

Deep vs. Surface Learning: An Empirical Test of Generational Differences

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ABSTRACT

Student learning and knowledge acquisition preferences influence pedagogy choices by instructors, particularly when critical thinking is a fundamental learning objective. Generational theory suggests that the Millennial generation, those born from 1981 to 2000, prefer to acquire knowledge that is much broader and shallower than their Baby Boomer and Generation X predecessors. This study tests the knowledge aspiration differences between Millennials, Generation Xers, and Baby Boomers. Using a snowball technique originating with students in a senior business capstone course at a state university, an online survey was completed by 1,790 students. Results show Boomers scoring significantly higher on deep learning and lower on surface learning than Millennials and Generation Xers, and Millennials scoring significantly higher on surface learning than Boomers or Generation Xers.

Keywords: generational difference, surface learning, deep learning, Baby Boomer, Millennial, Generation X

1. INTRODUCTION

The need for students and workers to develop critical thinking skills (Ennis, 1987; Kuhn, 1999; Dewey, 1910) is indisputable, and the technological advantages of the information age have made information readily accessible and instantly available. But in today's hypercompetitive marketplace, employers need workers who can do more than think critically, solve problems, and make good decisions—they need employees who know how to sift through large volumes of data and evidence in increasingly knowledge-rich environments (Bransford & Schwartz, 1999). Unfortunately, finding the “right” or “best” information can be problematic due to information clutter or insufficient sifting, sorting, or evaluation skills (Fornaciari & Roca, 1999). Individuals with sufficient technological acumen can locate and acquire information, but information is not knowledge. What is preferred over techno-wizardry is expertise (Simon & Prietula, 1989) and deep smarts (Leonard & Swap, 2005).

Deep smarts is “not raw brainpower, though that helps. It's not emotional intelligence, either, though that, too, is often involved.... [It's] the stuff that produces that mysterious quality, good judgment. Those who have deep smarts can see the whole picture and yet zoom in on a specific problem others haven't been able to diagnose. Almost intuitively, they can make the right decision, at the right level, with the right people” (Leonard & Swap, 2004, p88).

Deep smarts represent a deep understanding of domains and situations and requires a willingness to thoroughly engage a topic or situation through a learning approach that is deep-, rather than surface-oriented. Generational theory (Howe & Strauss, 2000; 2007) suggests that the Millennial generation, those born from 1981 to 2000, prefers to acquire knowledge that is much more broad and shallow than their Baby Boomer and Generation X predecessors. In fact, because the latest generation of students and workers are so techno-savvy, and so peer-centric, Bauerlein (2008) argues that this is our “Dumbest Generation.” Even with extraordinary search and filtering abilities, the Millennials are drowning in digital diversion rather than diving deep into subject matter (Bauerlein, 2008).

This research explores the “deep vs. surface” learning approaches for the three most recent generations—Baby Boomers, Generation Xers, and Millennials. Specifically, we examine whether one generation is prone to use a particular learning approach over another. Our intent is to advance the conversation as to whether “shallow” learners can acquire the deep smarts necessary to maximize their value in the classroom and eventually the workplace. To the best of our knowledge, this paper represents the first attempt to assess deep vs. surface learning preferences through the lens of generational differences. The remaining sections describe prior research related to generational and learning differences, followed by an explanation of our study's methodology, results, and conclusions.

2. LITERATURE REVIEW

2.1 Generational Theory

Generational theory asserts that individuals are born into a particular cohort affected by the current political/social moment, and as a result, individuals within this cohort develop “somewhat similar” belief systems, values, and peer personalities that produce patterns “strong enough to support a measure of predictability” (MacManus, 1997; Strauss & Howe, 1991; Howe & Strauss, 2007, p42).

Events typically include socio-economic transitions, major political events, war threats or unrest, unemployment rates, industry trends, and feelings of scarcity or security (Macky, Gardner, & Forsyth, 2008). Generational theory provides generalizable cohort differences; however, these differences do not provide absolute cohort differentiation (Markert, 2004; Rotolo & Wilson, 2004). People born on the cusp of a generation would not be expected to act entirely different from a person born a mere year on the other side of the generational divide. Nonetheless, evidence from studies using valid and reliable scales and controlling for age (Twenge & Campbell, 2008) suggest that differences can be generalized to the mean cohort level. For the purposes of this study, we use the birth years outlined by Strauss and Howe (1991) and Kupperschmidt (2006).

