Differences in Learning Preferences by Generational Cohort: Implications for Instructional Design in Corporate Web-based Learning

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Jessica Kriegel

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Differences in Learning Preferences by Generational Cohort: Implications for Instructional Design in Corporate Web-based Learning

Jessica Kriegel

Committee:

_____

Salvatore Falletta, Ed.D.

_____

Holly Carpenter, Ph.D.

_____

Mary Ellen Kassotakis, Ed.D.

_____

Date

Abstract

Differences in Learning Preferences by Generational Cohort: Implications for
Instructional Design in Corporate Web-based Learning

Jessica Kriegel, Ed.D.

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Chairperson: Salvatore Falletta, Ed.D.

In today's global and high-tech economy, the primary contributing factor to
sustainable competitive advantage is the strategic development of employees, an
organization's only unique asset. However, with four generations actively present in the
workforce and the proliferation of web-based learning as a key method for developing
employees, corporate training has not kept pace with the needs of the 21st-century,
generationally diverse employee population. This study used a quantitative and
descriptive methodology to investigate differences in learning style preferences of the
various generational cohorts.

Three streams of literature informed this research including generational
differences in learning preferences, existing and emerging technologies and learning
activities in web-based training, and how learning style preferences can inform effective
instructional design. A sample population of management employees at a publically
traded railroad organization were asked to complete the Felder-Soloman Index of
Learning Styles to identify their learning style preferences and to identify their preferred
learning activities.

The research study showed insignificant differences in learning style preferences
of the different generations. In addition, there were insignificant differences in learning
activity preferences. The results also showed learning styles corresponded closely with
learning activity preferences. Surprisingly, there was a lack of interest in learning with
Web 2.0 technologies, such as social media forums or twitter-like environments. This
was particularly unexpected as it pertains to Millennials, who are typically known as the
techno-generation.

The key research question from this study was how can instructional design for
web-based learning be optimized to address the learning style preferences of a
generationally diverse workforce? The recommendation is that each student population
be surveyed regarding learning style preferences and learning activity preferences before
designing curriculum. Popular literature indicates that Web 2.0 technology is the future
of learning and each generation has unique learning needs; however, this was not the case
for this particular student population. As such, the stereotypes of generations in popular
literature and the predictions of future learning trends should be considered carefully
before creating new learning environments. Instructional designers should be cautious
when making assumptions about generational differences.

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First and foremost, I am grateful to the participants of this study and the organization that helped facilitate this research. Without their input, this research would not have been possible.

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Chapter 1: Introduction to the Research

Introduction to the Problem

The United States workforce today is comprised of over 150 million employees across four generations (Bureau of Labor Statistics, 2012). These generations include Traditionalists, Baby Boomers, Generation X, and Millennials (Lancaster & Stillman, 2002). Increasingly, The Traditionalists and Baby Boomers are delaying retirement, citing a poor economy as the primary reason for doing so (Helman, Greenwald, Copeland, & VanDerhei, 2011). At the same time, Millennials are entering the workforce and beginning their careers. Instructional designers in the corporate learning and development field are, therefore, faced with the task of creating training programs for employees across four generations with varying degrees of technological skill (Oblinger & Oblinger, 2005; Reisenwitz & Iyer, 2009) and, perhaps, diverse learning style preferences as well (Hartman, Moskal, & Dziuban, 2005; Reeves & Oh, 2007).

To build curricula to address students' varying needs, Hartman et al. (2005) argued organizations must understand the different learning style preferences across generations. According to an American Society for Training and Development (ASTD; 2010) survey of 1,546 high-level business Human Resource (HR) and learning professionals, more than 60% of respondents stated that generational differences played a significant role in how they approached instructional design. The opinions were driven by popular corporate literature highlighting the many differences between generations in the work place.

In the corporate world, "a veritable cottage industry has sprung up" (Reeves & Oh, 2007, p. 300) around the issue of generational differences. However, most of the

research on generations is speculative in nature (Twenge & Campbell, 2008). Some of the leading authors on generational theory include Howe and Strauss (2000), Lancaster and Stillman (2002), Tulgan (2009), and Zemke, Raines, and Filipczak (2000). Unfortunately, the above authors provide little quantitative research to support their claims on generational differences, demonstrating the differences with case studies, interviews, and observation. For example, Howe and Strauss (2000) claimed Generation X is the latchkey kid generation. Having experienced high rates of parental divorce, they are a more cynical and depressed generation.

However, Howe and Strauss (2000) presented no psychological data on cynicism or depression to support the claim. In addition, much of the literature on generations is contradictory, perhaps as a result of the pervasive stereotyping. While Johnson and Johnson (2010) argued Millennials yearn for job security and want opportunities to advance within a single organization, Sujansky and Ferri-Reed (2009) warned companies must cater to Millennials or face high levels of turnover. GenerationMe is a term coined for the Baby Boomer generation by Lancaster and Stillman (2002), but the same term refers to the Millennial generation in Twenge and Campbell's (2008) work. Howe and Strauss (2000) suggested Millennials will follow rules and accept authority better than their parents, while Espinoza, Ukleja, and Rusch (2010) disagreed, pointing out that Millennials question instructions and resist kowtowing to superiors.

There are further examples of contradictory information when it comes to how generations learn. For example, despite being known as the Net Generation (Oblinger & Oblinger, 2005) and digital natives (Prensky, 2001), Millennials report lower satisfaction with web-based learning than older generations (Hartman et al., 2005; Sankey, 2006).

Millennials spend more time online and have greater satisfaction with the Internet (Reisenwitz & Iyer, 2009), and yet some studies show that older generations have higher satisfaction with web-based learning (Hartman et al., 2005; Sankey, 2006).

A number of theories have been posited to explain this discrepancy. For example, Holyoke and Larson (2009) believe older generations are more reflective learners, so they tend to do better in an online environment given that web-based learning is self-paced, allowing learners to absorb information at their own speed. Similarly, Manuel (2002) contended Millennials tend to be more active learners and, therefore, crave collaboration with peers. As such, Millennials would prefer live teaching environments in which collaboration and group work is possible. Conversely, Hartman et al. (2005) suggest the reason Millennials are dissatisfied with web-based learning is because the embedded tools used in most Learning Management Systems (LMS) are outmoded relative to what Millennials are accustomed to in social media and popular gaming contexts. Clearly, further research is needed to understand if generations have different learning style preferences, if they have different preferences when it comes to learning technologies and learning activities, and what implications there might be for designing effective training instruction catering to all four generations.

Statement of the Problem to Be Researched

With four generations actively present in the United States workforce (Bureau of Labor Statistics, 2012) and the proliferation of web-based learning as a key method for training employees (ASTD, 2010, 2011; O'Leonard, 2010), web-based learning has not kept pace with the needs of the 21st-century generationally diverse employee population

(ASTD, 2010; Davidson & Goldberg; 2010; Hartman et al., 2005; Lesser & Rivera, 2006;

Oblinger & Oblinger; 2005).

Purpose and Significance of the Problem

The purpose of this study was to determine how instructional design for web-

based corporate training may best be optimized to address the needs of the generationally

diverse workforce. In a 2006 interview, Robert Reich, an award-winning professor at the

University of California at Berkeley and former Secretary of Labor under President Bill

Clinton, stated:

> Nowadays, any competitor can get access to the same information technology, the
> same suppliers, the same distribution channels, and often the same proprietary
> technology. The only unique asset that a business has for gaining a sustained
> competitive advantage over rivals is its workforce—the skills and dedication of its
> employees. There is no other sustainable competitive advantage in the modern,
> high-tech, global economy. (Bingham & Galagan, 2006, p. 32)

To achieve the competitive advantage of which Reich speaks, organizations need to

invest in a better-trained workforce to drive business results (ASTD, 2011; Myers,

Watson, & Watson, 2007). This investment involves creating a comprehensive plan to

address the needs of the changing workforce demographics (Lesser & Rivera, 2006), such

as designing and developing effective training and learning solutions for a generationally

diverse and globally dispersed workforce.

Historically, a lack of funding or executive commitment has prevented many

organizations from making such an investment (Lesser & Rivera, 2006).

Notwithstanding, many human capital leaders argue the investment is necessary (e.g.,

ASTD, 2011; Bagley, 2011; MacDonald, 2011; Sage-Gavin, 2011). For example,

MacDonald (2011) asserted winning companies develop their human capital to achieve a

strategic competitive advantage. Similarly, Bagley (2011) contended companies with the best talent tend to be the most profitable firms, and providing employees with the tools and capability to be successful drives that competitive advantage. Therefore, high-performing companies that invest in workforce development tend to reap the rewards in terms of strategic competitive advantage, revenue, and profitability.

There is a significant cost associated with providing training and development to employees. The 2012 Training Industry Report reported that, on average, companies were spending between $749 and $1,059 per learner per year. The average training budget for large companies with 10,000 employees or more was $12.7 million in 2012 (Training Industry Report, 2012). For midsized companies with 1,000 to 9,999 employees, the average was $2 million. The total industry budget estimates range from $52.2 billion (Training Industry Report, 2012) to $67 billion (O'Leonard, 2011). When payroll costs of learning and development professionals are included, the number increases to over $171 billion (ASTD, 2011). Aguinis and Kraiger (2009) conducted an extensive literature review regarding the individual and organizational benefits of training and development. They found that despite the costs, organizations, on average, experienced improved performance (e.g., revenue per employee, profitability, increase productivity) as a result of training and development. Other intangible benefits associated with training and development included improved quality of products and services, reduced employee turnover, and enhanced organizational reputation and brand (Zornada, 2005).

To create effective training in the 21st century, many researchers argue learning professionals should consider new strategies to accommodate the generationally diverse

workforce (Beaver & Hutchings, 2005; Billings, Skiba, & Connors, 2005; Chen, 2006; Dede, 2005; Hartman et al., 2005; Lesser & Rivera, 2006). Since web-based learning is a key method for training employees (ASTD, 2010, 2011; O'Leonard, 2010), this study sought to understand how training can be improved with respect to web-based learning and delivery.

The transition from classroom to virtual instruction has been difficult for many organizations, as instructional designers and trainers find it difficult to create interactive, engaging experiences with remote trainees (O'Leonard, 2010). Despite the difficulties, organizations are boldly moving toward web-based learning, having doubled spending on virtual training in 2011 (O'Leonard, 2012). Among the Fortune 500, over 40% of training is delivered using technology-based methods, and these increasing trends are expected to continue in the coming years (ASTD, 2011).

Hartman et al. (2005) addressed the difficulty in engaging students in web-based learning and suggested an awareness of generational learning style differences gives instructional designers more options, resulting in more effective training. Rollins (2002), for example, conducted a mixed-methods research study of 50 graduate students ranging from ages 25-57 at Drexel University and found a significant correlation between learners with strong learning style preferences and success with particular interface design elements and navigation structures of educational websites. Some researchers go so far as to suggest training courses should be written in multiple iterations so each learner can attend training according to their preferred learning style (Battalio, 2009; Blackburn, 2009; Lee, 2005). However, it is a costly proposition. Due to the high cost associated with developing eLearning training, multiple iterations might not be a viable option for

corporations. On average, development of eLearning modules takes twice as long as the development of instructor-led training courses – about 55.7 hours for one hour of eLearning development (ASTD, 2010). Despite the logistical issues and cost considerations with creating multiple versions of each training program, the idea of matching teaching to an individual's learning style preference is popular in the literature (Battalio, 2009; Blackburn, 2009; Buch & Bartley, 2002; Buch & Sena, 2001; Manuel, 2002; Rollins, 2002). Another approach might be to design curricula that address all the needs of the broader learning population (Felder, 2003; Felder & Spurlin, 2005), which includes four generations of learners and potentially, many learning styles.

Research Questions

The following research questions were posed:

1. To what extent do learning style preferences vary by generational cohort?

2. To what extent do preferences for learning technologies and learning activities vary by generational cohort?

3. How can instructional design for web-based learning be optimized to address the learning style preferences of a generationally diverse workforce?

The Conceptual Framework

Researcher Stances and Experiential Base

I hold a positivist view of research. A positivist view of research assumes there is an objective reality that can be measured in terms of cause and effect. I believe scientific methods of research can be applied to social study and quantitative research offers insight

into the patterns and trends of a group of individuals. Creswell (2008) stated quantitative research methods are appropriate when the "researcher seeks to establish the overall tendency of responses from individuals and to note how this tendency varies among people" (p. 51). As such, this research study employs quantitative research methods to address the three research questions. As a positivist researcher, I believe a full understanding of the results can be achieved using these methods.

Conceptual Framework

To understand how corporate web-based learning can be optimized to address the learning style preferences of today's generationally diverse workforce, it is important to understand the existing literature, which falls into three categories. Figure 1 depicts the conceptual framework.
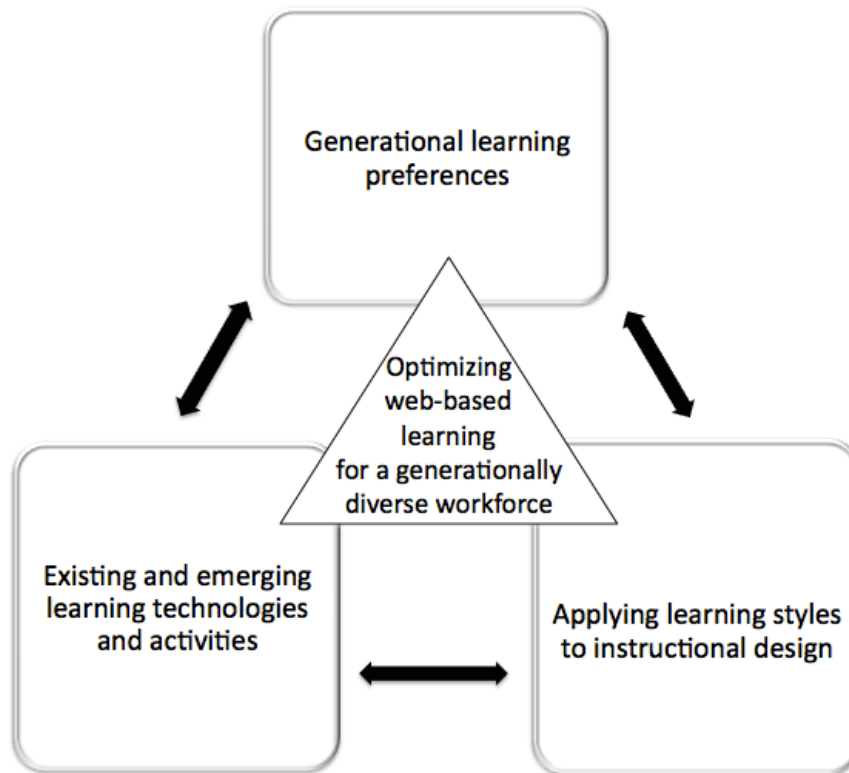
Figure 1: Conceptual framework.

The first stream explored whether or not different generations have different preferences when it comes to learning, which can include differences in learning styles or differences in learning activity preferences. The second asked what web-based learning activities exist or are emerging in corporate web-based learning. Finally, the third stream explored how learning style preferences can inform instructional design best practices.

