonomy within online courses than those indicated by the Millenials (M=4.255) and Baby Boomers (M=4.24).

Table 31

Descriptive Statistics: Student Autonomy

Generation	N	Mean	Std. Dev.	Std. Err.	95% C.I. Lower	95% C.I. Upper	Min.	Max.
Millennial	717	4.2556	0.73069	0.02731	4.202	4.3092	1	5
Generation X	519	4.3499	0.59996	0.02634	4.2982	4.4016	1	5
Baby Boomers	190	4.2432	0.70134	0.05088	4.1428	4.3435	1.4	5
Total	1425	4.2883	0.68301	0.01809	4.2528	4.3238	1	5

The following table indicates that significant mean differences exist with regard to student autonomy based on generational status.

Table 32

Results of ANOVA: Student Autonomy

Generational comparisons	S.S.	df	M.S.	F	Sig.
Between Groups	3.123	2	1.562	3.358	0.035
Within Groups	661.171	1422	0.465		
Total	664.294	1424			

Results of multiple comparison tests conducted on this item are presented in the table below. As shown, no statistically significant results were found, while the comparison between the Millennial Generation and Generation X was found to approach statistical significance, achieving a probability level of .057. A higher mean score on student autonomy was found with regard to Generation X as compared with the Millennial Generation.

Table 33

Multiple Comparisons: Student Autonomy

	Comparison group	Mean Dif	Std. Error	Sig.	95% C.I. Lower	Upper
Millennial	Generation X	-0.09432	0.03931	0.057	-0.1906	0.002
	Baby Boomers	0.01243	0.05565	0.975	-0.1239	0.1488
Generation X	Millennial	0.09432	0.03931	0.057	-0.002	0.1906
	Baby Boomers	0.10675	0.05782	0.182	-0.0349	0.2484
Baby Boomers	Millennial	-0.01243	0.05565	0.975	-0.1488	0.1239
	Generation X	-0.10675	0.05782	0.182	-0.2484	0.0349

DELES Subscales: Student Satisfaction with Distance Education

Student overall satisfaction with distance education was examined. The student satisfaction scale includes eight items, such as "distance education is worth my time," to assess

the "extent to which students enjoy learning in a distance education environment" (Walker, 2005, p. 9). Table 34 indicates some varied differences in the means associated with subsets of the overall examination of student satisfaction on the basis of generational status.

Descriptive statistics were compiled on all individual student satisfaction items based upon generational status. Table 34 summarizes all descriptive statistics conducted from the results of questions thirty-five through forty-two on the DELES survey. These results addressed overall satisfaction with distance education courses First, with regard to whether or not respondents felt that distance education is stimulating, an overall mean for the Millennials ($M =$ 3.14) was found. A scale mean of 3.14 (3.0 = sometimes, and 4.0 = often) demonstrates that Millennials find an overall lower satisfaction with online courses being stimulating than those indicated by Generation X (M=3.49). Degree of satisfaction by the Baby Boomer Generation with a (M=3.58) had the highest degree of satisfaction.

The next question analyzed whether respondents preferred distance education over the traditional classroom. Again, means were found to be lowest among the Millennials (M=2.99) and standard deviation (SD = 1.24. N=717). Means were found to be substantially higher among both Baby Boomer (M=3.34), and the highest was found with Generation X respondents (M=3.36). Similar results were associated with the other satisfaction questions regarding whether respondents felt that distance education was exciting, if distance education is worth their time, if they enjoy studying by distance, whether they look forward to studying by distance, and whether they would enjoy their education more if all their classes were by distance.

When the subset of overall student satisfaction was analyzed, with regard to whether respondents were satisfied with their online classes, mean scores were found to be similar among the Millennial generation, Generation X respondents, as well as Baby Boomers. The values of

the five-item DELES overall student satisfaction scales produce an overall mean for the

Millennial generation of (M = 3.6) compared to Generation X (M=3.76) and Baby Boomers

(M=3.75).

Table 34

Descriptive Statistics: Student Satisfaction with Distance Education

	N	Mean	Std. Dev.	Std. Err.	95% C.I.		Min	Max
					Lower	Upper		
Measure of if distance education is stimulating								
Millennial	717	3.14	1.047	0.039	3.06	3.21	1	5
Generation X	519	3.49	0.962	0.042	3.41	3.57	1	5
Baby Boomers	190	3.58	0.932	0.068	3.45	3.71	1	5
Total	1426	3.33	1.019	0.027	3.27	3.38	1	5
Measure of preference for distance education								
Millennial	717	2.99	1.247	0.047	2.9	3.08	1	5
Generation X	519	3.36	1.148	0.05	3.26	3.46	1	5
Baby Boomers	190	3.34	1.071	0.078	3.19	3.5	1	5
Total	1426	3.17	1.202	0.032	3.11	3.23	1	5
Measure of distance education is exciting								
Millennial	717	2.8	1.152	0.043	2.71	2.88	1	5
Generation X	519	3.11	1.078	0.047	3.01	3.2	1	5
Baby Boomers	190	3.28	1.089	0.079	3.12	3.43	1	5
Total	1426	2.97	1.132	0.03	2.92	3.03	1	5

Measure of distance education is worth my time

Millennial	717	3.57	1.14	0.043	3.49	3.65	1	5
Generation X	519	3.92	1.009	0.044	3.84	4.01	1	5
Baby Boomers	190	3.85	1.079	0.078	3.7	4.01	1	5
Total	1426	3.74	1.098	0.029	3.68	3.79	1	5

Measure of enjoy studying at a distance

Millennial	717	3.27	1.249	0.047	3.18	3.37	1	5
Generation X	519	3.57	1.13	0.05	3.47	3.67	1	5
Baby Boomers	190	3.68	1.097	0.08	3.52	3.84	1	5
Total	1426	3.44	1.198	0.032	3.37	3.5	1	5

Measure of looking forward to learning by distance

Millennial	717	3.07	1.268	0.047	2.98	3.17	1	5
Generation X	519	3.48	1.152	0.051	3.38	3.58	1	5
Baby Boomers	190	3.55	1.148	0.083	3.38	3.71	1	5
Total	1426	3.28	1.229	0.033	3.22	3.35	1	5

Measure of enjoy more if all my classes were by distance

Millennial	717	2.55	1.344	0.05	2.45	2.65	1	5
Generation X	519	2.93	1.313	0.058	2.82	3.04	1	5
Baby Boomers	190	3.03	1.188	0.086	2.86	3.2	1	5
Total	1426	2.75	1.328	0.035	2.68	2.82	1	5

Measure of overall satisfaction

Millennial	717	3.6	1.17	0.044	3.51	3.68	1	5
Generation X	519	3.76	1.012	0.044	3.67	3.85	1	5
Baby Boomers	190	3.75	1.079	0.078	3.59	3.9	1	5
Total	1426	3.68	1.105	0.029	3.62	3.73	1	5

Table 35 provides results from the ANOVA test. An analysis of variance (ANOVA) was done to evaluate the mean differences between the dependent variable (generational status) and the independent variables (student satisfaction). Analysis of Variance (ANOVA) is a statistical procedure comparing the amount of variance between groups of individual scores with the amount of variance within groups. This analysis indicates statistical significance with regard to the ANOVA conducted on each of the student satisfaction items. Statistical significance was indicated in all analyses, indicating significant differences in the means of all items on the basis of generational status.