2.1.1 The Baby Boomer Generation

Soldiers returning from WWII during a time of economic prosperity and hope resulted in a baby boom of 80 million from 1944 to 1960, twice that of the previous generation (Strauss & Howe, 1991). America was not prepared for this rapid expansion and consequently faced serious resource shortages including schools, hospitals, and homes, forcing children to compete for everything from sandbox space and sports teams to summer jobs and college admissions (Reynolds, 2005; Dychtwald, 1999; Lancaster & Stillman, 2002). Although competitive, the post-war economy ushered in an era of affluence and optimism (Lancaster & Stillman, 2002; Reynolds, 2005) allowing for “the first generation in which child rearing was a hobby and a pleasure and not an economic necessity... The Boom Babies were cherished by parents who had sacrificed and fought a war for the right to bear them, raise them, and indulge them” (Zemke, Raines, & Filipczak, 2000, p64). During a period of optimism, Boomers were raised with more freedoms and flexibility, were encouraged to dream big, and expected to correct the world’s woes (Lancaster & Stillman, 2002; Strauss & Howe, 1991).

The events of their time left Boomers with abstraction and spirituality as their prominent characteristics (Gillon, 2004; Strauss & Howe, 1991), with tendencies of individualism, self-absorption, and self-fulfillment (Dychtwald, 1999; Egri & Ralston, 2004; Hill, 2004; Lancaster & Stillman, 2002). “In stark contrast to earlier generations who were more inclined to align with their neighborhood, platoon, employer, church, or political party, Boomers have grown up with an overriding commitment to themselves, their immediate families, and their own inner drives” (Dychtwald, 1999, p209), and Boomers chose to enact change through extreme measures, such as riots and protests without fear of punishment (Strauss & Howe, 1991). Their competitive nature has surfaced in the workplace (Reynolds, 2005). Boomers are driven to perfection, demand respect (Zemke et al., 2000), and epitomize the quest for deep smarts (Lancaster & Stillman, 2002).

2.1.2 Generation X

The 51 million individuals born from 1961 to 1980 make up Generation X. Gen Xers witnessed the energy crisis, long gas lines, the women’s liberation movement, the onset of AIDS, the Challenger disaster, our first computers, MTV, and Watergate. “No other generation in history has been more overstimulated by noise, visual motion, and electronic signals than Gen X” (Bagby, 1998, p241). Growing up without parental authority or family stability, during a period of soaring divorce rates and a struggling economy, Xers saw a dramatic increase in single parent households and blended families (Lancaster & Stillman, 2002; Strauss & Howe, 1991; Zemke et al., 2000). Labeled “latchkey kids” because their parents worked outside the home and left them unattended after

school, Gen Xers developed a strong sense of independence and self-reliance and demonstrated a pragmatic, situational rather than visionary, perspective (Hicks & Hicks, 1999).

Gen Xers experienced failing economic, political, and family systems, and thus feel abandoned and are generally skeptical, defensive, and cynical (Hill, 2004; Lancaster & Stillman, 2002; Zemke et al., 2000). They watched their parents prioritize work over family, devoting themselves to their employers only to be abandoned during massive corporate layoffs and downsizing (Hill, 2004; Reynolds, 2005; Zemke et al., 2000). “Xers are an extremely resourceful and independent generation who count on their peers and themselves to get things done and don’t hold out too many false hopes that any person or institution is going to swoop down and save them from reality” (Lancaster & Stillman, 2002, p26).

Lancaster and Stillman (2002) suggest Generation X is the most misunderstood generation in the workplace. Having grown up with computers, Xers are technologically savvy. Their preference for smart work over hard work has led to their label of “slacker” by previous generations, and their casual view of authority does not fit within the military-like corporate structures established by their elders (Dychtwald, 1999; Strauss & Howe, 1991; Zemke et al., 2000). Because they value fun, work/life balance, informality, diversity, and flexibility, they are not as driven as their Boomer predecessors to acquire knowledge or to make the necessary sacrifices to attain deep smarts.