Differences in generational learning styles and preferences for learning activities. In one of the most comprehensive studies on generational differences (Reeves & Oh, 2007), Twenge and Campbell (2008) amassed data from 1.4 million people who had completed some form of personality, attitudinal, or behavioral surveys from the 1930s to the 2000s. The study compared each generational group when the subjects were all in their early 20s. Their findings revealed that many differences among generations are indeed a generational issue rather than an age or life-stage issue. Theirs was the first empirical study to support the work of Strauss and Howe (1991). Pioneers in generational research, Strauss and Howe (1991) stated the American culture, as well as shared living experiences, shape generations, and as they mature together, a generational identity is formed. Twenge and Campbell (2008) found that individuals who share the generational identity of "Millennial" have higher self-esteem, deal with higher levels of anxiety, and take less responsibility for their successes and failures. While the study did not address learning style preferences specifically, it did support the findings of Holyoke and Larson (2009) who studied the different learning motivations of each generation.

Holyoke and Larson (2009) found Millennials do not take as much responsibility for their academic success or failure as older generations, putting the onus of motivating learning on the instructor. Millennials also have the lowest motivation to learn of any

generation (Holyoke & Larson, 2009). If learning performance is heavily influenced by trainee motivation, as Lim, Lee, and Nam (2007) suggested, this may have serious implications for eLearning effectiveness with Millennials. On the other hand, in their study on corporate eLearning effectiveness among generations, Lim et al. (2007) also found that computer self-efficacy has a positive impact on eLearning performance, and Millennials have the highest computer self-efficacy of any generation (Oblinger & Oblinger, 2005).

Teaching the Millennial learner has been a popular topic in educational research for the last decade. Many researchers have experimented by customizing learning for incoming undergraduate and graduate students in an effort to understand how Millennials prefer to learn (Manuel, 2002; Sankey, 2006). Manuel (2002) delivered two versions of a one-credit course at California State University, Hayward (CSUH), then administered pre- and post-tests to all the students to understand the learning style preferences of Millennials. The results showed that the generation has a positive outlook toward technology, has a preference for audio-visual media over text, and has a desire for a customized experience and several choices. While it could be inferred the trends differ from previous generations, this study offers no evidence for that claim. In fact, Dede (2005) believes the tendencies can be found across all generations. Dede (2005) is one of the leading researchers in the area of neomillennial learning style education tools; neo-meaning new and millennial referring to the learning modality of the 21st century (Sankey, 2009). Dede (2005) suggested that since younger generations spend their free time on the Internet, their learning preferences lean more toward immersive media. However, Dede (2005) theorized generalizations can be made based on generations and

suggested many Baby Boomers exhibit neomillennial learning style preferences because they use the same technological tools and media as Millennials every day.

Existing and emerging technologies and learning activities in web-based corporate learning. Despite his discomfort with labeling generations based on stereotypes, Dede (2005) believes web-based learning needs to be modified to cater to the neomillennial learner. Numerous researchers have shown that play can enhance learning, according to the needs of the neomillenial learner (Davidson & Goldberg, 2010; Dede, 2005; Manuel, 2002; McGreal & Elliott, 2008). Popular multi-user games such as *World of Warcraft* have inspired educators to consider creating "Alice-in-Wonderland multi-user virtual environment (MUVE) interfaces in which participants' avatars interact with computer-based agents and digital artifacts in virtual contexts" (Dede, 2005, p. 8). Avatars can function not only in fantasy worlds, but also in virtual real-life situations, such as a classroom (McGreal & Elliott, 2008). Alternatively, avatars can be used to simulate real-life practice (McGreal & Elliott, 2008). These may be the learning tools of the new millennium, but currently most web-based learning experiences do not take advantage of those technologies (McGreal & Elliott, 2008). The most common learning activities for today's web-based learning include multi-media audio/visual components, web conferencing, blogs or vlogs, wiki pages, and instant message functions (McGreal & Elliott, 2008; Myers et al., 2007).

Social media and mobile technologies are also gaining popularity as learning tools (ASTD, 2010; Dede, 2005; McGreal & Elliott, 2008; Myers et al., 2007; Training Industry Report, 2012), but are still in their infancy in the corporate environment. The benefits of mobile learning include the ability for learners to augment their simulated

mobile experience within a real-life setting (Dede, 2005) or virtually interact with locations (such as street signs linked to online maps) (Dede, 2005). Mobile learning (and distance learning) may also lead to the end of printed training materials (McGreal & Elliott, 2008), which can lead to significant cost savings. Despite the advancements of the aforementioned technologies, web-based learning has not kept pace with student learning needs (Davidson & Goldberg; 2010; Hartman et al., 2005; Lesser & Rivera, 2006; Oblinger & Oblinger, 2005), warranting further investigation.

How learning style preferences can inform instructional design. Although student learning style preferences may be a generally accepted principle of pedagogy, the concept has not gone unchallenged in academic literature (Coffield, Moseley, Hall, & Ecclestone, 2004; Felder, 2003; Olson, 2006). Thus, numerous studies in the last decade have attempted to prove a positive correlation between learning style preferences and learning activities (Arora, Leseane, & Raisinghani, 2011; Becker, Kehoe, & Tennent; 2007; Buch & Sena, 2001; Lee, 2005; Rollins, 2002). Lee (2005) found a significant correlation between student learning style preferences and their activity preferences. Auditory learners prefer learning that involves hearing messages from their peers or the instructors. Visual learners prefer to read information – showing a strong preference for the activity of e-journaling. Kinesthetic learners prefer interactive activities such as the chat room. However, some might question the value of that information. Lee (2005) has shown that preferred learning styles determine preferred learning activities, but does that lead to greater comprehension? Battalio (2009) and Blackburn (2009) have found it does.

In a study for the *American Journal of Distance Education*, Battalio (2009) conducted a quantitative analysis using the Index of Learning Styles (Felder & Soloman,

2004) to measure preferred learning style and the relationship it had with success in web-based learning. Battalio (2009) found reflective learners (those who prefer to think quietly rather than interact with others) were more successful in self-directed courses than in the collaborative courses. In addition, active learners in the collaborative courses were more successful than active learners in self-directed courses. Battalio (2009) concluded there is a significant association between learning styles and academic success in distance education. Blackburn (2009) found similar results in a corporate setting. To account for this phenomenon, Battalio (2009) and Blackburn (2009) suggested instructors create multiple versions of each course so learners could thrive in an environment that fit their learning preferences. Some argued doing so places students in a box, a danger Coffield et al. (2004) and Felder and Spurlin (2005) cautioned against.

In a comprehensive review of the literature on learning styles, Coffield et al. (2004) identified 71 learning style models and conducted a critical analysis of 13, in particular. In an attempt to organize the 71 learning style models, Coffield et al. (2004) referenced Curry's (1983) three categorizations of learning style: instructional preferences, information processing style, and cognitive style. Coffield et al. (2004) took Curry's model and expanded it further across five categories. On one end of the spectrum, learning styles are cognitive features, deep-seated features of a person's heredity. On the other end are conceptions of learning based on experience and motivation. Coffield et al. (2004) pointed out it was a frequently debated theme in the field of learning styles. Some learning style theorists argued learning styles were fixed traits (Gregorc, 1985).

Coffield et al.'s (2004) theory might lead to labeling of individuals that promotes the "matching" concept of pairing learning styles to learning activities. Others stated awareness of fixed traits can allow students to develop their weaker preferences to learn in a well-rounded manner (Jackson, 2002). Still others contended learning styles are flexibly stable and knowing one's learning style offers a way for students and teachers to begin a dialogue about learning (Felder & Spurlin, 2005). Coffield et al. (2004) classified the Felder-Soloman Index of Learning Styles (the tool used in this research study) as one of these models in which learning styles are flexible and based on personal preference. Felder and Spurlin (2005) concurred, reiterating that learning styles are preferences and behavioral tendencies, not indicators of strength or predictors of behavior. Felder and Spurlin (2005) suggested information about student learning styles should be viewed within the context of an entire class or learning system. Felder and Spurlin (2005) agreed with other leading theorists in the field suggesting teachers should not be overly concerned with which students have which learning preferences, but rather, should design curricula addressing the needs of the whole teaching-learning environment (Entwistle & Peterson, 2004; Vermunt & Verloop, 1999). In the context of my research, this implies instructional designers would benefit from knowing the results of the learning style preferences for all generations so these preferences, as a whole, can be considered when creating corporate training programs.

Definition of Terms

Asynchronous Learning

Asynchronous learning is web-based learning in which students can access materials at anytime (Anderson, 2008). It is learning outside the constraints of place and time.

Baby Boomer

While there is some disagreement on the birth years defining each generation (Reeves & Oh, 2007), for the purposes of this study, the Baby Boomer generation is defined as individuals born between 1946 and 1964 (Reeves & Oh, 2007).

eLearning

"eLearning is defined as the use of electronic technologies to deliver information and facilitate the development of skills and knowledge" (ASTD, 2011, p. 37).

Generation

"A cohort-group whose length approximates the span of a phase of life and whose boundaries are fixed by peer personality" (Strauss & Howe, 1991, p. 60). Or alternatively, all of the people born and living at about the same time, regarded collectively.

Generation X

For the purposes of this study, Generation X is defined as individuals born between 1965 and 1980 (Reeves & Oh, 2007).

Instructional Design

Instructional design is putting together all the various tools, resources, and processes to meet the learning needs of a specific group of learners (ASTD, 2010).

Learning Style Preferences

The various strengths and preferences students have when taking in and processing information (Felder & Spurlin, 2005).

Millennial

For the purposes of this study, Millennials are defined as individuals born between 1981 and 2000. Other names for the Millennial generation include Nexters, the Digital Generation, Echo Boomers, N-Gens, and most often, Generation Y (Martin, 2005). Oblinger and Oblinger (2005) referred to Millennials as the Net Generation.

Synchronous Learning

Anderson (2008) described synchronous learning as web-based learning in which the students interact with the instructor and peers in real time.

Web-based Learning

Web-based learning is one of many commonly used terms to define web-based learning such as e-learning (also eLearning), Internet learning, virtual learning, web-based learning, computer-assisted learning, and distance learning (Anderson, 2008). In essence, all the above terms refer to education when the learner is at a distance from the instructor and uses some form of technology (usually a computer) to access learning materials (Anderson, 2008).

Assumptions and Limitations

A number of assumptions were made in conducting this research. First, it was assumed respondents would respond honestly to the survey. It was also assumed participants would be able to answer the questions definitively, based on past experience, meaning every respondent had experience with corporate learning.

In terms of limitations, the study was limited to a business unit of employees within a corporation, which represents the study site. Due to the number of respondents, the study results are not able to be generalized to other organizations. Further, despite anonymity provisions in the research, respondents may have felt the need to respond in a socially desirable manner. However, given the nature of the topic, this limitation is not a significant factor. Finally, one delimitation warrants mention in this study. The study focused exclusively on generational differences and did not probe into other factors and variables possibly influencing learning style preferences (e.g., personality traits or typology, gender, job category).

Summary

As web-based learning continues to grow in popularity for corporate training and development, instructional designers are charged with the responsibility of creating effective programs. To that end, it is plausible web-based learning will be more effective if generational diversity is taken into account. As Felder (1993) pointed out, students benefit when instructors teach to the entire learning style cycle. Therefore, even if no differences are found among generations, the general distribution of learning style preferences may help inform instructional designers (Felder, 1993). In addition, by adopting the policy of optimizing web-based learning based on age diversity,

organizations may gain a competitive advantage in the global marketplace. The above philosophy may also enable organizations to become more forward thinking regarding the needs of generations. The implications are that instructional designers can be more proactive rather than reactive in meeting the needs of Generation Z when they enter the workforce in 2018 (Hartman et al., 2005).

Chapter 2: Literature Review

Introduction

With four generations actively present in the workforce (Bureau of Labor

Statistics, 2012) and the proliferation of web-based learning as a key method for training

employees (ASTD, 2010, 2011; O'Leonard, 2010), web-based learning has not kept pace

with the needs of the 21st-century, generationally diverse employee population (ASTD,

2010; Davidson & Goldberg; 2010; Hartman et al., 2005; Lesser & Rivera, 2006;

Oblinger & Oblinger; 2005). The purpose of this study was to determine how

instructional design for web-based corporate training may best be optimized to address

the needs of the generationally diverse workforce. There are four generations of

employees in the workforce currently, namely Traditionalists (born before 1945), Baby

Boomers (born 1945-1964), Generation X (born 1965-1980), and Generation Y (born

1981-2000) (Eisner, 2005; Hess & Jepsen, 2009; Lancaster & Stillman, 2002; Manuel,

2002). If the four generations have different learning style preferences, then this may

have implications for effective instructional design for training and development in the

workforce. To understand previous literature as it pertains to this problem and purpose,

three streams of research were identified and explored in this chapter.

1. Generational learning preferences

2. Existing and emerging learning technologies and activities

3. Applying learning styles to instructional design

There is a logical progression to the three streams. First, it is important to

understand what the empirical research reveals about generational differences in learning

preferences as it pertains to learning styles and also learning activities. Second, what are

the current and emerging practices in web-based learning? Third, in what manner can the

resultant data be used to inform instructional design best practices? That is, specific

recommendations can be made to optimize instructional design for web-based learning

delivered to the 21st-century, generationally diverse workforce.

Literature Review

Differences in Generational Learning Styles and Preferences for Learning Activities

Generational differences are a topic of wide discussion in the corporate world

(Reeves & Oh, 2007). However, most of the published work on generational diversity is

unapologetically theoretical in nature (Reeves & Oh, 2007; Twenge & Campbell, 2008).

Two of the leading theorists on generational diversity, Lancaster and Stillman (2002), in

addressing concerns about perpetuating stereotypes, wrote:

> You *can* make generalizations about people. If one generation experienced a
> divorce rate of 15 *percent* during their formative years and a later generation
> experience a divorce rate of 50 *percent*, you can bet the two generations have
> been affected by divorce differently. (p. 33)

There is no research supporting the claim presented in their work. In addition, the field

has not come to a consensus on some of the stereotypes being perpetuated in the

literature. For example, Espinoza et al. (2010) called Generation X the MTV generation.

According to Lancaster (2004), Millennials are the MTV generation. Both present this

stereotype without defining what implications there are for being the MTV generation.

Lancaster and Stillman (2002) claimed Generation X is the generation of out-of-the-box

thinkers while Espinoza et al. (2010) called Millennials the out-of-the-box thinkers.

Likewise, Howe and Strauss (2002) called Millennials the volunteer generation whereas

Johnson and Johnson (2010) assigned that same label to the Baby Boomers. It is clear

more empirical research is needed to address the contradictory nature of the published literature on generations.

There have been some quantitative studies done on generational differences, specifically as they pertain to generational learning styles, but these studies often contradict generational stereotypes that abound in corporate circles. For example, while many generational theorists stress the importance of technology for engaging Millennials (Eisner, 2005; Manuel, 2002; Prensky, 2001), other researchers found older generations tended to prefer web-based learning more than younger generations did (Hartman et al., 2005; Sankey, 2006). While some scholars found Millennials do enjoy using technology in learning (Manuel, 2002; Reisenwitz & Iyer, 2009), they tended to be less satisfied with web-based learning than older generations (Hartman et al., 2005; Sankey, 2006). Oblinger and Oblinger (2005) addressed this contradiction in their seminal eBook titled *Educating the Net Generation*.