Table 35

Results of ANOVAs on Student Satisfaction Items

Generational Comparisons	S.S.	df	M.S.	F	Sig.
Measure of: If distance education is stimulating					
Between Groups	51.664	2	25.832	25.717	0
Within Groups	1429.36	1423	1.004		
Total	1481.02	1425			
Measure of: Preference for distance education					
Between Groups	47.564	2	23.782	16.814	0
Within Groups	2012.71	1423	1.414		
Total	2060.27	1425			
Measure of: Distance education is exciting					
Between Groups	49.596	2	24.798	19.864	0
Within Groups	1776.44	1423	1.248		
Total	1826.04	1425			
Measure of: Distance education is worth my time					
Between Groups	40.707	2	20.353	17.275	0
Within Groups	1676.62	1423	1.178		
Total	1717.33	1425			
Measure of: Enjoy studying at a distance					
Between Groups	39.49	2	19.745	14.011	0
Within Groups	2005.33	1423	1.409		
Total	2044.82	1425			
Measure of: Looking forward to learning by distance					
Between Groups	63.938	2	31.969	21.791	0
Within Groups	2087.61	1423	1.467		
Total	2151.54	1425			
Measure of: Enjoy more if all my classes were by distance					
Between Groups	59.9	2	29.95	17.376	0
Within Groups	2452.72	1423	1.724		
Total	2512.62	1425			
Measure of: Overall satisfaction					
Between Groups	9.367	2	4.683	3.85	0.021
Within Groups	1730.95	1423	1.216		
Total	1740.32	1425			

Table 36 presents results of a series of Scheffe post-hoc analyses associated with the

DELES student satisfaction items. Here, post-hoc tests were conducted in all cases as all

analyses of variance were found to achieve statistical significance. First, with regard to whether respondents felt that distance education is stimulating, mean scores were found to be significantly lower among the Millennial Generation as compared with Generation X and Baby Boomer respondents This was also found to be the case with regard to whether respondents (a) preferred distance education, (b) whether they felt that distance education is exciting, (c) whether they feel that distance education is worth their time, (d) whether they enjoy studying by distance, (e) whether they look forward to learning by distance, and (f) whether they would enjoy their education more if all their classes were by distance. The mean difference scores represent the difference between rated importance and rated success. A negative mean difference indicates that students think a goal is relatively less satisfactory than the online education is successful in meeting. A positive mean difference indicates that students think online education courses are relatively more successful in meeting their levels of satisfaction. Regarding the post-hoc tests conducted on whether respondents are satisfied with their online classes, the Millennial Generation was found to have a significantly lower mean score on this item as compared with Generation X. No other significant comparisons were found.

Table 36

Scheffe post-hoc Comparisons: Student Satisfaction Items

	Comparison Group	Mean Dif	Std. Error	Sig.	95% C.I. Lower	Upper
Measure of if distance education is stimulating						
Millennial	Generation X	-.353*	0.058	0	-0.49	-0.21
	Baby Boomers	-.441*	0.082	0	-0.64	-0.24
Generation X	Millennial	.353*	0.058	0	0.21	0.49
	Baby Boomers	-0.088	0.085	0.588	-0.3	0.12
Baby Boomers	Millennial	.441*	0.082	0	0.24	0.64
	Generation X	0.088	0.085	0.588	-0.12	0.3
Measure of preference for distance						
Millennial	Generation X	-.369*	0.069	0	-0.54	-0.2
	Baby Boomers	-.355*	0.097	0.001	-0.59	-0.12
Generation X	Millennial	.369*	0.069	0	0.2	0.54
	Baby Boomers	0.014	0.101	0.99	-0.23	0.26
Baby Boomers	Millennial	.355*	0.097	0.001	0.12	0.59
	Generation X	-0.014	0.101	0.99	-0.26	0.23
Measure of distance education is exciting						
Millennial	Generation X	-.312*	0.064	0	-0.47	-0.15
	Baby Boomers	-.483*	0.091	0	-0.71	-0.26
Generation X	Millennial	.312*	0.064	0	0.15	0.47
	Baby Boomers	-0.171	0.095	0.196	-0.4	0.06
Baby Boomers	Millennial	.483*	0.091	0	0.26	0.71
	Generation X	0.171	0.095	0.196	-0.06	0.4
Measure of distance education is worth my time						
Millennial	Generation X	-.354*	0.063	0	-0.51	-0.2
	Baby Boomers	-.284*	0.089	0.006	-0.5	-0.07
Generation X	Millennial	.354*	0.063	0	0.2	0.51
	Baby Boomers	0.07	0.092	0.747	-0.16	0.3
Baby Boomers	Millennial	.284*	0.089	0.006	0.07	0.5
	Generation X	-0.07	0.092	0.747	-0.3	0.16
Measure of enjoy studying at a distance						
Millennial	Generation X	-.297*	0.068	0	-0.47	-0.13
	Baby Boomers	-.404*	0.097	0	-0.64	-0.17
Generation X	Millennial	.297*	0.068	0	0.13	0.47
	Baby Boomers	-0.107	0.101	0.57	-0.35	0.14
Baby Boomers	Millennial	.404*	0.097	0	0.17	0.64
	Generation X	0.107	0.101	0.57	-0.14	0.35

Measure of looking forward to learning by distance

Millennial	Generation X	-.402*	0.07	0	-0.57	-0.23
	Baby Boomers	-.473*	0.099	0	-0.72	-0.23
Generation X	Millennial	.402*	0.07	0	0.23	0.57
	Baby Boomers	-0.071	0.103	0.785	-0.32	0.18
Baby Boomers	Millennial	.473*	0.099	0	0.23	0.72
	Generation X	0.071	0.103	0.785	-0.18	0.32

Measure of enjoy more if all my classes were by distance

Millennial	Generation X	-.379*	0.076	0	-0.56	-0.19
	Baby Boomers	-.477*	0.107	0	-0.74	-0.21
Generation X	Millennial	.379*	0.076	0	0.19	0.56
	Baby Boomers	-0.098	0.111	0.681	-0.37	0.18
Baby Boomers	Millennial	.477*	0.107	0	0.21	0.74
	Generation X	0.098	0.111	0.681	-0.18	0.37

Measure of overall satisfaction

Millennial	Generation X	-.166*	0.064	0.034	-0.32	-0.01
	Baby Boomers	-0.152	0.09	0.241	-0.37	0.07
Generation X	Millennial	.166*	0.064	0.034	0.01	0.32
	Baby Boomers	0.014	0.094	0.989	-0.22	0.24
Baby Boomers	Millennial	0.152	0.09	0.241	-0.07	0.37
	Generation X	-0.014	0.094	0.989	-0.24	0.22

Notes: *$p<.05$.

Correlations between Student Satisfaction and the Autonomy Scales

A series of correlations were conducted focusing upon the association between student satisfaction and the autonomy scales. This required a determination of the relational strength between scores on the dimensional scales and the independent variables of generational demographics. To test the strength of these relationships, a Pearson product-moment correlation statistical analysis was completed. Correlation is a measure of the strength of a relationship between two variables. Correlation is reported from 0, representing a random relationship to 1 or -1, representing a perfect relationship, either positive or negative (Garson, 2009). This r, or rho value, is calculated to show a linear relationship between two variables and interpreted as the percent of variance explained by this relationship (McMillan & Schumacher, 2006).

The correlation between student satisfaction and student autonomy and interaction was found to be weak, though positive and achieving statistical significance, $r(1424) = .131$, $p < .001$. Additionally, the correlation conducted between student satisfaction and student autonomy was found to be moderately strong, positive, and achieved statistical significance, $r(1423) = .381$, $p < .001$.

Additional correlations were conducted separately between these measures of autonomy and student satisfaction on the basis of generational status. First, with regard to Baby Boomers, the correlation between student satisfaction and student autonomy was found to be statistically significant and moderate strength, $r(188) = .373$, $p < .001$. Correlation between student satisfaction and student autonomy and interaction was also found to be positive and statistically significant, though weaker in strength, $r(188) = .227$, $p < .01$. Correlation between satisfaction and student autonomy among Generation X respondents was found to be positive, moderately strong, and statistically significant, $r(517) = .408$, $p < .001$.

Additionally, while weak, a positive, statistically significant association was also found between student satisfaction and student autonomy and interaction among these respondents, $r(517) = .114$, $p < .05$. Finally, correlations were conducted between these measures for Millennial Generation respondents. Again, a statistically significant, positive correlation of moderate strength was found between student autonomy and satisfaction, $r(714) = .367$, $p < .001$. Additionally a weak, though statistically significant, positive correlation was found between student autonomy and interaction and student satisfaction among these respondents, $r(715) = .092$, $p < .05$.

Additionally, a linear regression analysis was conducted using student satisfaction as the outcome variable. This analysis included student autonomy and student autonomy and

interaction scales as predictors. Table 37 describes the analysis between student satisfaction (dependent variable) and the student autonomy scale (independent variable). The Beta is used to compare the strength of the effect of each independent variable on the dependent variable. The independent variable with the largest standardized Beta has the strongest effect. Results of the analysis conducted on all respondents found both student autonomy scales do significantly and positively impact student satisfaction. These two predictors were also found to have a significant, positive impact on student satisfaction with regard to the regression analyses conducted on the basis of generational status. Student autonomy and interaction was found to be most important among Baby Boomers and had approximately half the impact among Generation X and Millennial respondents. The effect of student autonomy and student satisfaction was found to be quite similar among all groups of respondents.