2.1.3 The Millennial Generation

Millennials were born from 1981 to 2000. Millennials are approximately ninety million strong. As such, the Millennial generation will be substantively larger than any previous generation (Yax, 2004) making up over 20% of the U.S. workforce. The Millennial generation holds important implications for how organizations develop programs and policies during the initial decades of the twenty-first century. The assumption that generational greatness is potentially on the horizon is one of the reasons why there is so much attention being paid to Millennials (Howe & Strauss, 2000; Martin & Tulgan, 2001).

In response to the disappointment with how the latch-key children of Generation X were raised, Millennials became the most protected and wanted generation with parents reassuming the authoritative role and instilling a civic virtue in their children (Strauss & Howe, 1991; Zemke et al., 2000). Millennials were raised during a time dominated by societal restoration—a time when policies were implemented and efforts made to correct drug and alcohol abuse, child neglect, and teen pregnancy—a time during which legislation was passed to improve education and health care and to protect children. Doting helicopter parents, with “Baby on Board” signs, coddled and protected their Millennial children from failure, assuring them they were special and worthy. These parents encouraged, coached, cajoled, and chauffeured their children through a childhood of tightly scheduled and monitored school, sports, dance, music, and language endeavors. This has led to achievement-orientation, optimism, over-confidence, high expectations, and a narcissistic outlook (Lancaster & Stillman, 2002; Reynolds, 2005; Strauss & Howe, 1991; Zemke et al., 2000).

Millennials are culturally diverse, sociable, and work/life balance-oriented (Martin, 2004; Reynolds, 2005). They demonstrate “higher self-esteem, narcissism, anxiety, and depression” (Twenge & Campbell, 2008). While Millennials are considered to be high-maintenance

employees by their supervisors, their generation is expected to be the highest producing workforce in history (Martin, 2004). Millennials are technology savvy (Hill, 2004) as well as street smart, while possessing strong moral values (Zemke et al., 2000).

Millennials' coddled upbringing has produced some challenges in the workplace including a tendency to avoid making a decision due to a strong preference for guidance and a tendency to avoid "owning" a decision, thus limiting their decision-making and problem-solving capabilities. Their ready access to information and command of current technology, coupled with their narcissistic self-esteem and peer focus has them desiring an incessant information overload stream 24/7, acquiring data and connecting to peer-approved minutia rather than seeking understanding. This combined with the Millennials' need for balance in their lives has made them the shallowest of learners yet.

2.2 Learning Approaches: The Value of Deep vs. Surface Learning

Perry (1970) found that student learning developed from a "reproduction of knowledge" based on memorization to a "transformation of knowledge" based on meaning. Marton and Saljo (1976) identified the concept of deep versus surface learning, arguing that some students approach learning as an exercise in memorization while others search for underlying concerns, implications, and meaning. Their research indicated that, with respect to the subject matter studied, students adopting a deep approach had a better understanding of the material and related questions, remembered core messages more effectively, and had higher quality learning outcomes than their surface-learner counterparts.

Deep learning falls into Bloom's (1956) highest level of thinking: evaluation and synthesis. Deep learning involves (1) a focus on concepts, integration of knowledge, and cumulative experience, (2) an emphasis on intrinsic motivation and ownership of the material, (3) active learning, and (4) interactions and relationships (Rhem, 1995; McKay & Kember, 1997). Surface learning, on the other hand, focuses on rote memorization of unrelated facts, short term retention, uncritical acceptance of ideas and facts, dependence on formulae to problem solve, and passive information assimilation (Entwistle, 1988; Ramsden, 1992). Surface learning is the tacit acceptance of information and memorization as isolated and unlinked facts, often leading to superficial retention. Deep learners relate new and previous knowledge, while surface learners fail to recognize new material as building on previous work. Deep learners seek meaning, while surface learners search for heuristic shortcuts. Deep learning applies ideas, seeks patterns, and applies critical logic, while surface learning is motivated by the intention to cope with the task at hand, which is often seen to be memorizing of facts (Entwistle, 2000).

Wiggins and McTighe (2005) suggest that "enduring learning"—those key concepts students must learn as prerequisites for higher level courses and, more importantly, as contributing citizens and leaders of their chosen profession—is essential for success in all disciplines. Leonard and Swap (2004) explore the different learning approaches, suggesting that deep learning leads to deep smarts and that employees with deep smarts are more valuable than surface learners in various ways. Deep smart employees are quick analyzers of complex situations capable of applying knowledge to new and unfolding contexts, and they have a keen ability to recognize patterns and make intuitive decisions (Leonard & Swap, 2005).