Oblinger and Oblinger (2005) gathered experts in all areas of learning, technology, and generational trends to write on the topic of learning and the Net Generation. They argued the Net Generation is not necessarily defined only by age. In fact, in their view, the generation is defined by use and exposure to technology. Given Oblinger and Oblinger's definition, older generations that have been heavy users of information technology (IT) since a younger age may also fall into the Net Generation category. Dede (2005) also noted Baby Boomers exhibit neomillenial learning style preferences because they used the same tools and media as Millennials. A 2009 study produced by the Office of Information Technology at the University of Minnesota on the 21st-century student (Walker & Jorn, 2009) revealed that since 2007, fewer differences

have been found between older and younger students. No correlation was found between age and desire for technology in the classroom, technology use, comfort level, or even perceived usefulness of technology.

Hartman et al. (2005) cited a similar survey at the University of Central Florida (UCF). The UCF regularly surveyed students about their web-based learning experiences and preferences. The survey received 1,489 respondents and pulled data from three generations (Baby Boomers, Generation X, and Millennials). The results showed that older learners reported higher satisfaction with web-based learning than younger generations. Reasons for dissatisfaction across the three generations varied considerably. Boomers wished there was more face-to-face interaction, Generation X felt the continuous connectedness of web-based learning failed to get to the point, and Millennials felt a lack of immediacy in the web-based learning. Overall, however, the Baby Boomers were more satisfied with web-based learning than any other generation.

Hartman et al. (2005) argued that an awareness of these different learning preferences among each generation would allow institutions to build curricula addressing the students' varying needs. They argued courses need to be redesigned to align with student preferences, true not only at a curriculum level, but at an IT infrastructure level as well. Hartman et al. (2005) suggested the reason Millennials are dissatisfied with web-based learning may be because the web-based learning tools used by the institutions are far behind the technology those students are using in their everyday lives. As a result, the students are not engaged by the web-based learning interface. Therefore, Hartman et al. (2005) argued being aware of student learning preferences gives instructional designers

more options for engaging students in web-based learning. The understanding allows instructional designers to be forward thinking about student needs rather than reactionary.

Similar to Hartman et al. (2005), Billings et al. (2005) conducted a study in an attempt to gain insight into teaching strategies and best practices when engaging in web-based learning across generations. The purpose of the study was to understand if there were different perceptions among younger and older student using web-based learning. Five hundred fifty-eight nursing students representing each generation were surveyed with the Evaluating Educational Uses of the Web in Nursing (EEUWIN) instrument. The instrument was developed by Billings et al. (2005) and obtained data around student perceptions of educational practices and the use of technology. They found that while there was no difference between groups in use of technology, there were differences in perceptions. Most notably, the older generations felt less connected to other students and the instructor when engaging in web-based learning. Billings et al. (2005) hypothesized the disconnection may be due to a generational issue and younger generations were more comfortable connecting with their peers online than older generations. They also suggested educators should explore new instructional design strategies to accommodate for the diverse generations in the online environment, as understanding generational differences is paramount to creating effective online instruction (Billings et al., 2005).

To understand generational learning differences, Holyoke and Larson (2009) argued it is imperative to understand the different learning motivations of each generation. In their study, the Critical Incident Questionnaire (CIQ) developed by Brookfield (1995) was used to survey 60 adult learners engaged in hybrid courses (i.e., a combination of web-based learning and instructor-led classroom teaching). The survey

was administered multiple times throughout the course and included questions about what engaged the students, what confused them, what actions they enjoyed or did not enjoy, and their generation. Holyoke and Larson (2009) measured three learning aspects: readiness to learn (i.e., a students' inherent need to know new things), orientation to learning (i.e., students' interest in applying new knowledge to their own life experiences), and motivation to learn (i.e., a desire to improve one's life through learning).

The results indicated Millennials had the lowest readiness to learn of any generation, citing distractions or a lack of curiosity as the main reason. Generation X had the highest readiness to learn, whereas Baby Boomers only had a high readiness to learn when the material pertained to personal growth. This was a common theme in the survey results, as every generation had a high orientation to learning when the material pertained to their own lives. According to the results, Millennials lost interest quickly when they could not relate to the material. Generation X enjoyed personal discovery and had low orientation to learning when the material did not relate directly to them. Baby Boomers were most engaged in the "joy of discovery and self gratification" (Holyoke & Larson, 2009, p. 18). Another theme in the research showed that Generation X was most motivated when involved in collaborative efforts, while Baby Boomers were most motivated when they were able to show their competence and speak to their own experiences. Interestingly, Millennials were found to have the lowest motivation to learn, placing much of the onus of creating motivation on the instructor. Twenge and Campbell (2002) supported the motivation claim in their study on generational differences. Such a low internal motivation to learn may have serious implications for engaging Millennial learners in corporate training.

Pulling data from journal articles and dissertations, Twenge and Campbell (2002) amassed data from 1.4 million people who had completed some form of personality, attitude, or behavioral survey from the 1930s to 2008. According to Reeves and Oh (2007), it was the most comprehensive study on generational differences ever conducted. The study compared each generational group when the subjects were all in their early 20s and the findings revealed many differences among generations are indeed a generational issue and not an age or life-stage issue. Specifically, it revealed Millennials have higher self-esteem, higher levels of anxiety, less need for social approval, and take less responsibility for their successes and failures. Note that Holyoke and Larson (2009) found Millennials put the onus of motivating learning on the instructor – not themselves.

Unfortunately, Twenge and Campbell (2002) did not address learning preferences specifically. Nevertheless, the research is still critical to understanding generational learning style differences because it validates the decision to look at the data through a generational lens. In addition, the authors concluded, "organizations and managers who understand these deeper generational differences will be more successful in the long run as they manage their young employees, finding ways to accommodate differences" (p. 873). Their conclusion supports those of Hartman et al. (2005) and Billings et al. (2005) that learning should be optimized for the generationally diverse student population.

Many of the above studies were conducted in an academic setting with adult learners; however, there are studies on generational diversity in a corporate setting as well. McGuire, By, and Hutchings (2007) analyzed the effects of generational diversity in the workforce and, while they argued intergenerational conflict can stifle organizational learning, they proposed a model for dealing with such conflict. They

contended that while generational groups are counterproductive to creating an empowering work environment that encourages learning at all levels, there is a way to leverage the diversity to encourage learning at an organizational level. Some of their suggestions included intergenerational team building activities and pairing across generations.

While McGuire et al. (2007) offered a theoretical model for how human resources (HR) could respond to the needs of different generations in the workplace, Beaver and Hutchings (2005) offered very specific strategies on how to leverage the generational diversity to encourage organizational learning. Like McGuire et al. (2007), Beaver and Hutchings (2005) contended an ecological approach to understanding organizational learning and the intergenerational dynamic is important. However, they also pointed out that while an organizational approach to learning would contribute to the future success of the organization, there are benefits to the individual as well. Beaver and Hutchings (2005) further suggested each generation has different learning styles and values, so the traditional approach to learning is no longer sufficient with such a diverse workforce. As a result, the learning itself must be diverse. Beaver and Hutchings (2005) suggested it is no longer sufficient for a trainer to teach in the traditional format, as classroom learning is quickly becoming an outdated format for education. Therefore, they proposed organizations take an ecological and integrative approach to learning. For example, mentoring programs are an excellent way to encourage organizational learning. However, with the new intergenerational workforce, mentoring need not be one-directional. For example, "while younger employees can be mentored by older, more

experienced employees, the younger employee can in turn mentor older employees about the internet and other new technologies" (Beaver & Hutchings, 2005, p. 602).

McGuire and Gubbins (2010) also believe learning need not only take place in the traditional format. They stated Millennials have joined the workforce with a new set of expectations and requirements when it comes to their learning. McGuire and Gubbins (2010) posited much of this change is a result of technological advancements. Since Millennials have grown up as digital natives, they are "technologically literate, highly mobile, and autonomous individuals with short attention spans and are more inclined to question authority" (McGuire & Gubbins, 2010, p. 252). For example, Millennials are not interested in passive, classroom learning, but instead prefer many learning opportunities on a variety of subjects, taught in an interactive and participatory fashion. Thus, workplace experiences such as on-the-job training are now the new classroom. However, the authors pointed out that informal learning can be frustrating if there is a lack of direction. Therefore, McGuire and Gubbins (2010) offered that instead, learners must be considered active partners in the design and facilitation of the learning process. This means an ecological learning system must evolve in which the facilitator, subject-matter experts, and students are all an integral part to the creation of learning. Through such an active learning process, the organization may engage the generationally diverse workforce more effectively.

Many emerging technologies support and encourage this type of collaborative learning environment. Specifically, social media and mobile learning tools revolve around this type of learning exchange. The next stream of literature looks specifically at these existing and emerging technologies.

Existing and Emerging Technologies and Learning Activities in Web-based Corporate Learning

One of the key challenges for web-based instructional designers today is keeping pace with the rapid evolution of technology (Davidson & Goldberg, 2010; Fahy, 2008; Myers et al., 2007). An emerging trend in corporations is incorporating Web 2.0 technologies into learning and development solutions. Web 2.0 is frequently defined as a more collaborative version of the web in which social media and peer-to-peer sharing are the norm (Bingham & Conner, 2010; Davidson & Goldberg, 2010). However, there are challenges in incorporating this technology, namely, collaborative learning puts the onus of information sharing on the learner (Davidson & Goldberg, 2010; Jayaseelan & Mohan, 2011). As Bingham and Conner (2010) described, social learning is not a way to deliver information, but rather is an exchange in which all users contribute. For example, wikis and Google docs are examples of living content that everyone can update, thus growing collective intelligence (Bingham & Conner, 2010).

Some communication comes in the form of microsharing: short bursts of communication in forums such as *Twitter* or *Chatter*. In fact, some learners use Twitter in tandem with real-life experiences, such as lectures, to discuss a live presentation as it is happening. This may be distracting to the speaker, but revelatory for the audience – who is now able to communicate and ask questions during a lecture rather than afterwards (Bingham & Conner, 2010). Other popular Web 2.0 technologies include application services such as cloud computing, accessible from any device with an internet connection; RSS feeds, used to deliver regular updates; and mobile technologies. They are some of the existing Web 2.0 learning tools gaining popularity in corporate learning.

The emerging trends in corporate learning revolve around learning tools of the Web 3.0 generation. Web 3.0 technologies include immersive technologies, such as virtual worlds and multiplayer online role-playing games (Bingham & Conner, 2010; Chen, 2006; Dede, 2005; Shyamsunder & Sarmma, 2011). These simulation-based technologies are still in the infancy stages at a corporate learning level (Shyamsunder & Sarmma, 2011). However, many authors suggest video game play simulating new identities, experiences, contexts, and social relationships can expand social learning (Gee, 2003). Other Web 3.0 experiences include virtual reality in which the user can move through online worlds as if in a physical space, simulating being with colleagues in real time (Bingham & Conner, 2010). These are referred to as virtual worlds, because when a user leaves (logs out) the world continues without the user. Simulation games are also considered a Web 3.0 technology in which the player practices making decisions, gleaning knowledge about various situations without risk.

Aldrich (2003) described simulations as linear, cyclical, and open-ended. They are linear because players move along a defined path from beginning to end. They are cyclical because users can master a certain skill, learn from mistakes, and then correct behavior in future rounds. Simulations are open-ended because they involve creating new strategies as certain triggers and incidents along the game's path possibly alter the outcome (Aldrich, 2003). Aldrich (2003) described the evolution of simulation games: what was once a multiple-choice question game has become an environment in which the user is interacting with others, such as in a meeting room where the player has to convey information, interact with peers, and progress up the corporate ladder.

Davidson and Goldberg (2010) pointed out that the learning institutions of today are adapting slower than technology. They argued that while modes of learning have changed drastically, from Web 1.0, to Web 3.0, the conventions of learning have only changed on the edges. As a result, education today bears striking similarity to the education of yesteryear. There is a parody that Ichabod Crane could walk into any classroom and would know exactly where to stand and how to address the class (Davidson & Goldberg, 2010). Technology has the opportunity to change that formula. Davidson and Goldberg (2010) suggested the very definition of learning institutions may need to be revisited, suggesting that virtual, collaborative, open-source communities, such as Wikipedia, are learning institutions in themselves. Wikipedia is an exemplar of the online collaboration and social networking defining Web 2.0. To demonstrate other ways Web 2.0 can transform the norms of learning and knowledge distribution, Davidson and Goldberg (2010) posted a first draft of their book on The Future of the Book's collaborative site. Any individual who registered for the site was welcome to comment and participate. After a year of participatory writing and editing, the principal authors maintained the final edit and publication of the work.

In suggesting other ways in which modern-day learning might have evolved, Davidson and Goldberg (2010) argued playing and learning are now inseparable. They suggested games such as Pokémon motivate third-grade children to read. In addition, the game develops other skills as it involves customizing digital graphics, meeting other online players, developing technical skills, and narrative making. Davidson and Goldberg (2010) pointed out this form of learning is diametrically opposed to learning encouraged under the No Child Left Behind legislation, which uses antiquated testing and

standardized scoring techniques to motivate students. Davidson and Goldberg (2010) further suggested knowledge producers are going to have to think about how they create learning differently. For example, peer-to-peer information sharing has already become popularized among children and adults in the form of social media. Davidson and Goldberg (2010) suggested this should be a model for developing a collaborative digital learning environment. Sharing also means revisiting the very concept of teacher and learner. Just as Beaver and Hutchings (2005) suggested, the teacher/learner dynamic needs to be re-imagined with unique relationships such as bi-directional mentoring (Davidson & Goldberg, 2010). Davidson and Goldberg (2010) suggested Web 2.0 and social media collaboration will be a major catalyst for multi-directional learning.

In a 2011 publication of the SETLabs Briefings, various authors described other ways in which Web 2.0 is transforming modern technologies in business. Sontakey and Dube (2011) suggested today's learners prefer learning in a community on an ongoing basis, rather than stand-alone learning experiences consumed alone. Jayaseelan and Mohan (2011) said the trend in social media can be extended to corporate learning, as it is an interactive way to facilitate knowledge-transfer and management. For example, employees connected online can help solve each other's problems, share best practices, and exchange information among various subject-matter experts.

Shyamsunder and Sarmma (2011) contended the next generation of web-based learning involves immersive technologies. Immersive technologies include virtual worlds, multiplayer online role-playing games, and simulations. Virtual worlds are defined as electronic simulated environments where situations are visually recreated and students can interact with avatars (controlled by other students or artificial intelligence).

Multiplayer online role-playing games are similar worlds in which participants interact in fantasy-based interactions. Some examples of how these technologies are being used in business today include as a recruiting tool, virtual representations of the workplace, role-play based interview tests, virtual meeting spaces for geographically dispersed teams, virtual brainstorming environments, skill rehearsing spaces, and virtual learning spaces. Shyamsunder and Sarmma (2011) also suggested the trend of immersive technologies in corporate learning and development will increase over the course of the next decade. It is possible that with the influx of Millennials into the workplace and the increased pace of technology development, this trend will quicken.

Dede (2005) is one of the leading researchers in the area of neomillenial learning style education tools. He suggested while older generations grew up watching television (a passive experience), younger generations spend their free time on the Internet. As such, Millennial learning preferences lean more towards immersive media. Like other researchers in the field (e.g., Oblinger & Oblinger, 2005; Walker & Jorn, 2009), Dede does not believe generalizations can be made based on generations, and he suggested many Baby Boomers exhibit neomillenial learning style preferences because they use the same tools and media as Millennials (2005).