Table 37

Regression Analysis of Student Satisfaction on Student Autonomy Scales

Measure	B	S.E.	Beta	t	p
All Respondents[a]					
Student autonomy and Student interaction	1.082	0.213	0.123	5.074	<.001
Student satisfaction and Student autonomy	4.381	0.282	0.378	15.54	<.001
Constant	4.648	1.341		3.466	0.001
Baby Boomers[b]					
Student autonomy and Student interaction	1.741	0.59	0.196	2.948	0.004
Student satisfaction and Student autonomy	3.633	0.679	0.356	5.349	0
Constant	7.410	3.284		2.257	0.025
Generation X[c]					
Student autonomy and Student interaction	0.793	0.344	0.092	2.302	0.022
Student satisfaction and Student autonomy	5.068	0.503	0.403	10.073	0
Constant	3.415	2.354		1.451	0.148
Millennial[d]					
Student autonomy and Student interaction	0.843	0.304	0.096	2.77	0.006
Student satisfaction and Student autonomy	4.105	0.387	0.368	10.621	0
Constant	5.325	1.853		2.873	0.004

Notes: [a]$F_{(2, 1422)} = 135.472$, $p < .001$; $R2 = .160$, Adjusted $R2 = .159$; [b]$F_{(2, 713)} = 59.991$, $p < .001$; $R2 = .144$, Adjusted $R2 = .142$; [c]$F_{(2, 516)} = 54.758$, $p < .001$; $R2 = .175$, Adjusted $R2 = .172$; [d]$F_{(2, 187)} = 20.176$, $p < .001$; $R2 = .177$, Adjusted $R2 = .169$.

Analyses were conducted between instructor support and student satisfaction. With

regard to all respondents, the Pearson's correlation conducted between these two measures was

found to be statistically significant and positive, though weak, $r(1424) = .231$, $p < .001$. Similar results were found with regard to the correlations between these two measures conducted separately based on generational status. First, a statistically significant, positive correlation was found between instructor support and student satisfaction among Baby Boomers, $r(188) = .254$, $p < .001$. A significant correlation of similar size was found with respect to Generation X respondents, $r(517) = .248$, $p < .001$, while a slightly weaker, though still statistically significant, correlation was found with respect to the Millennial Generation, $r(715) = .209$, $p < .001$.

Additionally, a regression analysis was conducted in which instructor support was included as a predictor of student satisfaction. Results of this analysis are summarized in Table 38. With regard to the analysis conducted on all respondents, results indicate that instructor support had a significant, positive impact upon student satisfaction. A statistically significant, positive impact of similar strength was found with regard to the analyses conducted separately on the basis of generational status.

Table 38

Regression Analysis of Student Satisfaction on Instructor Support

Measure	B	S.E.	Beta	t	p
All Respondents[a]					
Instructor support	2.329	0.261	0.231	8.940	<.001
Constant	16.753	1.093		15.329	<.001
Baby Boomers[b]					
Instructor support	2.288	0.635	0.254	3.605	<.001
Constant	18.604	2.669		6.969	<.001
Generation X[c]					
Instructor support	2.466	0.424	0.248	5.820	<.001
Constant	17.361	1.791		9.691	<.001
Millennial[d]					
Instructor support	2.133	0.373	0.209	5.718	<.001
Constant	16.258	1.555		10.457	<.001

Notes: [a]$F(1, 1424) = 79.916$, $p < .001$; $R2 = .053$, Adjusted $R2 = .052$; [b]$F(1, 188) = 12.993$, $p < .001$; $R2 = .065$, Adjusted $R2 = .060$; [c]$F(1, 517) = 33.868$, $p < .001$; $R2 = .061$, Adjusted $R2 = .060$; [d]$F(1, 715) = 32.700$, $p < .001$; $R2 = .044$, Adjusted $R2 = .042$.

Finally, a multiple linear regression analysis was conducted which included all three

predictors (both student autonomy scales as well as instructor support) as predictors of student

satisfaction. These results are summarized in Table 39. With regard to the initial regression

analysis conducted on all respondents, results indicate that all three predictors had significant,

positive impacts upon student satisfaction. With respect to the regressions conducted separately

on the basis of generational status, positive effects were found in all cases, though instructor

support was not found to achieve statistical significance with regard to Baby Boomers, while

autonomy was not significant with respect to Generation X respondents. Finally, instructor support was not found to achieve statistical significance with regard to the analysis conducted on the Millennial Generation.

Table 39

Analysis of Student Satisfaction on Autonomy and Instructor Support

Measure	B	S.E.	Beta	t	p
All Respondents[a]					
Student autonomy and Student interaction	1.01	0.215	0.115	4.687	<.001
Student satisfaction and Student autonomy	4.079	0.313	0.352	13.023	<.001
Instructor support	0.607	0.276	0.06	2.201	0.028
Constant	3.637	1.416		2.569	0.01
Baby Boomers[b]					
Student autonomy and Student interaction	1.735	0.594	0.196	2.922	0.004
Student satisfaction and Student autonomy	3.565	0.876	0.349	4.069	0
Instructor support	0.096	0.775	0.011	0.123	0.902
Constant	7.321	3.371		2.172	0.031
Generation X[c]					
Student autonomy and Student interaction	0.659	0.346	0.077	1.904	0.058
Student satisfaction and Student autonomy	4.602	0.531	0.366	8.67	0
Instructor support	1.118	0.425	0.112	2.632	0.009
Constant	1.159	2.493		0.465	0.642
Millennial[d]					
Student autonomy and Student interaction	0.789	0.309	0.09	2.557	0.011
Student satisfaction and Student autonomy	3.901	0.433	0.35	9.019	0
Instructor support	0.42	0.4	0.041	1.052	0.293
Constant	4.615	1.972		2.34	0.02

Notes: [a]$F_{(3, 1421)} = 92.174$, $p < .001$; $R2 = .163$, Adjusted $R2 = .161$; [b]$F_{(3, 186)} = 13.385$, $p < .001$; $R2 = .178$, Adjusted $R2 = .164$; [c]$F_{(3, 515)} = 39.234$, $p < .001$; $R2 = .186$, Adjusted $R2 = .181$; [d]$F_{(3, 712)} = 40.369$, $p < .001$; $R2 = .145$, Adjusted $R2 = .142$.

Reliability Analyses

Reliability analyses were also conducted on all scale measures included in this study in order to determine the level of internal consistency reliability associated with these measures. In

previous studies conducted by Cook (2005) and Kinshuck(2009), the Cronbach's alpha and test-

retest correlation for ILS scores were 0.61 and 0.75 (active-reflective dimension), 0.78 and 0.81

(sensing-intuitive), 0.70 and 0.60 (visual-verbal), and 0.67 and 0.81 (sequential-global).

Cronbach's alpha results for this research are summarized in the following table. Internal

consistency reliability was found to be acceptably high (alpha > 0.70).

Table 40

Cronbach's Alpha Reliability Analyses

Statistic	Alpha	N of Items
Instructor Support	.906	8
Autonomy	.893	6
Relevance	.923	7
Authentic	.916	5
Satisfaction	.944	8
Active Learning	.838	3
Online Preference	.874	5
Active-Reflective	.740	11
Sensing-Intuitive	.696	11
Visual-Verbal	.717	11
Sequential-Global	.813	11

Summary

This chapter presented the results of the study complied after surveying student

populations enrolled in online courses from twelve higher education institutions across Montana.

The participants were asked to complete the Index of Learning Style questionnaire composed of

a 44 question instrument designed to assess learning along with the Distance Education Learning

Environment Survey (DELES) Instrument designed to examine students' preferential

satisfactions associated with online education. Data collection resulted in a total of 1426 (n)

completed survey returns, a 14% return rate out of a surveyed population of 9,938 accessible

online students. According to the analysis of the results there were approximately three times the

female respondent to that of male respondents. Of the students responding, 43.1% had engaged

in over six online courses. Examination of generational learning styles found that there were

signification differences with regard to visual-verbal but no notable differences with other ILS

quadrants. Analysis of generational differences found that specific indicators such as autonomy

and instructor support had statistically significant, positive impacts upon student satisfaction.