The value of deep smarts is based on the ability to produce tacit knowledge that is largely inimitable. According to Leonard and Swap (2005, p2), “Deep smarts [unlike surface learning] are as close as we get to wisdom. They are based on know-how more than know-what, the ability to comprehend complex, interactive relationships, and the ability to make swift, expert decisions. Deep smarts cannot be attained through formal education alone but they can be deliberately nourished and grown with dedication, as well as transferred or recreated”. Deep smarts are influenced by our desire and commitment to understand. Deep smarts are a result of deep learning.

2.3 Hypotheses Development

Across the generational theory literature, specific patterns emerge regarding a typical learning approach that is common within each generational category. Overall, the literature suggests that Millennials prefer to acquire knowledge that is broad and shallow, while Baby Boomers seek out a deeper understanding of subject matter. Generation Xers are in the middle; they understand the importance of deep smarts but are less willing than Baby Boomers to put forth the effort to acquire it. Generational theory coupled with the learning approaches described above form the following hypotheses:

H1: Boomers have a stronger Deep Learning Approach to learning than do Millennials.

H2: Boomers have a stronger Deep Learning Approach to learning than do Gen Xers.

H3: Gen Xers have a stronger Deep Learning Approach to learning than do Millennials.

H4: Millennials have a stronger Surface Approach to Learning than do Boomers.

H5: Millennials have a stronger Surface Approach to Learning than do Gen Xers.

H6: Gen Xers have a stronger Surface Approach to Learning than do Boomers.

3. RESEARCH DESIGN

3.1 Generational Learning Survey

The data for this research project was collected in 2010 using an online generational learning survey that was based on Entwistle’s (2000) ASSIST instrument (Approaches and Study Skills Inventory for Students). The original ASSIST instrument consists of three sections. The first section is a six item measurement of the student’s own conception of the term ‘learning’. The second section consists of 52 items that students respond to on a five-point Likert scale where 5=Agree, 4=Agree somewhat, 3=Unsure, 2=Disagree somewhat, 1=Disagree. These items are designed to measure the three main approaches to learning: deep, strategic and surface apathetic (Marton&Saljo, 1976, 1997; Entwistle&Ramsden, 1983). Each approach to learning consists of four or five subscales, with four items per subscale. Scores on the three main approaches are created by totaling the item responses for each subscale and then combining the subscale scores. The third section of ASSIST is an eight item questionnaire measuring preferences for different types of course materials and teaching styles.

For this study, we focus on two specific learning approaches—deep vs. surface apathetic (surface). Previous versions of the generational learning survey included strategic learning style items; however, respondents indicated that the survey was too long. Since the authors’ primary focus is distinguishing between deep and surface learning styles, the strategic items were eliminated.

Our hypotheses propose that generational cohorts—Baby Boomers, Generation Xers, and Millennials—may be prone to use a certain learning style over another. To test our six hypotheses, we adopted eight subscales from the ASSIST instrument (Tait&Entwistle, 1996; Entwistle,

2000). Four subscales were used to test the deep learning approach: (1) Seeking Meaning, (2) Relating Ideas, (3) Use of Evidence, and (4) Interest in Ideas. A sample item from the Seeking Meaning subscale includes “I usually set out to understand for myself the meaning of what we have to learn”. The surface approach was measured with the following subscales: (1) Lack of Purpose, (2) Unrelated Memorizing, (3) Syllabus-boundness, and (4) Fear of Failure. One Syllabus-boundness item states “I concentrate on learning just those bits of information I have to know to pass”. The eight subscales and their related items can be found in the Appendix.

The generational learning survey used in this study consists of 51 total items—three initial questions related to participant consent and extra credit, 16 deep learning approach items, 16 surface learning approach items, and 11 demographic questions. An additional five learning approach items (3 deep and 2 surface) were reverse-coded to ensure survey completion accuracy. Our study sought to capture the learning preferences of three different generations, which included respondents who were not currently in school. Because the ASSIST instrument was designed for students, the following instruction was added: “If you are not a student, simply answer the questions as if you were a student, or respond as you would when you were a student.”