Sankey (2006) used both quantitative and qualitative research methods to investigate 188 students in a first-year communications course at the University of Southern Queensland (USQ). The course design was multimodal so many learning styles are catered to. For example, the course involved face-to-face contact, individual work, and collaborative work online. Sankey (2006) found student engagement was high when using a multimodal model, and test scores increase when incorporating multimedia

elements into the curriculum. Sankey (2006) made a strong case for enhancing education curriculum with technology; however, the technology discussed in the study was fairly outdated.

Dede (2005) also asserted web-based learning needs to be modified to cater to the neomillenial learner and argued that emerging media drives students toward a neomillennial learning style. Both Dede (2005) and Sankey (2006) suggested learning styles might be influenced by instructional design, which may have implications for training and development professionals. Unlike Sankey (2006), however, Dede (2005) described in detail how instructional design can be optimized for the neomillenial learner. The author described "Alice-in-Wonderland multi-user virtual environments (MUVE) interfaces, in which participants' avatars interact with computer-based agents and digital artifacts in virtual contexts" (Dede, 2005, p. 8). MUVE is an example of the immersive technologies Shyamsunder and Sarmma (2011) described. Dede (2005) also suggested infusing ubiquitous computing in mobile devices so students can bring their learning environment with them. Not only do mobile technologies allow students to study from any location, they may soon be virtually connected to locations (services linked to ratings by customers or street sings linked to online maps). However, corporate web-based learning has not progressed to this level. Instead, most corporate learning is in a "world-to-the-desktop interface" (Dede, 2005, p. 8), which is not psychologically immersive.

Chen (2006) expanded upon the work of Dede (2005) by creating a distributed interactive simulation (DIS) environment to engage the learner in ways the traditional schoolhouse model did not. Using a number of cutting edge, internet-based techniques such as physically based modeling, computational steering, interactive visualization, and

artificial intelligence, Chen created a learning environment simulating realistic yet collaborative exercises. Chen (2006) posited this edutainment environment motivates students to learn because it simulates the video gaming experience. The new technology is essentially a virtual environment in which dynamic and unscripted interactions allows for simulation, training, and distance education.

While Dede (2005) and Chen (2006) suggested rich interactive environments in which to engage the learner, not all corporate training departments have the resources to develop this type of training environment (O'Leonard, 2010). In addition, simulations may not be appropriate for all types of training content. Myers et al. (2007) pointed out many companies struggle to create quality training that meets the requirements of compliance in the corporate world. They contended learning professionals have a responsibility to protect the workforce by providing thorough and effective training on safety information. For example, after the 2005 BP refinery explosion in Texas City, TX, investigative reports by the independent Baker Panel and the Chemical Safety Board stated insufficient training was a contributing factor to employee lack of safety. Given the importance of delivering training programs in this context, Myers et al. (2007) suggested it can be challenging for organizations to keep up with the increasing requirements of the changing workforce.

In reviewing some of the electronic tools currently being used in the workplace, Myers et al. (2007) listed certain learning technologies, such as mobile applications, mp3s, websites, discussion boards, collaborative software, email, blogs, wikis, text chat, computer aided assessment, educational animation, simulations, games, learning management software, and electronic voting systems. All the aforementioned tools can

help enhance learning, even in a compliance and safety training setting. McGreal and Elliott (2008) echoed the list and offered their own definition of learning technologies including audio, video, text chat, web-conferencing, instant messaging, peer-to-peer file sharing, blogs, RSS feeds, wikis, games, and digital worlds.

One question to consider in a corporate environment is how these learning tools are organized and distributed to the employee population. Mallon (2009) published a report on high-impact learning practices, outlining a number of organizational systems for managing a large amount of corporate learning data. Some of the organizational tools include: a) electronic performance support systems (EPSS) for just in time training that provides step-by-step instructions to employees; b) Learning management systems (LMS) that manage and distribute training and may also be integrated with talent management, succession, development planning, and performance tools; c) communities of practice, where people with similar interests come together and can collaborate to advance innovative solutions to corporate problems; d) expertise directories where professionals and experts are listed with contact information to help internal employee locate the help they need; e) enterprise search applications allowing employees to tap into company-wide information more efficiently; f) learning portals to help employees find and share information more efficiently; and finally, g) enterprise content management systems (ECMS) allowing employees to develop, discover, and share valuable content. In their report, Mallon (2009) also mentioned other learning tools such as internal blogs, podcasts, RSS feeds, social networking, mobile learning, instant messaging, and eLearning. These tools can be hosted on the learning management systems described above. The most common tool being hosted in corporate training today is eLearning.

In a series of field-based interviews, Zornada (2005) explored the benefits, challenges, and drawbacks to eLearning in particular. Zornada's (2005) study involved numerous international corporations such as Qantas Airways, Motorola, and Cisco Systems. Zornada (2005) found that eLearning provides time savings for employees as they are able to fit small periods of self-study into the slow parts of their day. Another benefit is financial. Both Cisco and Motorola reported that while start-up costs for eLearning were initially high, there was significant costs savings in delivery. Rosen (2009) echoed this thought, saying once eLearning is developed, it is available and low-cost to maintain. At Westpac Banking Corporation, eLearning offered deeper, more sustained learning leading to higher productivity and higher work quality. Employees stated that since they could move through the learning at their own pace and return to topics needing review, they achieved deeper learning. Rosen (2009) noted that when using eLearning, participants do not have to retain as much content as they do in traditional classroom training. This is because they can always return to review the course in their own time to refresh memories. However, Zornada (2005) found that eLearning was not suited for all employees or all training topics. Soft-skills training such as learning development and team skills are not always successfully taught in the eLearning format.

Lim et al. (2007) also sought to understand eLearning effectiveness through a corporate lens. The researchers distributed a survey to 151 employees at Samsung, Hyundai, and LG located in Korea. After participating in an online training, the participants were sent a survey measuring their learning motivation, computer self-efficacy, what training content they learned, and their assessment of any face-to-face or

email communication supplementing the online training. The participants were also asked about the ease of use of the eLearning, the support they received from supervisors, and their performance.

Lim et al. (2007) demonstrated that learning performance is heavily influenced by trainee motivation. This has implications for generational differences in web-based learning effectiveness given Holyoke and Larson's (2009) findings that Millennials had the lowest motivation to learn of any generation. On the other hand, Lim et al. (2007) observed that computer self-efficacy also has significant impact on learning performance. As Oblinger and Oblinger (2005) pointed out, Millennials have the most computer self-efficacy.

While significant research has been done on emerging technologies employed by corporate learning instructional designers, this information has not thoroughly been reviewed against the emerging needs of the 21st-century, generationally diverse learner. Perhaps insight into the learning style preferences of the different generations can help inform how these technologies can be employed to create effective and engaging corporate training.

How Learning Style Preferences Can Inform Instructional Design

Education practitioners have long studied the concept of student learning styles. Early research includes Curry's (1983) three categorizations of learning styles: instructional preferences, information processing style, and cognitive style. Since that time, hundreds of learning style models have been created to measure and classify students into learning style categories (Coffield et al., 2004). A frequent debate in the field is how the concept of learning styles can be used appropriately to inform

instructional design best practices. While some argued student learning styles should be matched to teaching style for maximum learning success (Battalio, 2009; Blackburn, 2009; Rollins, 2002), others contended this concept of matching can be detrimental to student achievement (Coffield et al., 2004; Felder & Spurlin, 2005). However, student achievement is only one piece of the learning style equation. The other piece is how learning style preferences affect student satisfaction in learning.

     Lee (2005) is one author who studied how learning style preference affects student satisfaction in web-based learning. Lee (2005) surveyed 145 graduate students at Texas A&M University to gather their demographic information, experiences with web-based learning, and learning styles as conceptualized by Sarasin's Learning Style Model (1999). Lee (2005) tested the survey for internal consistency and achieved Cronbach Alpha values ranging from .82 to .90, which is considered an acceptable level of reliability (Cortina, 1993). The survey was also distributed to five faculty members at Texas A&M University for validity. The average age of respondents was 37 years old.

     The Sarasin Learning Style Model Lee (2005) used to measure learning styles classified students into three categories: visual learners who prefer to read information, auditory learners who prefer to hear messages, and tactile or kinesthetic learners who favor physical hands-on experience. Lee (2005) found a significant correlation between student learning style preferences and their activity preferences. Auditory learners preferred learning involving hearing messages from their peers or the instructors. Visual learners preferred to read information, showing a strong preference for the activity of e-journaling. Kinesthetic learners preferred interactive activities such as the chat room. Lee (2005) concluded that instructional designers should account for a variety of learning

styles when designing web-based instruction. The study also informed how best practices can be gleaned from the data gathered in this study. If generations have different learning styles, particular learning activities corresponding with those learning styles can be employed to cater to those styles.

Like Lee (2005), Becker et al. (2007) studied the relationship of learning style preferences on preferences for web-based learning activities. The researchers surveyed a group of 891 undergraduate students enrolled in introductory Business and Law courses at Central Queensland University (CQU). The survey asked students about their preferences with web-based learning activities and also included the VARK model questionnaire (Fleming & Mills, 1992). The VARK model is a previously validated instrument measuring learning styles based on four classifications: Visual learners (those who prefer to take in information with pictures), Aural learners (those who prefer to have things explained to them), Read/write learners (those who prefer to read and write when learning), and Kinesthetic learners (those who prefer a hands-on approach to learning).

The first finding indicated student learning style preferences do not directly influence the preference for studying in an online course. That is, there was no statistically significant correlation between student learning styles as measured by the VARK model and student responses to the statement, I prefer a course that has all online/web-based materials. However, there were statistically significant results with regard to learning styles and other preferences. For example, students with an aural learning style valued the opportunity to study at their own time and place less than other students. Becker et al. (2007) posited that since aural learners prefer listening and discussing information, this is quite logical.

One unexpected finding pertained to Millennial learning preferences. More than 75% of students surveyed fell into the Millennial cohort, and the overwhelming majority stated they had a preference for working in groups. Becker et al. (2007) suggested their preferences indicated a shift in learning preferences from previous generations, as Generation X learners were described as "independent problem-solvers and self-starters" (Bova & Kroth, 2001, p. 58).

Rollins (2002) studied the relationship between student learning preferences and web-based learning activities. Using a mixed-methods research approach, Rollins gathered data from 50 graduate students at Drexel University who participated in an extensive 60-minute study involving a series of tests and assessments. Participants completed two learning style instruments including the Kolb Learning Style Inventory (LSI) (1999) and the Felder-Soloman Index of Learning Styles (ILS). Students were then asked to complete the Eachus/Cassidy Computer Self-Efficacy (CSE) instrument measuring confidence and likelihood to succeed with computers. Rollins (2002) then observed each participant performing various search operations across multiple websites while recording their results on an Interface Element Checklist. Finally, the students completed a satisfaction questionnaire. The results revealed a number of statistically significant correlations. Students who scored high on the Visual-Verbal dimension on the Felder-Soloman ILS tool had a correspondingly high preference for graphic or text interface elements. There was also a significant correlation between preference for certain web elements and success in navigation with those elements. The results indicated a statistically significant relationship between preferred learning style and success in web interaction when the construct matches that learning style preference.

Other notable researchers found similar correlation between learning style preference and success in online education. For example, Battalio (2009) conducted a quantitative analysis using the Index of Learning Styles (Felder & Soloman, 2004) to measure preferred learning style and the relationship it has with success in distance education. The purpose of the study was to understand to what extent learning styles correlated with academic success in web-based learning. Battalio (2009) posited that if a correlation were found, instructional designers would be better able to design effective courses. To find this correlation, Battalio created two versions of an undergraduate-level, online, technical communications course: a collaborative version and a self-directed version. One hundred twenty students enrolled in one of these two versions were asked to fill out the ILS survey, a demographic survey, and an opinion survey of the course upon completion. Success was measured based on the course grade and a pre- and post-test analysis. Battalio (2009) found that reflective learners (i.e., those who preferred to think quietly rather than interact with others) were more successful in the self-directed course than the collaborative course. In addition, active learners in the collaborative version of the course were more successful than active learners in the self-directed version of the course. Battalio (2009) concluded there was a significant association between learning styles and academic success in distance education. To account for this phenomenon, he recommended instructors create two versions of this course so all learners can thrive in an environment that fits their learning preferences.

Other authors, such as Blackburn (2009) also concluded that courses should be created in multiple iterations to account for the different learning style preferences among students. Blackburn (2009) conducted a research study at GlaxoSmithKline in

collaboration with the training and development professionals at the organization. The study involved 40 employees participating in an instructor-led live training program titled Leadership Without Authority. After several interviews with the training professionals, students were asked to complete the Felder-Soloman Index of Learning Styles tool. Four training groups were then created: active, sensing, visual, and control. In every group except for the control group, instruction was modified to cater to the learning style of the participants. Active learners were placed in the active group; visual learners were placed in the visual group, and so on. The students were also given a pre- and post-test on the training material. The results indicated a statistically significant difference ($p=.006$) in the post-test scores between participants taught with their preferred learning style as opposed to participants in the control group. Based on the results, Blackburn (2009) made the argument that corporations may benefit from creating differentiated training for all learners based on their learning style.

Despite numerous studies indicating students could benefit from matching learning style to instructional design components (Battalio, 2009; Blackburn, 2009; Rollins, 2002), others cautioned against placing students in a box (Coffield et al., 2004; Felder & Spurlin, 2005). In a comprehensive review of the literature on learning styles, Coffield et al. (2004) reviewed 71 learning style models with a critical analysis of 13 in particular. The 58 models not described in detail are either not widely used, are simply new labels on existing constructs, or are adaptations of leading models that may not have influenced the field as heavily. Such is the case with the Felder-Soloman Index of Learning Styles (the tool used for this research study). As Richard Felder himself described in an unpublished article on his learning style model entitled "Are Learning

Styles Invalid? (Hint: No!)," the ILS draws from both the Myers-Briggs Type Indicator (MBTI) and the Kolb Learning Styles Model.

In an attempt to organize the 71 learning style models, Coffield et al. (2004) referenced Curry's (1983) three categorizations of learning styles: instructional preferences, information processing style, and cognitive style. Coffield et al. (2004) expanded the model further across five categories. On one end of the spectrum, learning styles are cognitive features, deep-seated features of a person's heredity. On the other end, they are conceptions of learning based on experience and motivation. Table 1 shows a sampling of some authors that fall into these families of learning styles as classified by Coffield et al. (2004).

Table 1

Families of Learning Styles

Learning Style Family	Author(s)
Learning styles and preferences are largely constitutionally based including the four modalities: VAKT (Visual, Auditory, Kinesthetic, Tactile)	Gregorc (1985) Richardson (2000)
Learning styles reflect deep-seated features on the cognitive structure, including 'patterns of ability'	Riding and Rayner (1998)
Learning styles are one component of a relatively stable personality type	Apter (2001) Jackson (2002)
Learning styles are flexibly stable learning preferences	Kolb (1999) Felder (1993)
Move on from learning styles to learning approaches, strategies, orientations, and conceptions of learning	Entwistle (1998) Vermunt (1992)

Source: Adapted from Coffield et al. (2004)

Coffield et al. (2004) pointed out that learning style classification is a frequently debated theme in the field of learning styles. Many learning style theorists argue learning styles are fixed traits, a theory that might lead to labeling individuals, promoting the matching concept of pairing teaching styles to learning styles. Others state awareness of

fixed traits can allow students to develop their weaker preferences to learn in a well-rounded manner.