Further, mean scores associated with subsets of student satisfaction were found to be

significantly lower among the Millennial Generation as compared with Generation X and Baby

Boomer respondents. Chapter five presents these findings in relationship to the study and

research question. Recommendations for practice and future research are also offered.

CHAPTER 5

Conclusion and Recommendations

Generational differences are widely discussed in the media and within educational research (Allen & Seaman, 2010; Coates 2007; Davis, Pawloski, & Houston, 2006; Greer, 2010; Hartman, Moskal, & Dziuban, 2005; Strauss & Howe, 1991). For the past six years, online enrollments have been growing substantially faster than overall higher education enrollments. This growth shows an increase of more than 6.1 million students taking at least one online course during the fall 2010 term than during the previous fall term; this is an increase of 560,000 students over the number reported the previous year (Allen & Seaman, 2011). With this growth, student populations associated within online education are becoming more diverse in age, educational background, and cultural traits (Allen & Seaman, 2011; Dabbagh & Bannan-Ritland, 2005). Leadership and instructional faculty in higher education are faced with uncertainty as to how to address the generational differences (Greer, 2010). Rapid growth of online education coupled with increased competition for students by different distance education programs has created competition that leadership must address so that focus is not only focused on program development but also student satisfaction in order to maintain retention within these programs (Greer, 2010; Lin & Overbaugh 2007; Sheard & Markham, 2005).

This research offers instructional leadership insights into the examination of these generational groups. It further provides an important understanding about how these students' learning styles associated with the generational groups may be related to their satisfaction with the growing number of online education courses offered within the educational setting.

Purpose and Procedures

The purpose of this study was to determine whether students associated with a generational group as described by Strauss and Howe (1991a), exhibit distinct learning styles as identified through the use of the Felder and Soloman Index of Learning Styles instrument. The secondary purpose was to determine to what degree these generational groups rate their satisfaction with online education. The researcher used quantitative methods to study the generational cohorts' learning styles as identified through the use of a web-based Index of Learning Style questionnaire (ILS) developed originally by Richard Felder and Linda Silverman in 1988 and upgraded in association with Barbara Soloman. The web-based Distance Education Learning Environment Survey (DELES) instrument was also administered in order to analyze generational cohorts' satisfaction with online education courses. Descriptive statistics and ANOVAS were conducted to look for relationships between generational identification, the four Index of Learning Style domain scales and the DELES satisfaction. To test the relationship strength of the DELES student satisfaction subsets, a Pearson product-moment correlation statistical analysis was completed to measure relationship strength between two variables.

Discussion of Data Analysis by Research Question

The following section discusses the research questions which examine the relationships between generational learning styles and measures of student satisfaction within online courses. For the next part of this chapter, the use of various statistical tests such as descriptive statistics, Analysis of Variance and correlations were conducted to test the hypotheses as described in Chapter Four. The collected data in this study was analyzed to address the following research question:

What, if any, relationships exist among learning styles, generational groups, and satisfaction with online learning?

Examination of Hypothesis

The two specific hypotheses addressed by the analyses of collected data in this study are the following:

H_1) There is a difference in perceived learning style based on Felder and Soloman ILS in online courses reported among Baby Boomer, Generation X, and Millennial Generation students.

$H1_0$) There is no difference in perceived learning style based on Felder and Soloman ILS in online courses reported among Baby Boomer, Generation X, and Millennial Generation students.

An examination of the first hypothesis indicated a relationship between generational groups with a difference between groups towards the Visual-Verbal learning style indicator. Statistically significant differences were found between Baby Boomers and the Millennial Generation as well as Generation X. Baby boomers were found to have significantly lower scores on this subscale as compared with both the Millennial Generation and Generation X. The null hypothesis is rejected because statistically significant differences were found to exist between the generational groups regarding the Visual – Verbal learning style indicator. No other statistically significant differences related to preference for one learning style over another learning style was determined between generational groups.

The second hypothesis stated:

$H2_1$) There is a difference in overall satisfaction in online courses reported among Baby Boomer, Generation X, and Millennial Generation students.

H2$_0$) There is no difference in overall satisfaction in online courses reported among Baby

Boomer, Generation X, and Millennial Generation students.

In view of the current status of generational differences and learning satisfaction

research, this study found that there were significant mean difference score comparisons among

the Millennial generation, Generation X, and Baby Boomers. Specifically, the Millennial

Generation reported lower scores on overall satisfaction survey components as compared with

both Generation Xers and Baby Boomers as described Chapter Four.

Further, when evaluating the generational groups based on the predictors of student

autonomy and interaction as an indicator, these two predictors were found to have a statistically

significant, positive impact on student satisfaction. The findings indicate that student autonomy

and interaction was found to be most important among Baby Boomers and had approximately

half the impact among Generation X and Millennial respondents. Based on these findings, a

relationship exists between students' generational groupings and satisfaction with their online

education course as measured by the DELES instrument. Therefore, the second null hypothesis

was rejected.

Implications

With online education continuing to grow within higher education, there is continued

need to critically examine and meet student needs. Although the literature supports conclusions

that distance students achieve equivalent learning outcomes to those in the traditional face-to-

face classroom barriers still exist. Existing barriers identified in the work of Mulienburg and

Berge (2005) include feelings of isolation and lack of social interaction by students. Research

conducted by Jaggars (2011) and Mandernach, Donnelli, and Dailey-Herbert (2006) as well as

Simons, et. al, (2009) also indicate that the general lack of instructor interaction and support

were direct predictors of success in the online environment. Statements made by Peter Drucker in 1995 about higher education campuses needing to address instructional delivery methodologies and change or become relics of the past (Lenzer & Johnson, 1997) are now echoed in Clayton M. Christensen and Henry J. Eyring's book "*The Innovative University*". In looking at the delivery of education through Christiansen's "*theory of disruptive innovation*," university systems must continue to reevaluate delivery and instructional methodologies that they use in order to prepare students for the workplace. If university systems are not preparing, they will give way to more innovative educational models.

This study indicates the need for development of improvement in online education cognizant of differing needs within different generations of students. In each generational group, many participants reported mild preferences on one side or the other of each learning style preference. The one exception was visual-verbal. In this learning style preference, the Baby Boomer population was more heavily tilted toward verbal preference. In this study there were substantially more moderate preferences on one side of the dimension than on the other, and those imbalances are interesting and have important implications for teaching. However, they are generally not enough to make a great difference in the categorization of a group's preference.

Diaz and Cartnal (1999) wrote: "One of the first things we teachers can do to aid the learning process is simply to be aware that there are diverse learning styles in the student population" (p. 130). A growing body of evidence indicates that generational group exhibit different learning and satisfaction characteristics. This evaluation of students is tied directly to the seven principles for good practice in education as outlined by Chickering and Gamson (1997). These practices encourage; (a) contact between students and faculty (b) active learning; (c) increased cooperation between students; (d) providing prompt feedback; (e) communication

of high expectations; (f) emphasis upon time on task; and (g) respect for diverse ways of learning and talents. It is within this new context that faculty and institutions may find it valuable to ask how well they know and understand their student population. How these student populations are addressed will almost undoubtedly affect how student populations are retained.

Each of the generational cohort groups presented a mixture of learning and satisfaction preferences. When looking at correlations between student autonomy, interaction and student satisfaction all generational groups were found to exhibit positive statistically significant relationships. Educators as well as school administrators have expressed agreement that individual differences and the changing demographical characteristics of learners play an important role in learning. This understanding, then, supports awareness in the adoption and implementation of technologies and instructional practices (Christensen, Johnson, & Horn, 2010; Dede, 2006; Felder & Silverman, 1988; Knowles, 1980).

Recommendations for Further Research and Conclusion

This study focused on the relationship between generational groups as defined by Strauss and Howe (1991), their identified learning styles, and reported satisfaction of online learning. Several recommendations for future research can be made.

Between generational groups this study showed a slight significance of preference for the visual verbal learning style over another learning style. However, some segments of generational groups showed a wide diversity of learning styles preference within each group. With increased diversity in online learning management systems (LMS) delivering online courses, the examination of course elements and technology related to these groups should be examined. This examination could include designing objectively similar courses to be implemented on different learning management system platforms to see if an effect on satisfaction and learning style is

found. A further investigation associated with technology is to use instructional design practices that design two parallel courses with differing learning styles in mind in order to study student satisfaction and retention rates.

Thiele (2003) has noted the importance of identifying student learning styles and adapting online course design to accommodate these styles. Future research could be conducted to examine if providing students with an awareness of their own learning style preference would affect their satisfaction with online education courses. This study then could be followed by examining this increased satisfaction and if this increased satisfaction resulted in higher retention and grades for the course compared to a control group that was not informed of its learning style preferences.

A similar study is recommended to examine if instructor awareness of learning style research may affect an instructor's ability to design and teach an online course. Pollaff and Pratt (2007) explain that in order to increase student satisfaction, instructors and universities need to focus on the learning community within the online course. Would this increased ability to design a course towards learning styles increase student satisfaction within the course?

Another recommendation for future research would be to examine instructor training in relationship to teaching an online course. Results of this study indicate that instructor support had a statistically significant, positive impact upon student satisfaction. As online learning continues to progress in student numbers and offerings, instructors will most likely be held to a higher standard of excellence, driving increased demand for tech-savvy instructors. What is not known is how the direct impact of instructor training on an LMS relates to identified student satisfaction of a course.

The results of this study also identified measurable differences in student satisfaction based on instructional strategies. For example, a study is recommended to evaluate generational student satisfaction in a course designed with an emphasis towards student autonomy compared to a course designed towards collaboration. This information could then be used by instructors and instructional designers to apply alternative delivery methods to better align with student learning preferences.

The act of learning is based on the individual's biological processes to establish neural pathways for learning. Future research is suggested to examine the newest generation entering colleges known as the Net Generation which has been raised in a technologically rich society. Additional research based on the work of Small, Moody, Siddarth, and Bookheimer (2009), could focus on not only differences with older generations but also examine if neural pathways are increased through being taught by a preferred learning style compared to a individuals non-preferred learning style.

This researcher also recommends conducting additional studies that use a mixed method approach to examine the role of learning styles and satisfaction as they relate to online education. According to Creswell, Plano, Clark, Gutmann, and Hanson (2003), a mixed method approach enables the participant to have a "voice" while removing potential bias that could occur from a strictly qualitative study.

Parting Thought

Education, in various forms, has presented itself as a medium in which to impart and improve the knowledge of students. In recent years online education within institutions of higher education has experienced and continues to experience a rapid and continual growth. It is the desire of this researcher that future researchers will use this information to examine and

investigate the structure of online course design that identifies students' learning style preferences in order to address student satisfaction and retention rates in the online environment. It is not enough to develop an awareness of student learning styles, and the associated learning style preference of a student population by the instructor. This understanding must translate into evolving learning and instructional strategies, respectively. A major reason for learning style awareness is the need for instructors, and course developers to broaden their understanding of learner preferences in order to be more effective in creating stimulating learning environments. Additional research is needed in order to design and structure online learning environments based on those styles. Introducing online technology alone is not a solution. The large educational gain associated with these diverse generational groups comes when new technologies are combined with new ways of teaching. It is believed that through an increased understanding, the design and implementation will improve the satisfaction and quality of online education learning experiences for generations to come.

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APPENDICES

Appendix A: Permission to Conduct Campus Research Sample Letter

Date
Dean [*name*]
[*Institution*]
Address

RE: Permission to Conduct Research Study

Dear Dean [*name*]:

My name is Chad Williams, and I am currently a doctoral candidate within the Educational Leadership program at The University of Montana, and am in the process of writing my dissertation. I am writing to request permission to disseminate a research survey to students at [*institutional name*].   The dissertation study that I am working on is entitled "Generational Perspective of Montana Higher Education Online Student Learning Styles". Questions about this study can be directed to me or to my dissertation chair, Dr. John Matt at The University of Montana, Department of Educational Leadership, 406-243-5610, john.matt@umontana.edu.

The purpose of this study is to determine if students associated with a generational group as described by Strauss and Howe (1991a), exhibit different learning styles as identified through the use of the Felder and Soloman Index of Learning Styles instrument. The secondary purpose is to determine to what degree these generational groups rate their satisfaction with online education.

I am hereby seeking your consent to obtain student email addresses for all students who are enrolled in one or more online course within [*institutions name*]. These email addresses will be used to contact the student with an invitation to participate in this study. This information will instruct the participants that completing the survey is voluntary and that they may refuse to participate or withdraw at any time. They will further be informed that the survey will take approximately eight to twelve minutes of their time. During the initial contact, the participants will be provided with the rational for the study. Further, participants will be informed that their confidentiality will be protected as well as that of the school in which they are associated, and result will be calculated only in an aggregated form.
The participant's electronic survey responses will be collected through the use of web survey software created by zoomerang.com®. The initial component of the online survey will be a disclosure and consent form. Participants will not be able to proceed with the survey until after acknowledgment has been selected. The initial section of this survey will include general demographic information. The second section will be the Felder and Soloman Index of Learning Style instrument (ILS) and the Distance Education Learning Environments survey (DELES). These tools will be used to identify the learners' preferred learning style and perspective preferences associated within their learning environment.
This information will be coded to an assigned alphanumerically coded web link provided in the correspondence inviting the participants into the research study so as to protect the participant's

confidentiality. At any time during this survey, participants will be able to exit the survey. Upon completion of the survey, collected data will be transmitted to the researcher via zoomerang.com software into the researcher's purchased secure data account.

For those participants wishing to obtain a paper copy of the survey, a contact link will be included within the electronic email invitation. Participates will be provided with instructions explaining the procedures on how to return the survey form. Return of the survey will be accomplished both though the use of confidential electronic submissions as well as the use of surface mail using a supplied physical mailing address.

The researcher will further inform and record each participant's consent through an electronic signature. This consent will protect the confidentiality and anonymity of the participants as well as the Montana University System Campus where the participant is enrolled in the online course.

Your institutions approval to conduct this study will be greatly appreciated. I will follow up with a telephone call next week and would be happy to answer any questions or concerns that you may have at that time. I have included my contact information at the end of this request.

If you agree, please sign below and return the signed form in the enclosed self-addressed envelope. Alternatively, kindly submit a signed letter of permission on your institution's letterhead acknowledging your consent and permission for me to conduct this survey/study at your institution.

Sincerely,

Chad James Williams
Doctoral Candidate
The University of Montana – Department of Educational Leadership

Chad Williams
712 Darby Street #2
Helena, Montana 59601
1(406) 370-9844 Cell
1(406) 444-3813 Office
chadjwilliamsmt@gmail.com

Enclosure

cc:
Dr. John Matt, Dissertation Chair
The University of Montana, Department of Educational Leadership

I _____ on behalf of the [*institutions name*], I am writing to formally indicate our awareness of the research proposed by Chad James Williams, a Doctoral

Student at The University of Montana in the Department of Educational Leadership. We are aware that Chad James Williams intends to conduct his research by obtaining a list of student emails that are enrolled in one or more online courses within [*institutions name*]. This list will then be used to initiate contact with an invitation to participate in the web based research survey. It is also acknowledged that there will be a second follow-up email invitation for student participation in the event that the first email invitation is not responded to in the survey. If the student prefers to not participate in the study or does not wish to receive the second email invitational a link will be provided to automatically remove their email from the mailing list.

Institutional Representatives name: _____

Title of Institutional Representative: _____

Date of acceptance of request to conduct study: _____

Appendix B: Invitation to Participate Student Cover Email Letter

Dear Student,

Hello my name is Chad Williams. I am a doctoral candidate within The University of Montana Educational Leadership program, and I am in the process of writing my dissertation. As a requirement for completion of my doctoral degree, I am working on a dissertation entitled "*Generational Perspective of Montana Higher Education Online Student Learning Styles*".

You were selected to participate in this study because you have been identified by your institution as being enrolled in one or more online courses. This study will require input from students such as you from the various Montana Colleges and Universities across the state through a Web-based survey. I would be very grateful if you could take a few minutes to respond to the Web-based survey questionnaire linked at the bottom of this email.

The purpose of this study is to determine if students associated with a generational group as described by Strauss and Howe (1991a), exhibit different learning styles as identified through the use of the Felder and Soloman Index of Learning Styles instrument. The secondary purpose is to determine to what degree these generational groups rate their satisfaction with online education.