The other side of the debate contends learning styles are flexibly stable and knowing one's learning style offers a way for students and teachers to begin a dialogue about learning. Coffield et al. (2004) classified the Felder-Silverman model (on which the Felder-Soloman Index of Learning Styles is based) closer to the right end of the spectrum in which learning styles are flexible and based on personal preference. Felder and Spurlin (2005) concurred with Coffield et al.'s (2004) analysis of the ILS. Felder and Spurlin (2005) reiterated that learning styles are preferences and behavioral tendencies, not indicators of strength or predictors of behavior. Felder and Spurlin (2005) suggested information about student learning styles should be viewed within the context of an entire class or learning system. They agreed with other leading theorists in the field who say teachers should not be overly concerned with which students have which learning preferences, but rather, should design curricula addressing the needs of the whole teaching-learning environment (Bonk & Zhang, 2006; Entwistle & Peterson, 2004; Felder & Spurlin, 2005; Vermunt & Verloop, 1999).

Another concept to consider is the learning style model might serve as a starting point for developing virtual learning development best practices. With this concept in mind, Bonk and Zhang (2006) created a model for designing web-based education called the R2D2 model. R2D2 refers to Read, Reflect, Display, and Do. The authors suggested web-based learning be designed with the above four learning methods in mind, suggesting the result will be more engaging and will teach to the whole teaching-learning environment.

The R2D2 model suggests a series of learning activities and technologies for addressing the various learning preferences of the population. These activities fall into four quadrants. The Read quadrant suggests methods such as online readings, lectures, podcasts, and virtual explorations. The Reflect quadrant includes online blogs, reflective writing tasks, and self-examinations such as electronic portfolios. The Display quadrant contains virtual tours, animations, maps, and timelines. Finally, the Do quadrant includes hands-on activities such as simulations, scenarios, and case studies.

Understanding how learning styles can be applied to instructional design best practices contextualizes the research data from this study. If different generations are found to have different learning styles, how can that information be applied to instructional design? While matching learning style to teaching style has resulted in academic success, the consensus among researchers is that curriculum should cater to the entire learning cycle.

Summary

Given the contradictory research on generational learning preferences as it pertains to web-based learning, further study is warranted on the generational learning style preferences of the corporate employee. In addition, an understanding of such differences (or lack thereof) can inform instructional design best practices if training developers create training programs catering to the entire learning cycle. With a myriad of technological tools and learning activities available, the next age of corporate web-based training will look vastly different from the corporate training of the last decade. As the evolution takes place, an understanding of the needs of the generationally diverse workforce can lead to more effective and engaging training.

Chapter 3: Research Methodology

Introduction

This researched employed a non-experimental cross-sectional descriptive design and used a survey data collection method to investigate the differences in learning style preferences and web-based learning activity preferences across various generational cohorts. Specifically, the purpose of the study was to gain insight into the extent to which learning style preferences and learning activities for online technologies varied by generational cohort to identify best practices for online instructional design with respect to any generational differences.

The site and population identified for the study was a large, publically traded, railroad company. The population for this study was employees who graduated from the leadership and management development programs. Hence, this sampling approach represents a convenience sample. All participants selected for the study were sent an email invitation to participate with an embedded URL to an online survey (see Appendix A). Participants were asked to complete a two-part web-based survey (see Appendix B). The first part of the survey included a validated survey instrument – namely the Felder-Soloman Index of Learning Styles (ILS) (Felder & Spurlin, 2005; Litzinger, Lee, Wise, & Felder, 2007; Zywno, 2003). The second part of the survey asked participants about their preferences for various web-based learning activities when participating in web-based learning as well as some key demographic items of interest.

The data collected through the online survey were analyzed to determine whether any generational differences existed in terms of learning styles and learning activity

preferences. The study also allowed the researcher to develop practical guidelines with which to advance instructional design best practices in online training.

The following research questions were posed.

1. To what extent do learning style preferences vary by generational cohort?

2. To what extent do preferences for learning technologies and learning activities vary by generational cohort?

3. How can instructional design for web-based learning be optimized to address the learning style preferences of a generationally diverse workforce?

Research Design and Rationale

As mentioned, the study represents a non-experimental cross-sectional descriptive design and used a customized, web-based survey instrument. The design allowed for the identification of several variables of interest related to learning style and learning activity preferences as they pertained to web-based learning and generational theory. The study primarily sought to explore the extent to which learning style preferences and learning activities preferences varied by generational cohort. It was done with the goal of identifying best practices to enhance instructional design for web-based learning.

According to Creswell (2008), a quantitative approach is preferable when the "researcher seeks to establish the overall tendency of responses from individuals and to note how this tendency varies among people" (p. 51). A limitation in this study was the mono-method bias associated with using a survey as the sole means with which to collect data. However, it should be noted the Felder-Soloman Index of Learning Styles chosen

for this study was only available in survey form and has been researched extensively with respect to validity and reliability (Hosford & Siders, 2010; Felder & Spurlin, 2005; Litzinger et al., 2007; Zywno, 2003).

Site and Population

Population Description

Given the intent and purpose of the research, the sample population for the study included employees who completed a company-sponsored leadership and management development program. This program has been in effect since 2001 and participants included executives, managers, and new hires. In addition, Baby Boomers, Generation X, and Millennials were all represented in the sample population. The survey was distributed to 765 participants.

Site Description

As mentioned earlier, the site for the study was a large, publically traded, railroad company. This organization had annual revenue of over $15 billion and operated in the continental United States.

Site Access

Site access was granted and secured verbally by the manager of Management Development at the company. This manager served as a point of contact at the company and assisted in the distribution of the web-based survey.

Research Methods

Description of Each Method Used

The data collection method used for this study was the survey method. Surveys are the most prevalent and efficient means by which to collect a large amount of data in a

reasonable amount of time (Church & Waclawski, 1998; Fowler, 2009; Kraut, 1996) and have been the mainstay in Human Resources Development (HRD) research for decades (Swanson & Holton, 1997). To reiterate, the study used the ILS instrument as well as a customized survey section including items and questions pertaining to instructional design and web-based learning activity for web-based learning.

Index of learning styles instrument. The first part of the survey used all questionnaire items on the ILS. The ILS is a 44-item web-based survey designed to identify an individual's learning style preferences. Felder and Soloman designed the instrument in 1991 and based their work on the four dimensions of the Felder-Silverman learning style model (Felder & Silverman, 1988). The Index of Learning Styles (ILS) measures learning preferences on four dimensions: (1) active (i.e., learning by doing) vs. reflective (i.e., learning by thinking), (2) sensing (i.e., practical and fact-based) vs. intuitive (i.e., theoretical and abstract), (3) visual (i.e., learning via images) vs. verbal (i.e., learning via writing or speech), and (4) sequential (step-like linearity) vs. global (holistic).

Results are presented for each dimension along a range of odd integers. Eleven questions are posed for each dimension and there are two possible answers for each question. One answer translates to a value of +1 while the other answer translates to a value of -1. Figure 2 shows a sample learning styles results page.

Wilkinson, & Anderson, 2000; Zywno, 2003). There was one exception in which Zwanenberg et al. (2000) found the sequential-global dimension did not meet the criterion value of 0.5 or better for attitude surveys. However, on the whole, these studies suggest the ILS is a sufficiently reliable and valid instrument for assessing learning styles (Livesay et al., 2002; Zywno, 2003).

Felder and Spurlin (2005) clarified that the intended use of this tool was to suggest behavioral tendencies along a continuum but was not a reliable indicator of skill, nor should it be considered a fixed measurement, given learners' preferences can evolve over time. In an often-cited critical review of learning style measurement tools, Coffield et al. (2004) warned of the danger of learning style tools as they can put students in boxes and actually hinder learning progress. Felder and Spurlin (2005) acknowledged and generally agreed with these critiques, but argued the primary purpose of the ILS tool was to help design effective learning programs. They further added that by understanding the learning style profile of a particular class, course designers and instructors could build in design elements that support various learning styles.

Design component preferences. The second part of the survey was a customized preferences survey. This portion of the survey explored web-based learning activity preferences. In addition, key demographic variables were included on the survey instrument to determine whether any differences existed in terms of generational cohort.

Data analysis procedures. The quantitative research study relied on descriptive statistical analysis such as frequency distributions, percentages, and mean scores. Cross tabulations across demographic variables were also performed.

Stages of Data Collection

After obtaining IRB approval, a link to the survey was emailed to all participants. Specifically, an email invitation to participate was sent to the sample population (N = 765) with an embedded URL to the online survey. Upon entering the survey site, participants read an informed consent page outlining the risks and benefits associated with the study and the safeguards in place to ensure individual anonymity and confidentiality. The information from the survey was kept strictly confidential. To participate in the survey, participants had to click a box indicating they had read the information page prior to proceeding to the survey. Participants, however, were able to opt-out and withdraw from the survey at any time throughout the survey administration process.

The survey administration window remained open for two weeks and an email reminder to participate was sent one week before the end to encourage participation and maximize the overall response rate. At the end of the survey, the client organization also received a summary report of the findings and results. The most difficult barrier to overcome in this research was the potential for a low response rate given that the only means of communication with participants was via email (Porter & Whitcomb, 2003). To address the concern the survey came from an internal email so the employees understood the request was coming from internal resources, thereby increasing the likelihood of participation on behalf of the organization.

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Ethical Considerations

</div>

The proposed study presented minimal risk to the participants and did not involve any procedures requiring consent outside the context of participation in the survey. The

proposed research was reviewed and approved through Drexel University's IRB process. Informed consent was obtained prior to the participants being able to enter the web-based survey as mentioned. Informed consent included a written statement of the basic elements of consent (risks, benefits, confidentiality) followed by a statement such as, "Clicking below indicates that I have read the description of the study and I agree to participate." In addition, a brief summary of the research methodology was provided and the participants were assured of their individual anonymity and confidentiality. Further, participants were able to exit and opt-out from the survey at any point in time.

Chapter 4: Findings, Results, and Interpretations

Findings

The purpose of this study was to determine how instructional design for web-based corporate training might be optimized to address the needs of the generationally diverse workforce. The following research questions were posed.

1. To what extent do learning style preferences vary by generational cohort?

2. To what extent do preferences for learning technologies and learning activities vary by generational cohort?

3. How can instructional design for web-based learning be optimized to address the learning style preferences of a generationally diverse workforce?

This chapter describes the data collection, findings, and results of the research study. The data and information gathered from the survey pertain to individual learning style preferences and individual learning activity preferences. By understanding these preferences, this study hopes to inform instructional design optimization for web-based corporate training and learning.

A web-based survey was distributed via email to a sample population of 765 employees at a railroad company, all of whom had completed a company-sponsored management training program. The survey remained open and was available for two weeks. An email reminder to participate was sent a week before the survey closed in an effort to encourage participation. Roth and BeVier's (1998) suggested reminder emails can significantly increase internet survey response rates. Of the 765 employees in the

sample, 230 completed the survey, which represents a 30% response rate. Previous research on Internet survey response rates vary; however, several studies indicated a 30% response rate is the norm (Baruch & Holtom, 2008; Roster, Rogers, Albaum, & Klein, 2004), particularly for managerial respondents (Anseel, Lievens, Schollaert, Choragwicka; 2010) as in this study. Nonetheless, a response rate of 30% is considered an adequate rate of response for survey research (Roth & BeVier, 1998). Because of the anonymity of the survey, no follow-up was conducted with those who chose not to participate in the study.

The survey consisted of two sections to measure learning style preferences and learning activity preferences. The first section, aimed at discovering learning style preferences, used the Felder-Soloman Index of Learning Styles instrument. The second section asked more specifically about learning activity preferences. The participants were also asked to identify their generational cohort. Table 2 describes the participant population and some of their characteristics. Of the 230 respondents, 0.5% (*n*=1) were Traditionalists (over the age of 67). Nine and one-tenths percent of respondents (*n*=21) were Baby Boomers (between 47-66 years old), while 51.7% (*n*=119) were Generation X (between 33-46 years old) and 38.7% (*n*=89) were Millennials (under the age of 33).

Table 2

Descriptive Statistics

	Percent (%)	*n*
Traditionalists	0.5	1
Baby Boomers	9.1	21
Generation X	51.7	119
Millennials	38.7	89
Total	100.0	230

Learning Style Preferences

To understand the learning style preferences of the study population, the Felder-Soloman Index of Learning Styles (ILS) was used. The ILS tool measures learning styles on four dimensions: (1) active (i.e., learning by doing) vs. reflective (i.e., learning by thinking), (2) sensing (i.e., practical and fact-based) vs. intuitive (i.e., theoretical and abstract), (3) visual (i.e., learning via images) vs. verbal (i.e., learning via writing or speech), and (4) sequential (step-like linearity) vs. global (holistic).

Of the 230 participants, 63% (*n*=145) were classified as active learners. The remaining 37% (*n*=85) were classified as reflective learners. On the sensing vs. intuitive dimension, 65.2% (*n*=150) were classified as sensing learning whereas 34.8% (*n*=80) were intuitive. Overwhelmingly, the group was classified as visual learners more than as verbal learners. Eighty-five and seven-tenths percent of participants (*n*=197) were visual compared to 14.3% (*n*=33) verbal learners. Finally, on the sequential vs. global

dimension, 55.7% (*n*=128) were sequential whereas 44.3% (*n*=102) were global. Table 3

summarizes the results of learning style preferences for all 230 participants.

Table 3

Summary of Average Learning Style Preferences: All Generations (N=230)

	Percent (%)	*n*		Percent (%)	*n*
Active	63.0	145	Reflective	37.0	85
Sensing	65.2	150	Intuitive	34.8	80
Visual	85.7	197	Verbal	14.3	33
Sequential	55.7	128	Global	44.3	102

Overall, the group of participants was classified as more active than reflective

learners, meaning they preferred to learn by doing rather than by thinking. The group

was also more sensing than intuitive, meaning they were interested in learning about facts

and practical application rather than abstract concepts and theories. The most striking

dimension was the visual vs. verbal dimension in which 85.7% (*n*=197) of participants

were visual rather than verbal (learning with writing or speech). Finally, the sequential

vs. global dimension was the most balanced dimension with a little over half the

participants on the sequential side (learning things step-by-step) vs. global (seeing the big

picture).

Learning Style Preferences by Generational Cohort

The results of this study are consistent with previous research. For instance,

Felder and Brent (2005) calculated the average responses from 17 studies (2,506 total

participants) that used the Felder-Soloman Index of Learning Styles to understand the

average learner distribution on the four dimensions (see Table 4). The active dimension

was higher than the reflective dimension in both the Felder and Brent (2005) study

(64.0%) and in this study (63.0%). Sensing was also higher than the intuitive dimension,

63.0% in Felder and Brent (2005) and 65.2% in this study. Felder and Brent (2005)

found the same overwhelming preference for visual learning 82% as in this study

(85.7%). The greatest variance was found in the sequential vs. global dimension. In

Felder and Brent's (2005) summary of data, the sequential dimension was slightly higher

(60.0%) than that of this study (55.7%).

Table 4

Summary of Average Learning Style Preferences: 17 previous studies (N =2,506)

	Percent (%)	*n*		Percent (%)	*n*
Active	64.0	1,604	Reflective	36.0	902
Sensing	63.0	1,579	Intuitive	37.0	927
Visual	82.0	2,055	Verbal	18.0	451
Sequential	60.0	1,504	Global	40.0	1,002

Source: Felder and Brent (2005)

The first research question for this study asked how the learning style preferences

varied by generational cohort. However, this research showed little variance in learning

style preferences among the four generations. Table 5 presents a summary of learning

style preferences for the Millennial cohort only. For Millennials, 60.0% (*n*=53) of

respondents in this study were classified as active learners as compared to 64% overall in

the Felder and Brent (2005) study. Seventy and eight-tenths percent (70.8%, *n*=63) were

sensing learners in this study as compared to 63% in Felder and Brent (2005). Eight-four

and three-tenths percent (84.3%, *n*=75) of Millennials were classified as visual learners,

only slightly higher than Felder Brent's (2005) of 82%. Finally, 58.4% (*n*=52) of

Millennials preferred the sequential dimension compared to the average of 60% in Felder

Brent (2005).