By participating in this research study, it is not anticipated that you will experience any personal risks. In fact, your institution could possibly benefit from the results of the study. Your valuable input in this study may help identify factors with which to address components of providing online education courses.

Participation in this research study is voluntary. The survey will take approximately ten to fifteen minutes of your time. You are free to decide not to participate in this study or to withdraw at any time without adversely affecting your relationship with the investigators, or the University of Montana, or your institution. All collected responses will be coded to an assigned alphanumerically coded web link so as to protect the participant's confidentiality.

Please accept my sincere thank you in advance for your cooperation in this study. There is no reward for your effort other than the knowledge that you have helped a graduate student complete his dissertation and that you have contributed to further research associated with distance education and generational learning styles.

If you have any questions about this study, please contact Chad Williams at (406) 370-9844 or email chadjwilliamsmt@gmail.com. If you have any questions about your rights as a research participant that we have not answered, or to report any concerns about the study, you may contact the University of Montana Institutional Review Board at (406) 243-6672.

Your help in completing the Web-based questionnaire will be greatly appreciated.

The link to this survey: https://www.zoomerang.com/Survey/U2MWTWZMS62X

Thank you again for your time and helping me with this endeavor,

Chad Williams
Doctoral Candidate
The University of Montana - Department of Educational Leadership
Email: chadjwilliamsmt@gmail.com
Phone: (406) 444-3813

University of Montana Research IRB approval number: IRB217-11

NOTE: If for any reason you prefer not to participate in this study and do not wish to receive further emails from us, please click the link below, and you will be automatically removed from our mailing list. http://app.zoomerang.com/Home/OptOut.aspx?p=U2MWTWZMS62X

Appendix C: Second Invitation to Participate Email Letter

Dear Student,

Hello my name is Chad Williams, and I am a doctoral candidate within The University of Montana Educational Leadership program, and I am in the process of writing my dissertation. As a requirement for completion of my doctoral degree, I am working on a dissertation entitled "*Generational Perspective of Montana Higher Education Online Student Learning Styles*".

You were selected to participate in this study because you have been identified by your institution as being enrolled in one or more online courses. The study will require input from students such as you from the various Montana Colleges and Universities across the state through a Web-based survey. I would be very grateful if you could take a few minutes to respond to the Web-based survey questionnaire linked at the bottom of this email.

During the last month I have been collecting data on an important research study I am conducting for completion of my dissertation and for examining online education for higher education students within the state of Montana

The purpose of this study is to determine if students associated with a generational group as described by Strauss and Howe (1991a), exhibit different learning styles as identified through the use of the Felder and Soloman Index of Learning Styles instrument. The secondary purpose is to determine to what degree these generational groups rate their satisfaction with online education.

I am sending this final contact because of our concern that students who have not responded may have had different experiences than those who have. Hearing from every student who is enrolled in an online course will help assure that the survey results are as accurate as possible. I also want to assure you that your response to this study is voluntary, and if you prefer not to respond that is acceptable.
Participation in this research study is voluntary. The survey will take approximately eight to twelve minutes of your time. You are free to decide not to participate in this study or to withdraw at any time without adversely affecting your relationship with the investigators, or the University of Montana, or your institution. All collected responses will be coded to an assigned alphanumerically coded web link so as to protect the participant's confidentiality.
I appreciate your willingness to consider the request as I conclude this effort to better understand the generational aspects of online student learning styles and their satisfaction within online courses. Please accept my sincere thank you in advance for your cooperation in this study.

Your help in completing the Web-based questionnaire will be greatly appreciated.

Here is the link to the survey: https://www.zoomerang.com/Survey/U2MWTWZMS62X

If you have any questions about this study, please contact Chad Williams at (406) 370-9844 or email chadjwilliamsmt@gmail.com or to my dissertation chair, Dr. John Matt at The University of Montana, Department of Educational Leadership, 406-243-5610, john.matt@umontana.edu .

If you have any questions about your rights as a research participant that we have not answered, or to report any concerns about the study, you may contact the University of Montana Institutional Review Board at (406) 243-6672.Thanks again for your time and helping me with this endeavor,

Chad Williams
Email: chadjwilliamsmt@gmail.com
Phone: (406) 444-3813

The University of Montana Research IRB approval number: IRB217-11

NOTE: If for any reason you prefer not to participate in this study and do not wish to receive further emails from us, please click the link below, and you will be automatically removed from our mailing list. http://app.zoomerang.com/Home/OptOut.aspx?p=U2MWTWZMS62X

Appendix D: Final Invitation to Participate Email Letter

Dear Student,

Hello my name is Chad Williams, and I am a doctoral candidate within The University of Montana Educational Leadership program. As a requirement for completion of my doctoral degree, I am working on a dissertation entitled "*Generational Perspective of Montana Higher Education Online Student Learning Styles*".

You were selected to participate in this study because you have been identified by your institution as being enrolled in one or more online courses. The study will require input from students such as you from the various Montana Colleges and Universities across the state through a Web-based survey. I would be very grateful if you could take a few minutes to respond to the Web-based survey questionnaire linked at the bottom of this email.

The purpose of this study is to determine if students associated with a generational group as described by Strauss and Howe (1991a), exhibit different learning styles as identified through the use of the Felder and Soloman Index of Learning Styles instrument. The secondary purpose is to determine to what degree these generational groups rate their satisfaction with online education.

Hearing from every student who is enrolled in an online course will help assure that the survey results are as accurate as possible. I also want to assure you that your response to this study is voluntary, and if you prefer not to respond that is acceptable.

Participation in this research study is voluntary. The survey will take approximately eight to twelve minutes of your time. You are free to decide not to participate in this study or to withdraw at any time without adversely affecting your relationship with the investigators, or the University of Montana, or your institution. All collected responses will be coded to an assigned alphanumerically coded web link so as to protect the participant's confidentiality.

I appreciate your willingness to consider the request as I conclude this effort to better understand the generational aspects of online student learning styles and their satisfaction within online courses. Please accept my sincere thank you in advance for your cooperation in this study.

Your help in completing the Web-based questionnaire will be greatly appreciated.

Here is the link to the survey: https://www.zoomerang.com/Survey/U2MWTWZMS62X

If you have any questions about this study, please contact Chad Williams at (406) 370-9844 or email chadjwilliamsmt@gmail.com or to my dissertation chair, Dr. John Matt at The University of Montana, Department of Educational Leadership, 406-243-5610, john.matt@umontana.edu . If you have any questions about your rights as a research participant that we have not answered, or to report any concerns about the study, you may contact the University of Montana Institutional Review Board at (406) 243-6672.Thanks again for your time and helping me with this endeavor,

Thanks again for your time and helping me with this endeavor,

Chad Williams
Email: chadjwilliamsmt@gmail.com
Phone: (406) 444-3813

The University of Montana Research IRB approval number: IRB217-11

NOTE: If for any reason you prefer not to participate in this study and do not wish to receive further emails from us, please click the link below, and you will be automatically removed from our mailing list. http://app.zoomerang.com/Home/OptOut.aspx?p=U2MWTWZMS62X

Appendix E: Demographic Information to be collected

Gender:
☐Male
☐Female

Select your Birth Year Group:
☐ Millennial Generation 1982-2001
☐ Generation X 1961-1981
☐ Baby Boomer Generation 1943-1960
☐ Silent Generation 1925 - 1942

Overall Grade Point Average (GPA):
☐ (4.0 – 3.5)
☐ (3.49 – 3.0)
☐ (2.99 – 2.5)
☐ (2.49 – 2.0)
☐ (1.99 – 1.5)
☐ (1.49 – 1.0)
☐ (0.99 – 0)

Ethnicity:
☐American Indian or Alaskan Native
☐Asian
☐Black or African American
☐Hawaiian or Pacific Islander
☐Hispanic
☐White Caucasian
☐Other

Number of Online Education Classes that you have taken including the ones in which you are currently enrolled:
☐1
☐2
☐3
☐4
☐5
☐6 or more

Level of Study:
☐Certificate program   ☐Associate Degree   ☐Bachelor Degree
☐Master Degree   ☐Doctoral Degree   ☐Other : _____

Appendix F: Index of Learning Styles Instrument

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.

Appendix G: Distance Education Learning Environments Survey (DELES)

Preferred Form

This survey contains 42 statements about how you prefer practices to take place in this class, followed by eight statements regarding your opinion about distance education.

There are no 'right' or 'wrong' answers. Your opinion is what is wanted on each item. Please think about how well each statement describes what this class could be like for you.

In this class, I prefer that...	Never	Seldom	Sometimes	Often	Always
1. If I have an inquiry, the instructor finds time to respond.					
2. The instructor helps me identify problem areas in my study.	●	●	●	●	●
3. The instructor responds promptly to my questions.	●	●	●	●	●
4. The instructor gives me valuable feedback on my assignments.	●	●	●	●	●
5. The instructor adequately addresses my questions.	●	●	●	●	●
6. The instructor encourages my participation.	●	●	●	●	●
7. It is easy to contact the instructor.	●	●	●	●	●
8. The instructor provides me positive and negative feedback on my work.	●	●	●	●	●

In this class I prefer to...	Never	Seldom	Sometimes	Often	Always
9. Work with others.	●	●	●	●	●
10. Relate my work to other's work.	●	●	●	●	●
11. Share information with other students.	●	●	●	●	●
12. Discuss my ideas with other students.	●	●	●	●	●
13. Collaborate with other students in the class.	●	●	●	●	●
14. that group work is a part of my activities.	●	●	●	●	●

In this class I prefer that…	Never	Seldom	Sometimes	Often	Always
15. I can relate what I learn to my life outside of university.	●	●	●	●	●
16. I am able to pursue topics that interest me.	●	●	●	●	●
17. I can connect my studies to my activities outside of class.	●	●	●	●	●
18. I apply my everyday experiences in class.	●	●	●	●	●
19. I link class work to my life outside of university.	●	●	●	●	●
20. I learn things about the world outside of university.	●	●	●	●	●
21. I apply my out-of-class experience.	●	●	●	●	●

In this class I prefer that…	Never	Seldom	Sometimes	Often	Always
22. I study real cases related to the class.	●	●	●	●	●
23. I use real facts in class activities.	●	●	●	●	●
24. I work on assignments that deal with real-world information.	●	●	●	●	●
25. I work with real examples.	●	●	●	●	●
26. I enter the real world of the topic of study.	●	●	●	●	●

In this class I prefer that…	Never	Seldom	Sometimes	Often	Always
27. I explore my own strategies for learning.	●	●	●	●	●
28. I seek my own answers.	●	●	●	●	●
29. I solve my own problems.	●	●	●	●	●

In this class I prefer that…	Never	Seldom	Sometimes	Often	Always
30. I make decisions about my learning.	●	●	●	●	●

31. I work during times I find convenient.	●	●	●	●	●
32. I am in control of my learning.	●	●	●	●	●
33. I play an important role in my learning.	●	●	●	●	●
34. I approach learning in my own way.	●	●	●	●	●

The following items refer to your preferences about satisfaction with distance education.	Never	Seldom	Sometimes	Often	Always
35. Distance education is stimulating.	●	●	●	●	●
36. I prefer distance education.	●	●	●	●	●
37. Distance education is exciting.	●	●	●	●	●
38. Distance education is worth my time.	●	●	●	●	●
39. I enjoy studying by distance.	●	●	●	●	●
40. I look forward to learning by distance.	●	●	●	●	●
41. I would enjoy my education more if all my classes were by distance.	●	●	●	●	●
42. I am satisfied with this class.	●	●	●	●	●

Appendix H: Index of Learning Styles Scoring Sheet

1. Put "1"s in the appropriate spaces in the table below (e.g. if you answered "a" to Question 3, put a "1" in Column A by Question 3).

2. Total the columns and write the totals in the indicated spaces.

3. For each of the four scales, subtract the smaller total from the larger one. Write the difference (1 to 11) and the letter (a or b) for which the total was larger on the bottom line.

   For example, if under "ACT/REF" you had 4 "a" and 7 "b" responses, you would write "3b" on the bottom line under that heading.

4. On the next page, mark "X"s above your scores on each of the four scales.

ACT/REF	SNS/INT	VIS/VRB	SEQ/GLO
Q a b	Q a b	Q a b	Q a b
1 ___ ___	2 ___ ___	3 ___ ___	4 ___ ___
5 ___ ___	6 ___ ___	7 ___ ___	8 ___ ___
9 ___ ___	10 ___ ___	11 ___ ___	12 ___ ___
13 ___ ___	14 ___ ___	15 ___ ___	16 ___ ___
17 ___ ___	18 ___ ___	19 ___ ___	20 ___ ___
21 ___ ___	22 ___ ___	23 ___ ___	24 ___ ___
25 ___ ___	26 ___ ___	27 ___ ___	28 ___ ___
29 ___ ___	30 ___ ___	31 ___ ___	32 ___ ___
33 ___ ___	34 ___ ___	35 ___ ___	36 ___ ___
37 ___ ___	38 ___ ___	39 ___ ___	40 ___ ___
41 ___ ___	42 ___ ___	43 ___ ___	44 ___ ___

Total (sum X's in each column)

ACT/REF	SNS/INT	VIS/VRB	SEQ/GLO
a b	a b	a b	a b
___ ___	___ ___	___ ___	___ ___ *

(Larger – Smaller) + Letter of Larger (see below)

_____   _____   _____   _____

Appendix I: DELES Instrument Usage Permission Letter

Scott L. Walker, ScEdD
397 S. Willow Ave.
New Braunfels, TX 78130
USA
walkstx@gmail.com

DELES Permission Letter

Chad William has been granted permission to use the Distance Education Learning Environments Survey (DELES) for the purpose of the proposed doctoral study: ***Generational Perspective of Montana Higher Education Online Student Learning Styles*** through the University of Montana with the following usage rights being granted.

One time U.S. rights for Web posting of the Preferred, Actual, and Instructor forms of the DELES to be removed from the Web no later than August 1, 2012.

The DELES and its versions and derivatives are copyright protected. When the DELES is published or presented in non-commercial use, you must mention Scott L. Walker as the copyright holder of the instrument in this format:

© 2004-2021 Scott L. Walker Used with permission

_____   October 14, 2011
Scott L. Walker , ScEdD   Date

Appendix J: Index of Learning Styles Certification of Educational Affiliation

Click on whichever bullet is appropriate.

√ I am affiliated with an educational institution and plan to administer the Index of Learning Styles only as part of my teaching, advising, staff development, and/or research activities with that institution.

__ If you are affiliated with an organization other than an educational institution or you are in business for yourself and wish to administer the ILS to your colleagues, employees, or clients, or if you are with an educational institution and wish to administer it to anyone other than students, advisees, or educational research subjects, please contact Mr. Warren G. Sasser of the N.C. State Technology Transfer Office, *sasser@gw.fis.ncsu.edu*, to purchase a license.

Index of Learning Styles

LICENSE FOR USE AT EDUCATIONAL INSTITUTIONS FOR EDUCATIONAL PURPOSES

This license relates to the "Index of Learning Styles" and associated documentation (ILS questionnaire, scoring key, report form, and "Learning Styles and Strategies" handout, collectively referred to as "Material"). Permission is hereby granted, free of charge, to use the Material without restriction, including without limitation the rights to use, copy, and distribute copies of the Material for the internal use of your institution for teaching, advising, staff development, and/or research, subject to the following conditions:

1. The copyright notice,

   Copyright © 1991 North Carolina State University (Authored by Richard M. Felder and Barbara A. Soloman). Reprinted by permission of North Carolina State University

   must be included in all copies of substantial portions of the Material.

2. The Material will not be distributed outside your institution, or used within the institution for any purposes but teaching, advising, staff development, and research.

3. The material is provided "as is," without warranty of any kind, express or implied, including but not limited to the warranties of merchantability, fitness for a particular purpose and noninfringement. In no event shall the authors or copyright holders be liable for any claim, damages or other liability, whether in an action of contract, tort or otherwise, arising from, out of or in connection with the material or the use or other dealings in the material.

http://www4.ncsu.edu/unity/lockers/users/f/felder/public/ILSdir/ILS-certification.html

Appendix K: Index of Learning Styles instrument Usage Permission Letter

From Richard Felder rmfelder@mindspring.com

to	Chad Williams <chadjwilliamsmt@gmail.com>
cc	sasser@gw.fis.ncsu.edu
date	Thu, Oct 27, 2011 at 2:42 PM
subject	Re: Permission to use the ILS instrument for doctoral work
signed-by	mindspring.com
	Important mainly because it was sent directly to you.