Table 5

Summary of Learning Style Preferences by Generation: Millennials (N=89)

	Percent (%)	*n*		Percent (%)	*n*
Active	60.0	53	Reflective	40.0	36
Sensing	70.8	63	Intuitive	29.2	26
Visual	84.3	75	Verbal	15.7	14
Sequential	58.4	52	Global	41.6	37

The research results for Generation X revealed similar results. Table 6 presents a

summary of data for learning style preferences of Generation X. The active dimension

was preferred at a rate of 67.2% (*n*=80), compared with 64% in previous research. The

sensing dimension was preferred at a rate of 61.3% (*n*=73) compared to 63%. The visual

dimension was overwhelmingly preferred at 87.4% (*n*=104) compared to 82% on

average. Finally, the sequential dimension was preferred at 58.4% (*n*=69) compared to

60%.

Table 6

Summary of Learning Style Preferences by Generation: Generation X (N=119)

	Percent (%)	n		Percent (%)	n
Active	67.2	80	Reflective	32.8	39
Sensing	61.3	73	Intuitive	38.7	46
Visual	87.4	104	Verbal	12.6	15
Sequential	58.0	69	Global	42.0	50

Table 7 presents a summary of data for learning style preferences of the Baby Boomers. The active dimension was preferred by 57.1% (n=12) of Baby Boomers compared to a 64% average in previous literature. The difference is of 7 percentage points. The sensing dimension was preferred by Baby Boomers at a rate of 66.7% (n=14); the average in previous literature was 63%. The visual dimension was preferred by Baby Boomers at a rate of 81% (n=17) as compared to an average of 82%. However, the sequential dimension is where some variance is found. In this study, 33.3% (n=7) of Baby Boomers preferred the sequential dimension. In previous literature, the sequential dimension was preferred by 60% of participants. The research seems to indicate that while most individuals prefer learning using a step-by-step approach, Baby Boomers in this group prefer learning in a holistic manner. Another explanation for this difference could be the small sample size of the Baby Boomer cohort in this research study (n=21).

Table 7

Summary of Learning Style Preferences by Generation: Baby Boomers (N=21)

	Percent (%)	n		Percent (%)	n
Active	57.1	12	Reflective	42.9	9
Sensing	66.7	14	Intuitive	33.3	7
Visual	81.0	17	Verbal	19.0	4
Sequential	33.3	7	Global	66.7	14

Due to the low response rate of the Traditionalist generation (*n*=1), generational results were only calculated for the Baby Boomers, Generation X, and Millennials. Overall, the results seem to indicate that learning style preferences do not vary significantly when accounting for generation.

Learning Activity Preferences

The second research question asked to what extent does learning activity preferences vary by generational cohort? In the second section of the survey, participants were presented with a comprehensive, yet unexhausted list of 22 web-based learning activities (see Appendix B). The participants were asked to select their top five favorite learning activities in terms of their web-based learning experiences. Table 8 presents a summary of the top five, most frequently selected learning activities and the bottom five, least selected learning activities for all participants, organized by generation.

Table 8

Summary of Most and Least Selected Learning Activity Preferences for All Generations

		Baby Boomers Generation X and Millennials		Baby Boomers		Generation X		Millennials	
		%	n	%	n	%	n	%	n
1	Reviewing information in graphic format (tables, charts, graphs)	58.1	133	52.4	11	54.2	65	64.8	57
2	Using search engines for online research	45.2	104	47.6	10	45.8	55	44.3	39
3	Interacting with computer simulations	44.3	102	61.9	13	49.2	59	34.1	30
4	Practicing real-world interactions in online simulations	40.6	93	28.6	6	45.0	54	37.5	33
5	Reviewing quick reference guides such as FAQs	32.6	75	42.9	9	30.8	37	33.0	29
6	Viewing video-recorded lectures	31.7	73	28.6	6	30.8	37	34.1	30
7	Reading text (theories, concepts, non-fiction)	31.4	72	47.6	10	25.0	30	36.4	32
8	Designing / drawing concepts visually	28.3	65	19.0	4	27.5	33	31.8	28
9	Presenting your findings to others	23.9	55	23.8	5	24.2	29	23.9	21
10	Watching educational animations	22.3	51	28.6	6	20.0	24	23.9	21
11	Engaging in live short (one-hour) webinars	18.3	42	19.0	4	23.3	28	11.4	10
12	Playing one-player computer games	17.8	41	9.5	2	20.0	24	17.0	15
13	Interacting with peers in social media forums	16.1	37	19.0	4	15.0	18	17.0	15
14	Chatting online with experts / specialists	14.0	32	14.3	3	13.3	16	14.8	13

Table 8 (continued)

		Baby Boomers Generation X and Millennials		Baby Boomers		Generation X		Millennials	
		%	*n*	%	*n*	%	*n*	%	*n*
15	Engaging in virtual realities	13.9	32	14.3	3	13.3	16	14.8	13
16	Using mobile apps to engage in learning via smart phone devices	13.0	30	4.8	1	15.0	18	12.5	11
17	Playing multi-player online games within virtual worlds	11.3	26	4.8	1	10.8	13	13.6	12
18	Participating in multi-user online brainstorming centers	9.1	21	4.8	1	8.3	10	11.4	10
19	Completing questionnaires and/or surveys	9.1	21	14.3	3	10.0	12	6.8	6
20	Participating in online discussion boards	8.3	19	9.5	2	8.3	10	8.0	7
21	Observing people online (desktop-sharing)	7.0	16	4.8	1	8.3	10	5.7	5
22	Sharing snippets of info online in twitter-like communities	2.2	5	0.0	0	1.7	2	3.4	3

The most frequently selected learning activity for all participants regardless of generation was "reviewing information in graphic format (tables, charts, graphs)" (58d.1%, n=133). Table 9 presents a summary of learning activity preferences for the entire group. Because there was only one traditionalist response, that datum was omitted from the aggregate table. The second most popular selection was "using search engines for online research" (45.2%, n=104). The third most popular selection for all participants was "interacting with computer simulations," (44.3%, n=102). The fourth most popular selection was "practicing real-world interactions in online simulations," (40.6%, n=93). Finally, the fifth most popular selection was "reviewing quick reference guides such as Frequently Asked Questions (FAQs) (32.6%, n=75).

The least popular selection out of 22 total learning activities was "sharing snippets of information online in twitter-like communities" (2.2%, n=5). The second least popular option was "observing people online (desktop sharing)," (7.0%, n=16) while the third least popular option was "participating in online discussion boards" (8.3%, n=19). Two learning activities were tied for fourth least popular. They were "completing questionnaires and/or a survey" and "participating in multi-user online brainstorming centers" (9.1%, n=21). Finally, the fifth least popular option was "playing multi-player online games within virtual worlds" (11.3%, n=26)

Table 9

Summary of Learning Activity Preferences (N=229)

	Baby Boomers, Generation X, and Millennials	
	Percent (%)	*n*
Reviewing information in graphic format (tables, charts, graphs)	58.1	133
Using search engines for online research	45.2	104
Interacting with computer simulations	44.3	102
Practicing real-world interactions in online simulations	40.6	93
Reviewing quick reference guides such as FAQs	32.6	75
Viewing video-recorded lectures	31.7	73
Reading text (theories, concepts, non-fiction)	31.4	72
Designing / drawing concepts visually	28.3	65
Presenting your findings to others	23.9	55
Watching educational animations	22.3	51
Engaging in live short (one-hour) webinars	18.3	42
Playing one-player computer games	17.8	41
Interacting with peers in social media forums	16.1	37
Chatting online with experts / specialists	14.0	32
Engaging in virtual realities	13.9	32
Using mobile apps to engage in learning via smart phone devices	13.0	30
Playing multi-player online games within virtual worlds	11.3	26
Participating in multi-user online brainstorming centers	9.1	21
Completing questionnaires and/or surveys	9.1	21
Participating in online discussion boards	8.3	19
Observing people online (desktop-sharing)	7.0	16
Sharing snippets of info online in twitter-like communities	2.2	5

When accounting for variations by generation, there were some slight differences in the results. Table 10 summarizes learning activity preferences for the Millennial generation. The most often selected learning activity for Millennials was "reviewing information in graphic format (tables, charts, graphs)" (64.8%, $n=57$). The second most popular selection was "using search engines for online research" (44.3%, $n=39$). The Millennials' first and second choices were the same first and second choices for all generations. The third most popular selection for Millennials was "practicing real-world interactions in online simulations" (37.5%, $n=33$). The fourth most popular selection among Millennials was "reading text" (36.4%, $n=32$). Finally, two learning activities were tied for fifth most popular among Millennials. These were "interacting with computer simulations" and "viewing video-recorded lectures" (34.1%, $n=30$).

As within the larger group, the least popular selection among Millennials was "sharing snippets of information online in twitter-like communities," and 3.4% ($n=3$) of Millennials selected this option as a favorite, a slightly higher percentage than the larger group. The second least popular option was, again, "observing people online (desktop sharing)" (5.7%, $n=5$). The third least popular option was "completing questionnaires and/or surveys" (6.8%, $n=6$). The fourth least popular option among Millennials was "participating in online discussion boards" (8.0%, $n=7$). Finally, two learning activities were tied for fifth least popular. They were "participating in multi-user online brainstorming centers" and "engaging in live short (one-hour) webinars" (11.4%, $n=10$).

Table 10

Summary of Learning Activity Preferences: Millennials (N=89)

	Millennials	
	Percent (%)	*n*
Reviewing information in graphic format (tables, charts, graphs)	64.8	57
Using search engines for online research	44.3	39
Practicing real-world interactions in online simulations	37.5	33
Reading text (theories, concepts, non-fiction)	36.4	32
Interacting with computer simulations	34.1	30
Viewing video-recorded lectures	34.1	30
Reviewing quick reference guides such as FAQs	33.0	29
Designing / drawing concepts visually	31.8	28
Watching educational animations	23.9	21
Presenting your findings to others	23.9	21
Interacting with peers in social media forums	17.0	15
Playing one-player computer games	17.0	15
Chatting online with experts / specialists	14.8	13
Engaging in virtual realities	14.8	13
Playing multi-player online games within virtual worlds	13.6	12
Using mobile apps to engage in learning via smart phone devices	12.5	11
Engaging in live short (one-hour) webinars	11.4	10
Participating in multi-user online brainstorming centers	11.4	10
Participating in online discussion boards	8.0	7
Completing questionnaires and/or surveys	6.8	6
Observing people online (desktop-sharing)	5.7	5
Sharing snippets of info online in twitter-like communities	3.4	3

The largest generational group was Generation X with 119 participants. See

Table 11 for the summary of learning activity preferences for Generation X in this study.

Table 11

Summary of Learning Activity Preferences: Generation X (N=119)

	Generation X	
	Percent (%)	*n*
Reviewing information in graphic format (tables, charts, graphs)	54.2	65
Interacting with computer simulations	49.2	59
Using search engines for online research	45.8	55
Practicing real-world interactions in online simulations	45.0	54
Reviewing quick reference guides such as FAQs	30.8	37
Viewing video-recorded lectures	30.8	37
Designing / drawing concepts visually	27.5	33
Reading text (theories, concepts, non-fiction)	25.0	30
Presenting your findings to others	24.2	29
Engaging in live short (one-hour) webinars	23.3	28
Watching educational animations	20.0	24
Playing one-player computer games	20.0	24
Interacting with peers in social media forums	15.0	18
Using mobile apps to engage in learning via smart phone devices	15.0	18
Chatting online with experts / specialists	13.3	16
Engaging in virtual realities	13.3	16
Playing multi-player online games within virtual worlds	10.8	13
Completing questionnaires and/or surveys	10.0	12
Participating in online discussion boards	8.3	10
Observing people online (desktop-sharing)	8.3	10
Participating in multi-user online brainstorming centers	8.3	10
Sharing snippets of info online in twitter-like communities	1.7	2

Consistent with previous results, the most popular learning activity for this generation was "reviewing information in graphic format (tables, charts, graphs)" selected by 54.2% (*n*=65) of participants in Generation X. The second most popular selection among Generation X was "interacting with computer simulations" (49.2%, *n*=59). The third most popular selection was "using search engines for online research" (second for Millennials) selected by 45.8% (*n*=55) of Generation X. The fourth most popular selection was "practicing real-world interactions in online simulations" (45.0%, *n*=54). Finally, two learning activities were tied for fifth most popular among Generation X, "reviewing quick reference guides, such as FAQs" and "viewing video-recorded lectures" (30.8%, *n*=37).

As is the case with all groups in this study, the least popular selection among Generation X was "sharing snippets of information online in twitter-like communities" (1.7%, *n*=2). Three activities tied for second least popular among Generation X, "participating in multi-user online brainstorming centers," "observing people online (desktop-sharing)," and "participating in online discussion boards" (8.3%, *n*=10). The third least popular option was "completing questionnaires and/or surveys" (10.0%, *n*=12). The fourth least popular option among Generation X was "playing in multi-player online games within virtual worlds" (10.8%, *n*=13). Finally, two learning activities were tied for fifth least popular. They were "engaging in virtual realities" and "chatting online with experts/specialists" (13.3%, *n*=16).

The Baby Boomer generation had 21 participants. See Table 12 for the summary of learning activity preferences for Baby Boomers in this study.

Table 12

Summary of Learning Activity Preferences: Baby Boomers (N=21)

	Baby Boomer	
	Percent (%)	*n*
Interacting with computer simulations	61.9	13
Reviewing information in graphic format (tables, charts, graphs)	52.4	11
Reading text (theories, concepts, non-fiction)	47.6	10
Using search engines for online research	47.6	10
Reviewing quick reference guides such as FAQs	42.9	9
Viewing video-recorded lectures	28.6	6
Watching educational animations	28.6	6
Practicing real-world interactions in online simulations	28.6	6
Presenting your findings to others	23.8	5
Engaging in live short (one-hour) webinars	19.0	4
Designing / drawing concepts visually	19.0	4
Interacting with peers in social media forums	19.0	4
Completing questionnaires and/or surveys	14.3	3
Chatting online with experts / specialists	14.3	3
Engaging in virtual realities	14.3	3
Participating in online discussion boards	9.5	2
Playing one-player computer games	9.5	2
Observing people online (desktop-sharing)	4.8	1
Participating in multi-user online brainstorming centers	4.8	1
Playing multi-player online games within virtual worlds	4.8	1
Using mobile apps to engage in learning via smart phone devices	4.8	1
Sharing snippets of info online in twitter-like communities	0.0	0

Baby Boomers were the only group to name "interacting with computer simulations" as the number one choice (61.9%, *n*=13). The second most popular learning activity for this

generation was "reviewing information in graphic format (tables, charts, graphs)" (52.4%, n=11), which was the first choice for Generation X and Millennials. Two learning activities tied for third most popular among Baby Boomers. These were "reading text (theories, concepts, non-fiction)" and "using search engines for online research" (47.6%, n=10). The fourth most popular selection among Baby Boomers was "reviewing quick reference guides such as FAQs" (42.9%, n=9). Finally, the fifth most popular was tied between three activities. These were "viewing video-recorded lectures," "watching educational animations," and "practicing real-world interactions in online simulations" (28.6%, n=6).

As is the case with all groups in this study, the least popular selection among Baby Boomers was "sharing snippets of information online in twitter-like communities," selected by 0% of participants. Four activities tied for second least popular among Baby Boomers. They were "using mobile applications to engage in learning via smart phone devices," "playing multi-player online games within virtual worlds," "participating in multi-user online brainstorming centers," and "observing people online (desktop-sharing)" (4.8%, n=1). Baby Boomers were the only generation to identify "using mobile applications to engage in learning via smart phone devices" in the bottom five options. The third least popular option was tied between "playing one-player computer games" and "participating in online discussion boards" (9.5%, n=2). Three learning activities were tied for fourth least popular including "engaging in virtual realities," "chatting online with experts/specialists," and "completing questionnaires and/or surveys" (14.3%, n=3). Finally, three learning activities were tied for fifth least popular. They were

"interacting with peers in social media forums," "designing/drawing concepts visually," and "engaging in live short (one-hour) webinars" (19.0%, *n*=4).

Results and Interpretations

Four key elements emerged from the data analysis . These were the homogeneity of the responses across generations, the resistance all generations demonstrated toward emerging technological advances in learning activities, alignment of preferred learning activities and learning style preferences, and unexpected results as they pertain to Millennials, typically known as the techno-generation.

Homogeneity Across the Generations

With regard to learning style preferences, the three generations, Millennials, Generation X, and Baby Boomers, were largely homogeneous. Even when accounting for age, each generation fell within only a few data points of the averages cited in the previous studies that used the same Felder-Soloman Index of Learning Styles. The one difference found in the study was concerning the preference for global learning styles over sequential learning styles in Baby Boomers. For example, the averages found in previous research showed the sequential dimension was preferred 60% of the time and the global dimension preferred 40% of the time (Felder & Brent, 2005), whereas Baby Boomers in this study preferred the sequential dimension 33.3% (*n*=7) and global dimension 66.7% (*n*=14) respectively. Sequential learners gain understanding in a step-by-step fashion, following logical paths to find solutions. Global learners on the other hand, gain understanding randomly without immediately seeing connections. Global learners absorb information and then experience an "aha" moment when they suddenly see the big picture. This research indicates Baby Boomers prefer to learn globally at a

higher rate than other generations. However, there may be some contributing factors

for this finding. First, Baby Boomers were the smallest generational group in the study,

with only 21 participants. This difference in learning style preference could be an

anomaly, resulting from the small sample size of the group. Second, Felder-Soloman's

sequential/global dimension is the only dimension exhibiting some weakness in reliability

testing. In prior analysis, Zwanenberg et al. (2000) found the sequential-global

dimension did not meet the criterion value minimum standard of 0.50 or better suggested

by Tuckman (1999) for attitude and preference assessments. However, three other

studies found acceptable Cronbach alpha coefficients for this dimension, ranging from

0.53 to 0.61 (Litzinger et al., 2007; Livesay et al., 2002; Zywno, 2003). Given these

reliability concerns and the small variance across the other learning dimensions, this

study determines there is little difference in learning style preferences among the

generational cohorts in this population.

Similarly, when analyzing the five least favorite learning activities, all three

generations chose "sharing snippets of information online in twitter-like communities" as

their least favorite learning activity. "Observing people online (desktop-sharing)" and

"participating in multi-user online brainstorming centers" were in each generational

cohort's bottom five selections. "Desktop sharing" was second worst for Millennials,

third worst for Generation X, and fifth worst for Baby Boomers. "Online brainstorming

centers" was fifth worst for Millennials, second worst for Generation X, and fourth worst

for Baby Boomers. Given the group had 22 learning activities from which to choose, it is

surprising how consistent these results are.

Even when selecting an activity falling in the middle of the list, the results were consistent. For example, 23.8% of Baby Boomers selected "presenting your findings to others" as a favorite activity, landing ninth on the list. "Presenting to others" was also ninth on the list for Generation X with 24.2%, and it was 10th on the list for Millennials with 23.9%, a difference of less than 0.5% across the three generations. The striking similarity can perhaps be explained by the fact that the survey was conducted within a corporate organization. All the participants worked in the same organization, in the same sector. In addition, they had all completed the same management development program. This may explain the homogeneous results.

Resistance to Emerging Technological Advanced in Learning Activities

The participants in this study were largely homogeneous when it came to learning activity preferences as well. When looking at the results of the overall group, the top five selected learning activities were "reviewing information in graphic format," "using search engines for online research," "interacting with computer simulations," "practicing real-world interactions in online simulations," and "reviewing quick reference guides such as FAQs." Interestingly, the above activities are mostly Web 1.0 technologies. Web 1.0 technologies are those technologies that have been available and popular since the inception of the Internet. It is possible the group was primarily selecting learning activities with which they were familiar. Given that all participants worked for the same organization, these may be common learning tools used in the workplace, and, therefore, more familiar. Among the five least favorite learning activities for the entire group, the most notable were "sharing snippets of information online in twitter-like communities," "participating in online discussion boards," "participating in multi-user online

brainstorming centers," and "playing multi-player online games within virtual worlds."

These are Web 2.0 and Web 3.0 technologies with a focus on social learning and sharing.

Web 2.0 is frequently defined as a more collaborative version of the web in which social

media and peer-to-peer sharing are the norm (Bingham & Conner, 2010; Davidson &

Goldberg, 2010), whereas Web 3.0 technologies include immersive technologies, such as

virtual worlds and multiplayer online role-playing games (Bingham & Conner, 2010;

Chen, 2006; Dede, 2005; Shyamsunder & Sarmma, 2011).

It seems this population was resistant to the concept of social learning and peer-

to-peer sharing, the wave of future learning as posited by Bingham and Conner (2010)

and Davidson and Goldberg (2010). Given the 21st-century technological advances and

the popularity of social media sites in recreational use, it is not unrealistic to assume these

would have been at the top of the list. Sontakey and Dube (2011) argued strongly that

today's learner prefers ongoing community-based learning rather than stand-alone

learning experiences consumed alone. Such is not the case for this particular group.

Table 13 defines each learning activity in this study as Web 1.0, Web 2.0, or Web 3.0

technology. Some learning activities can be classified in all three categories. For

example, practicing real-world interactions in online simulations can be a Web 1.0

technology if the program is fairly simple and the individual is interacting with a

computer. If the simulation involves multiple users, an element of social collaboration

may define the simulation as a Web 2.0 technology. If the simulation is highly advanced

and creates a virtual reality, this is an immersive technology and would be considered

Web 3.0. As such, some learning activities fall into more than one category.

Table 13

Defining Learning Activities as Web 1.0, Web 2.0, or Web 3.0 Technologies

Interacting with computer simulations	Web 1.0, 2.0, or 3.0
Reviewing information in graphic format	Web 1.0
Reading text (theories, concepts, non-fiction)	Web 1.0
Using search engines for online research	Web 1.0
Reviewing quick reference guides such as FAQs	Web 1.0
Viewing video-recorded lectures	Web 1.0
Watching educational animations	Web 1.0
Practicing real-world interactions in online simulations	Web 1.0, 2.0, or 3.0
Presenting your findings to others	Web 2.0 or 3.0
Engaging in live short (one-hour) webinars	Web 2.0
Designing / drawing concepts visually	Web 1.0 or 3.0
Interacting with peers in social media forums	Web 2.0
Completing questionnaires and/or surveys	Web 1.0
Chatting online with experts / specialists	Web 2.0
Engaging in virtual realities	Web 3.0
Participating in online discussion boards	Web 2.0
Playing one-player computer games	Web 1.0 or 3.0
Observing people online (desktop-sharing)	Web 2.0
Participating in multi-user online brainstorming centers	Web 2.0 or 3.0
Playing multi-player online games within virtual worlds	Web 3.0
Using mobile apps to engage in learning via smart phone	Web 3.0
Sharing snippets of info online in twitter-like communities	Web 2.0

The most popular Web 2.0 (or collaborative) learning activity was "interacting with peers in a social media forum" and appeared 14th on the list of 22 among all generations. No social media learning activities appeared in any generation's top 10 list. Therefore, all generational groups expressed the same disinterest in this type of learning.

This may be due to the fact that the group is not currently engaged in social media learning in the workplace, or if they are, perhaps the experience has been poor.

Alignment of Preferred Learning Activities and Learning Style Preferences

The most often selected activity was "reviewing information in graphic format (tables, charts, graphs)." It was the first selection for Millennials and Generation X and second for Baby Boomers. It is interesting to note that 85.7% (n=197) of participants were classified as visual learners and the group overwhelmingly selected a visual learning activity as their top choice. While some learning activities are closely linked with specific learning styles, others may cut across multiple learning styles. In this case, reviewing information in graphic format via tables, charts, and graphs lends itself to the visual learning style.

Second choice for Millennials was "using search engines for online research." It was third choice for Generation X and third choice for the Baby Boomers. Using search engines is a sensing activity and 65.2% (*n*=150) of respondents were classified as sensing learners as opposed to intuitive learners on the Felder-Soloman Index of Learning Styles. Sensing learners like to learn facts, are patient with details, and enjoy problem solving using well-established methods. Conversely, intuitive learners prefer discovering possibilities, innovation, and they dislike repetition. This is an example of how the learning style preferences correspond closely with the learning activity preferences selected in this group. Other researchers have reported similar findings. Lee (2005) found a similar correlation between student learning style preferences and their learning activity preferences.

Another popular learning activity was interacting with computer simulations. While third overall, it was first choice for Baby Boomers, second choice for Generation X, and fifth choice for Millennials. Interacting with computer simulation is an active activity, as opposed to a reflective one. Active learners learn best by doing and prefer to do rather than discuss, whereas reflective learners prefer to think quietly and work alone. Again, the learning style preference matches the learning activity preference.

Unexpected Results from the Millennial Generation

In some ways, the trends in the data defy stereotypes of the young techno-generation typically defining Millennials. For example, interacting with computer simulation was most popular among older generations, decreasing in popularity with each generation. It was the number one most popular learning activity among Baby Boomers with 61.9% (n=13). Almost half, 49.2% (n=59), of the Generation X group selected "computer simulations" as a preferred learning activity, and only 34.1% (n=30) of Millennials selected this activity as a favorite. While this was a popular activity for all generations and did appear as a top five favorite for each cohort, it was interesting to note that a more advanced technology was more popular with older participants. Hartman et al. (2005) reported similar results, finding that older learners reported higher satisfaction with web-based learning than younger generations. This defies the stereotypes of the younger generation being more comfortable with technology. On the other hand, "designing/drawing concepts visually" became less popular with age. Only 19.0% (n=4) of Baby Boomers selected "drawing" as a favorite activity. Conversely, 27.5% (n=33) of Generation X and 31.8% (n=28) of Millennials selected "drawing" as a preferred activity. This activity could be considered one of the least technological activities on the list and

yet was more popular among younger generations – again defying the techno-generation stereotype. However, as technology evolves, it will become more difficult to classify these learning activities in such a way. Certain advanced programs can facilitate drawing in a high-tech environment. Likewise, some simplified computer simulations could be considered out-dated technology (for example, flight simulations have been in existence for decades).

Some trends in the data do reflect the stereotype of the techno-generation. For example, "playing multi-player online games within virtual worlds" was more popular among Millennials than within Generation X and Baby Boomers. While only 4.8% (n=1) of Baby Boomers selected this option, 10.8% (n=13) of Generation X and 13.6% (n=12) of Millennials preferred this activity. While multi-user virtual gaming is most popular with Millennials, it is still only the 15th most popular activity out of 22 and is relatively low on the list, considering how popular gaming is among Millennials. The NPD Group, a global market research company, and the Entertainment Software Association (ESA) revealed that the video game industry sold $10.5 billion in revenue in 2009 alone (ESA, 2010). Given the popularity of these games, these numbers are quite low. It could be that this particular group of individuals is not interested in gaming, or perhaps they do not feel gaming is an effective way to facilitate learning.

Similarly, "using mobile applications to engage in online learning via smart phone devices" was also a relatively unpopular learning activity. For Baby Boomers, this was the second to last option selected by 4.8% (n=1) of participants. Only 12.5% (n=11) of Millennials selected this option as a favorite and 15.0% (n=18) of Generation X did as well. While mobile apps are widespread and very popular, they scored low on the list in

this survey. The distinction should be made here that while Millennials may enjoy using smart phones and mobile apps, they may not feel that this is the best method for learning. This speaks to a larger discussion about the advisability of implementing popular technologies in a learning environment before first analyzing whether or not these technologies are conducive to facilitating learning. It may be that mobile applications are not an effective way to teach adults. Based on the survey results, mobile application learning would not be preferable for this particular group.

Summary

In this research, little difference in learning style preferences was found among the generational cohorts. All the generational groups were predominantly active learners, sensing, and visual. The only variance among the groups was found on the sequential/global dimension. Millennials and Generation X were classified mostly as sequential learners, whereas Baby Boomers were mostly global learners. However, overall, this research found that little difference (if any) exists among the learning style preferences of these three generational groups. Further research is necessary across a variety of organizations and industries to determine if these results can be generalized beyond this particular research site.

In addition, the learning activity preferences among generations were also strikingly similar. This particular group was not fond of Web 2.0 activities, such as collaboration and social media in learning. Nor were they interested in using mobile applications or twitter-like environments to learn. In addition, the stereotype of the technologically advanced Millennial generation was not supported in this research. Millennials selected computer simulations less often than Generation X and Baby

Boomers. They also selected designing and drawing more than any other generation.

However, these differences were minor. Overall, the three generations enjoy the same

learning activities and dislike the same learning activities with little variation. This

homogeneity could be due to the fact that all employees work in the same corporate

environment. Therefore, the results, while relevant and useful for the participating

company, cannot be generalized to the generational cohorts across all industries and

professions. Replicating this study at other organizations and in different corporate

settings will be important to understand if generational differences exist in other contexts.

Chapter 5: Conclusions and Recommendations

Introduction

This quantitative study used survey research methodology to collect data from 230 management employees at a US-based railroad company. A literature review was conducted to define the context of the study and to develop a set of relevant research questions. The purpose of this study was to determine how instructional design for web-based corporate training might best be optimized to address the needs of the generationally diverse workforce. A web-based survey was sent out via email to 765 employees who had all graduated from a management training program within the organization. Thirty percent of the employees completed the survey including the demographic items (e.g., age). Thirty-eight percent (n=89) of respondents were Millennials, 51.7% (n=119) were in Generation X, 9.1% (n=21) were Baby Boomers, and 0.5% (n=1) were Traditionalists. The Felder-Soloman Index of Learning Styles was used to understand the learning style preferences of the individuals in each group. Participants were also surveyed as to their learning activity preferences. Previous research has shown that understanding students' learning preferences can assist training professionals in creating effective training.

Conclusions

Research Question One

To what extent do learning style preferences vary by generational cohort?

The research showed little variance in learning style preferences across the generational cohorts. This is an unexpected finding as the prevailing stereotypes on generational differences are that each generation has a unique way of learning. However,

it has been suggested that these differences may be exaggerated by a virtual cottage industry (Dede, 2005; Reeves & Oh, 2007) of corporate consultants marketing and peddling plausible, yet unsubstantiated, theories. Dede (2005), for example, argued that contrary to popular belief, generalizations should not be made based on generations. He argued many Baby Boomers active in the corporate settings today exhibit the same neomillennial learning styles and activity preferences as Millennials because of the ubiquitous technological and media tools available to them.