Dear Mr. Williams,

You may consider this message permission to use the ILS as you've indicated below.

The fact that you attached the document you did and copied Gerry Sasser in your message tells me that you've checked the FAQ file about the ILS on my website. If you have not already done so, you might also find it useful to go again to my website (URL below) and check the references at the link to "Learning Styles."

Sincerely,

Richard M. Felder
Hoechst Celanese Professor Emeritus of Chemical Engineering
N.C. State University
http://www.ncsu.edu/effective_teaching

Appendix L: University of Montana IRB 217-11 Exempt approval

The University of
Montana

INSTITUTIONAL REVIEW BOARD
for the Protection of Human Subjects
FWA 00000078

Research & Development
University Hall 116
The University of Montana
Missoula MT 59812
Phone 406-243-6670 | Fax 406-243-6330

Date: January 4, 2012

To: Chad Williams/John Matt, EDLD

From: ☒ Paula Baker, IRB Coordinator
         ☐ Dan Corti, IRB Chair

RE: IRB 217-11: "Generational Perspective of MT Higher Education Online Student Learning Styles"

Your IRB proposal cited above is **exempt** from the requirement of review by the Institutional Review Board in accordance with the Code of Federal Regulations, Part 46, section 101. The specific paragraph which applies to your research is:

___(b)(1) Research conducted in established or commonly accepted educational settings, involving normal educational practices, such as (i) research on regular and special education instructional strategies, or (ii) research on the effectiveness of or the comparison among instructional techniques, curricula, or classroom management methods.

_X_(b)(2) Research involving the use of educational tests (cognitive, diagnostic, aptitude, achievement), survey procedures, interview procedures or observation of public behavior, unless: (i)Information obtained is recorded in such a manner that human subjects can be identified, directly or through identifiers linked to the subjects; and (ii) any disclosure of the human subjects' responses outside the research could reasonably place the subjects at risk of criminal or civil liability or be damaging to the subjects' financial standing, employability, or reputation.

___(b)(3) Research involving the use of educational tests (cognitive, diagnostic, aptitude, achievement), survey procedures, interview procedures, or observation of public behavior that is not exempt under paragraph (b)(2) of this section, if: (i) The human subjects are elected or appointed public officials or candidates for public office; or (ii) federal statute(s) require(s) without exception that the confidentiality of the personally identifiable information will be maintained throughout the research and thereafter.

___(b)(4) Research, involving the collection or study of existing data, documents, records, pathological specimens, or diagnostic specimens, if these sources are publicly available or if the information is recorded by the investigator in such a manner that subjects cannot be identified, directly or through identifiers linked to the subjects.

___(b)(5) Research and demonstration projects which are conducted by or subject to the approval of department or agency heads, and which are designed to study, evaluate, or otherwise examine: (i) Public benefit or service programs; (ii) procedures for obtaining benefits or services under those programs; (iii) possible changes in or alternatives to those programs or procedures; or (iv) possible changes in methods or levels of payment for benefits or services under those programs.

___(b)(6) Taste and food quality evaluation and consumer acceptance studies, (i) if wholesome foods without additives are consumed or (ii) if a food is consumed that contains a food ingredient at or below the level and for a use found to be safe, or agricultural chemical or environmental contaminant at or below the level found to be safe, by the Food and Drug Administration or approved by the Environmental Protection Agency or the Food Safety and Inspection Service of the U.S. Department of Agriculture.

University of Montana IRB policy does not require you to file an annual Continuation Report (Form RA-109) for exempt studies. However, you are required to timely notify the IRB if there are any significant changes or if unanticipated or adverse events occur during the study, if you experience an increased risk to the participants, or if you have participants withdraw from the study or register complaints about the study.

Form RA-108
(Rev. 11/11)

THE UNIVERSITY OF MONTANA-MISSOULA
Institutional Review Board (IRB)
for the Protection of Human Subjects in Research
CHECKLIST / APPLICATION

IRB Protocol No.:
217-11

At The University of Montana (UM), the Institutional Review Board (IRB) is the institutional review body responsible for oversight of all research activities involving human subjects outlined in the U.S. Department of Health and Human Services Office of Human Research Protection (www.hhs.gov/ohrp) and the National Institutes of Health, Inclusion of Children Policy Implementation (http://grants.nih.gov/grants/funding/children/children.htm).

Instructions: A separate application form must be submitted for each project. IRB proposals are approved for no longer than one year and must be continued annually. Faculty and students may email the completed form as a Word document to *IRB@umontana.edu*. or submit a hardcopy to the Office of the Vice President for Research & Development, University Hall 116. Student applications must be accompanied by email authorization by the supervising faculty member or a signed hard copy.

All fields must be completed. If an item does not apply to this project, write in: n/a.

1. **Administrative Information**

Project Title: Generational Perspective of Montana Higher Education Online Student Learning Styles	
Principal Investigator: Chad James Williams	Title: Doctoral Canidate Dept. of
Email address: chadjwilliamsmt@gmail.com (or) chad.williams@umhelena.edu	Educational Leadership / Director of Online Learning UM-Helena
Work Phone: 406-444-3813	Cell Phone: 406-370-9844
Department: Department of Educational Leadership	Office location: UMH Don 113

2. **Human Subjects Protection Training** *(All researchers, including faculty supervisors for student projects, must have completed a self-study course on protection of human research subjects **within the last three years** (http://www.umt.edu/research/complianceinfo/IRB/) and be able to supply the "Certificate(s) of Completion" upon request. Add rows to table if needed.*

NAME and DEPT.	PI	CO-PI	Faculty Supervisor	Research Assistant	DATE COMPLETED Human Subjects Protection Course
Chad James Williams	☒	☐	☐	☐	12/13/2011
John Matt	☐	☐	☒	☐	11/15/2011
	☐	☐	☐	☐	
	☐	☐	☐	☐	

3. **Project Funding** *(If federally funded, you must submit a copy of the abstract.)*

Is grant application currently under review at a grant funding agency? ☐Yes *(If yes, cite sponsor on ICF if applicable)* ☒No			Has grant proposal received approval and funding? ☐Yes *(If yes, cite sponsor on ICF if applicable)* ☐No	
Agency	Grant No.	Start Date	End Date	PI
na	na	na	na	na
Is this part of a thesis or dissertation? ☐No ☒Yes If yes, whose? Chad James Williams				

For UM-IRB Use Only

IRB Determination:

_____ Not Human Subjects Research
__X__ Approved Exempt from Review, Exemption # _2_ *(see memo)*
_____ Approved by Expedited Review, Category #____ *(see *Note to PI)*
_____ Full IRB Determination
_____ Approved *(see *Note to PI)*
_____ Conditional Approval *(see memo)* - IRB Chair Signature/Date: _____
_____ Conditions Met *(see *Note to PI)*
_____ Resubmit Proposal *(see memo)*
_____ Disapproved *(see memo)*

* **Note to PI:** Study is approved for one year. Use any attached IRB-approved forms (signed/dated) as "masters" when preparing copies. If continuing beyond the expiration date, a continuation report must be submitted. Notify the IRB if any significant changes or unanticipated events occur. Notify the IRB in writing when the study is terminated

Risk Level: *minimal*

Final Approval by IRB Chair/Coordinator: *(signature)* Date: 1/4/12 Expires: N/A

1

Appendix M: Montana State University - Billings IRB 217-11 Exempt approval

MONTANA
STATE UNIVERSITY
BILLINGS
Access & Excellence

Office of
Research Compliance

MSU-Billings Institutional Review Board #1
(IRB00001622)

March 1, 2012

TO: Chad James Williams

FROM: Mark Hardt
           Chair, MSU-Billings IRB

RE: IRB 12-047 – Generational Perspective of Montana Higher
           Education Online Student Learning Styles

Your research protocols have been received by the IRB. Due to the nature and
design of the proposed study, it has received an expedited review. Everything
appears to be in order with your protocol and approval is granted for the study as
it has been described.

Please be aware that no modifications can be made without further review and
this approval is valid until March 1, 2013. You may apply for a six (6) month
extension if necessary prior to that deadline.

Good luck in your research endeavors.

cc: Deborah Peters
           Dr. John Matt

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