Despite the similarities that may exist, one learning style dimension showed a difference. Baby Boomers were more likely to be global learners than any of the other generations. In fact, whereas most of Millennials and Generation X participants were sequential learners, two-thirds of Baby Boomers were global learners. This difference could be explained by the small sample size of the Baby Boomer population in this study (n=21). Additionally, the global/sequential learning style is the only dimension on the Felder-Soloman Index of Learning Styles exhibiting weakness in previous reliability testing, so perhaps this difference is due to the instrument. Still, it is possible Baby Boomers in this group learn more globally and grasp concepts more easily than younger students because of their wider knowledge and experience. There is general agreement that prior knowledge influences learning and affects how a student constructs concepts (Glaserfeld, 1984; Resnick, 1983). Perhaps younger learners prefer the sequential dimension because it is a straightforward step-by-step, linear process in terms of knowledge acquisition and assimilation. On the other hand, given the breadth and depth of Baby Boomers' prior experience, they tend to learn more conceptually and easily (i.e., globally) in terms of, finding connections, seeing systems, and the big picture. In this

study, this is the only area in which differences were found in learning preferences

among the generations.

Research Question Two

To what extent do preferences for learning technologies and learning activities vary by generational cohort?

In this study, little variance was found in learning activity preferences across the

generational cohorts. To a surprising degree, each generation liked and disliked the same

learning activities presented in the survey. The most frequently selected favorite learning

activities were selected with the same frequency regardless of generation. These

included, reviewing information in graphic format, using search engines for online

research, using various online simulations, and reviewing FAQs. Likewise, the least

favorite learning activities were also selected with the same frequency, regardless of

generation. These were using twitter communities, desktop sharing, online discussion

boards, completing surveys, and online brainstorming centers.

While this may be contrary to popular belief on generational diversity, previous

research supports this conclusion. A 2009 study out of the Office of Information

Technology at the University of Minnesota of 1,279 individuals on the 21st-century

student (Walker & Jorn, 2009) revealed that since 2007, no correlation was found

between age and desire for technology in the classroom, technology use, comfort level, or

even perceived usefulness of technology. The results of this study reveal a similar

finding. Baby Boomers at the railroad company in this study preferred interacting with

online simulations at a slightly higher rate than younger generations. Whereas 61.9%

(*n*=13) of Baby Boomers selected this as a favorite, only 34.1% (*n*=30) of Millennials

did. Previous research has found similar results. Millennials, in general, reported

lower satisfaction with web-based learning than older generations in two other studies

(Hartman et al., 2005; Sankey, 2006). Millennials at this railroad company were less

interested in online simulations than older generations. Perhaps Millennials, in general,

are dissatisfied with the state of the technology being used in corporate training and

learning. Regardless of why, the fact is that training professionals and instructional

designers should not make judgments about the generations without investigating the

specific learning preferences within their organizations.

There seemed to be a relationship between learning style preferences and learning

activity preferences. The survey indicated all respondents were largely visual and their

preferred learning activities were visual activities by far. Most, 85.7% (*n*=197),

respondents were visual learners, and the number one most selected learning activity was

reviewing information in graphic format. This is not uncommon. In a Rollins (2002)

study, students who scored high on the visual dimension of the Felder-Soloman Index of

Learning styles had a correspondingly high preference for graphic interface elements.

The same finding was confirmed in this study. Likewise, this group was largely active

learners and selected many hands-on activities as their favorites. Sixty-three percent

(63%, *n*=145) of respondents were active learners and two of the top five favorite

learning activities were interacting with simulations to learn. The group was not

reflective and did not select reflective activities as favorites. Knowing a correlation

exists between learning style preferences and learning activity preferences can help

inform instructional designers on the best learning tools to employ when the learning

styles of the student population are known.

Research Question Three

How can instructional design for web-based learning be optimized to address the learning style preferences of a generationally diverse workforce?

Some researchers argue that training courses should be written in multiple iterations so each learner can participate in tailored training according to their preferred learning style (Battalio, 2009; Blackburn, 2009; Lee, 2005). However, with this particular population at the railroad company, there were no differences in the learning style preferences with the exception of the global/sequential dimension. This finding in and of itself is an important tool for training professionals and instructional designers. Rather than focusing on differences, programs can be geared to honor similarities. However, these results are not able to be generalized across all corporate organizations. It is entirely possible that if this survey had been conducted at an internet start-up or a marketing firm, the results would be quite different.

Instructional design optimization begins with information. Once the learning style preferences are collected, training and learning programs can be designed with the preferences of the student population in mind. For example, it might surprise the training and learning leaders at this particular railroad company that observing people online (e.g., desktop sharing) was at the bottom of the list of favorite activities for this participant group among all generations. While this may be a powerful demonstration tool, it is not preferred by this particular group. The suggestion is not to eliminate desktop sharing from all learning, but to heavily weigh or begin class activities with learning tools with which class members are most comfortable. Though this particular group would enjoy classes with online computer simulations, reviewing quick reference guides such as

FAQs and using search engines to find information, designers could also include less desirable tools, which research shows are effective. For example, even though this group indicated they did not enjoy one-player computer games or multi-user online games, Davidson and Goldberg (2010) argued playing and learning are now inseparable. Activities such as game-based learning can be incorporated into training as a secondary or tertiary tool so as not to disengage the player/learners in this group.

Another finding was how Millennials in this population were not interested in using Web 2.0 technologies in learning. In fact, no generation in this study was interested in using social media forums or twitter-like environments in learning, contrary to the popular literature describing it as the cutting-edge in corporate learning. While this may be the wave of the future, it would be, in fact, somewhat ineffective for this group. Perhaps curriculum designers should be wary of creating new programs based on assumptions that Millennials like new technologies and Baby Boomers learn differently from younger generations. This is not to say that these stereotypes are never true. In fact, there might be significant differences across the generations if the organization studied had been a government organization or a high-tech organization. It is entirely possible the Millennial employees at Facebook would prefer learning via social media tools. The only way for training and learning leaders to be sure is to survey their learner population internally before designing and developing new training and learning solutions. In fact, Felder and Spurlin (2005) pointed out that the primary purpose of the Index of Learning Styles is to help design effective learning programs. This will require extra time and flexibility on the instructional designer and developers' part, but will help

ensure that web-based learning will be optimized to address the learning style preferences of the generationally diverse workforce.

Recommendations

The literature on generational differences is largely speculative in nature. Reeves and Oh (2007) discussed the cottage industry of stereotypes that has sprung up in popular literature when it comes to the topic of generational differences. However, according to a 2010 study, more than 60% of learning professionals said they considered possible generational differences in their approaches to instructional design (ASTD, 2010). Since the generational issue has been at the forefront of corporate learning discussions in recent years, learning professionals are in a position to make curriculum design decisions based on weak, unreliable information that has been widely distributed in corporate circles (Twenge & Campbell, 2008). As such, instructional designers should be cautious when making assumptions about generational differences.

Despite these challenges, it is crucial to develop effective training solutions for the employees in organizations. Zornada (2005) found that despite the costs, organizations, on average, experienced improved performance (e.g., revenue per employee, profitability, increase productivity) as a result of well designed training and development programs. Other intangible benefits associated with training and development include improved quality of products and services, reduced employee turnover, and enhanced organizational reputation and brand (Zornada, 2005). If this is the case, how can we equip instructional designers with the information they need to optimize training for the learning style preferences of the generationally diverse workforce?

The recommendation for instructional designers when developing new classes for corporate web-based learning is to avoid making assumptions about the generationally diverse workforce, and instead assess the characteristics of the learning population. Assessing the characteristics of the learning population is the first step in the overall needs assessment process in order to understand the learning preferences of the specific group (Combs & Falletta, 2000). Many ways exist to assess trainees and learners in organizational settings. The first is to distribute the Felder-Soloman Index of Learning styles or another similar tool that measure learning style preferences. The Felder-Soloman Index of Learning Styles is a simple tool that takes only a few minutes to complete and is freely available at http://www.engr.ncsu.edu/learningstyles/ilsweb.html. The tool will give instructional designers a unique look into their trainee population's learning preferences, valuable when designing and developing learning programs. Individual employees are unique and vary in terms of their learning styles and preferences; therefore, instructional designers should avoid developing and applying a one-size-fits-all approach. It is only through understanding a specific workforce's learning needs and preferences that learning can be truly optimized.

This research study and others like it (Rollins, 2002) demonstrated that a trainee's learning style preferences generally correspond to a student's learning activity preferences. If the trainee population is highly visual, then the instructional designers and developers should incorporate visual activities such as video-recorded lectures or animations. Presenting information in graphic format will be more effective than text. In addition, trainees could be encouraged to draw or design theoretical concepts visually in order to make abstract connections more clear. In a distance-learning scenario, trainers

would be advised to share their desktop to demonstrate what they are doing to the students.

If the survey, on the other hand, reveals the trainee population is active, then instructional designers and developers should integrate collaborative and hands-on activities into the curriculum. This might include online computer simulations or multi-user virtual realities in which the learners interact. Encouraging the learners to work in groups or present their findings to the class are also active teaching methods. Social media and twitter are also excellent tools to support active learning as they encourage the trainee to get involved in a conversation and participate with the group. Virtual, collaborative, open-source communities create an ecological learning system in which the learners are considered active partners in the design and facilitation of the learning process (Davidson & Goldberg, 2010; McGuire & Gubbins, 2010). This is the ultimate active learning tool if the students are open to it.

On the other hand, if the trainee population is classified as primarily reflective learners, then other activities such as audio-recorded lectures and reading text are more appropriate. Reflective learners might write short summaries of class concepts and notes. Writing summaries and quiet contemplation are effective ways for reflective learners to absorb new information.

Another suggestion for instructional designers and developers is to amass a list of all learning activities within the scope of their ability to design. For example, if a training and learning team has no capacity for creating a learning mobile application, then asking about mobile learning is not valuable. On the other hand, if an organization is contemplating an investment in an internal social media forum for learning and

knowledge exchange, then it could be valuable to gauge learner interest in such a tool before the investment. This research shows assumptions should not be made about how different generations learn, nor on generational differences described in popular literature.

Further scholarly research is necessary to determine if the homogeneity of learning preferences across generations found here can be generalized to other populations. One suggestion is to conduct a similar survey at other national railroad organizations. The homogeneity in the survey results of this study may be indicative of a larger theme in the railroad industry. Future research should be repeated at the manager level and also at other levels within the organization. If other surveys reveal similar results, the theory of generational differences as it pertains to learning style preferences may be put into question.

Summary

The value of this research study is in finding the unexpected. While there is undoubtedly truth to some of the literature on generational differences, these generalizations cannot be applied to all corporate learners. The suggested approach for instructional designers is to invest in time, energy, and resources toward a greater understanding of the student population to be trained. It is crucial instructional designers do not make assumptions on generational differences based on popular literature and stereotype. It could be that Baby Boomers and Millennials are vastly different learners or they are quite similar at any given organization.

It is suggested this study be repeated in other organizational settings to understand if generational differences exist in other industries or corporate settings. In addition,

though many authors suggest social collaboration and Web 2.0 technologies are the wave of future learning, and though these tools have been implemented with success at certain organizations, one size does not fit all. Such tools would not be effective for the population studied here. Understanding the particular needs of the learner at any given organization will help curriculum designers optimize web-based learning for the generationally diverse workforce, requiring flexibility and adaptability to create effective learning. The responsibility falls on the purveyors of information to be flexible. We no longer live in a top-down education system but must respond to student's needs and preferences with a variety of skills and a repertoire of learning strategies.

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Appendix A: Email Invitation

Invitation Email to Participants

Subject: Help Us Help You!

In an effort to bring you more effective and engaging corporate learning opportunities, you are being asked to complete this survey. The purpose of this survey is to measure learning style preferences of our employees. The results of this survey will help us develop more engaging and effective corporate web-based learning and development opportunities.

The name of the study is "Differences in Learning Preferences by Generational Cohort: Implications for Instructional Design in Corporate Web-Based Learning. This web-based survey is comprised of two parts. The first part is the Felder-Soloman Index of Learning Styles. The second was created by Jessica Kriegel to measure learning activity preferences.

The survey should take approximately 10 minutes to complete. The information from this survey will be kept strictly confidential. Without exception, individual responses will not be released to anyone.

The website for the survey is
https://www.surveymonkey.com/s/learningpreferencessurvey

Simply click on this address to go directly to the survey. If this does not work, copy and paste the URL into the address bar of your Internet Browser.

If you have questions about this survey, please contact Jessica Kriegel at jpk58@drexel.edu or (415) 244-2617. Jessica Kriegel is the researcher for this study and is a Doctoral Student at Drexel University.

Thank you for participating in this important survey.

Appendix B: Survey

Welcome to the corporate learning survey for XYZ Corporation. The survey is in two parts. The first part is the Felder-Soloman Index of Learning Styles, and the second part asks about your favorite learning activities.

Informed Consent

Research Procedures

This research project is being conducted to examine learning style preferences of our employees in an effort to bring you more effective and engaging corporate learning opportunities. The survey should take approximately 10 minutes to complete.

Risks

There are no foreseeable risks for participating in this research.

Benefits

A summary research report on the outcome of the project will be available to those who participate. The summary research report will inform you on how our employees prefer to learn.

Confidentiality

Individual responses will be kept strictly confidential. All data and information will be reported in aggregate form only.

Participation

Your participation is voluntary, and you may withdraw from this research project at any time and for any reason.

Contact

This research study has IRB approval from Drexel University and is being conducted by Jessica Kriegel (jesskriegel@gmail.com; 415-244-2617).

Consent

This page may be printed and kept for your records. If you agree to the above points and agree to participate, please check the following box and click next to begin the survey.

Part One: Felder-Soloman Index of Learning Styles

Directions

For each of the 44 questions below select either "a" or "b" to indicate your answer. 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. When you are finished selecting answers to each question please select the submit button at the end of the form.

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) 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.

Part Two: Web-Based Learning Activity Preferences

Directions

The following is a list of learning activities typically used in corporate web-based training and learning. Please select your **5** favorite learning activities in terms of your web-based learning preferences.

☐ Reading text (theories, concepts, non-fiction)

☐ Viewing video-recorded lectures

☐ Reviewing information in graphic format (tables, charts, graphs)

☐ Completing questionnaires and/or surveys

☐ Reviewing quick reference guides such as Frequently Asked Questions

☐ Participating in online discussion boards

☐ Presenting your findings to others

☐ Engaging in live short (one-hour) webinars

☐ Watching educational animations

☐ Chatting online with experts / specialists

☐ Interacting with computer simulations

☐ Observing people online (desktop-sharing)

☐ Designing / drawing concepts visually

☐ Sharing snippets of information online in twitter-like communities

☐ Participating in multi-user online brainstorming centers

☐ Using search engines for online research

☐ Playing one-player computer games

☐ Playing multi-player online games within virtual worlds

☐ Practicing real-world interactions in online simulations

☐ Interacting with peers in social media forums

☐ Using mobile applications to engage in learning via smart phone devices

☐ Engaging in virtual realities

     I was born
- (c) before 1945
- (d) between 1945-1964
- (e) between 1965-1980
- (f) after 1980