3.2 Data Collection

Students at a West Coast State University in five senior-level management courses were asked to complete the online generational learning survey for class extra credit and to encourage their friends and family to do the same. To ensure anonymity, encrypted files and codes were used rather than student names, which encouraged students and their respondents to accurately fill out the survey. Students were briefly trained on potential data collection problems or issues, and they were awarded extra credit points for every survey that was completed on their behalf. During the survey, one of the first three questions asked of the respondent was “Provide the name of the student that will receive class credit for you completing this survey.” No scale or absolute value of specific extra credit points was provided. Instead, it was intended as an opportunity for students to improve their grade. It was also purposefully presented as a competition to see who could return the most “good” responses. Most students raised their grade between 1/3 to 2/3 of a grade (e.g. C+ to a B- or a B).

This type of data collection, known as snowball sampling, has its limitations (Biernacki & Waldorf, 1981). Selection bias is a primary concern because initial participants refer or provide access to other respondents. According to Atkinson and Flint (2001), however, a large sample size may minimize this bias and increase the odds for “representative proportions”. In our study, we collected over 5200 responses from students and their friends and family. Snowball sampling can also be effective at obtaining input from groups of people that are difficult to reach, such as specific age groups (Bjorkhaug and Hatloy, 2009; Sadler, Lee, Lim, & Fullerton, 2010). For example, a generational study by Cabral (2011) used the snowballing technique to effectively survey Millennials. After asking friends to share a survey via Facebook, Twitter, and email, the author received over 300 responses in less than two weeks. Other generational studies focused on Baby Boomers and Generation Xers have also successfully employed snowball sampling (Barker, 2012; Ting & de Run, 2012). Therefore, this method seems appropriate for obtaining data from multiple generations in an effort to assess their learning differences.

Additional reliability measures were included as part of the data collection process to ensure accurate survey completion. First, the respondents were asked at the beginning of the survey: “Have

you previously completed this survey about “Generational Learning” (possibly for another student, or at another time)?” This was done to discourage the same person from completing the survey multiple times. Second, students were told that only usable surveys would be counted towards extra credit. Surveys that were incomplete or questionable would actually count against them. Students were also made aware that the following information would be tracked: survey start time, survey completion time, and computer IP address. If the survey duration was too short or the same computer was used to complete multiple surveys without the professor’s permission, the completed surveys would be discarded. Finally, surveys which failed data reliability checks were eliminated. The initial reliability check involved eliminating the responses of students who selected the same answer for all of scaled response items. For five of the items, a reversed version was also included the survey. With the exception of neutral responses, a reliability check failure occurred when students selected the same answer, or an answer on the same side of the scale (e.g., Agree, Somewhat Agree) for the regular and reversed item. Those who failed two or more of the five reliability check items were eliminated, resulting in a final sample size of 1790.

4. RESULTS & DISCUSSION

4.1 Sample Characteristics

The results indicate that 51.1% of the respondents were female, while 22.8% were currently married. The average age of sample respondents was 32.5 with a standard deviation of 11.1 years. While 23.2% of the respondents completed a high school degree or the equivalent, 69% of respondents had some form of college education, including an associate degree (8.6%), bachelor degree (40.8%), master degree (4.9%) and doctoral or professional degrees (1.5%). Additionally, 13.2% of respondents were currently enrolled college students or individuals who taken some college courses but who had not earned a degree. The remaining sample members had less than a high school education (2.1%), graduated from trade, vocational, or military school (1%), did not answer the question (1.7%), or could not be classified based on the answer provided (2.9%). Finally, when grouped by birth year into generational cohorts, 7.5% of the sample was classified as Baby Boomers, 23.1% fell into the Generation X category, and the remaining 69.4% were Millennials.

4.2 Data Analysis and Discussion

As per the ASSIST scoring instructions, sub-scale scores for the four deep learning and four surface apathetic learning subscales were formed by summing the scores of the items related to each sub-scale. The scores for the overall deep learning approach scale and surface apathetic approach scale were then computed by adding together the relevant sub-scale scores. Theoretically, scale scores could range from 16 to 80. Both learning approach scales exhibited strong reliability, with Chronbach alpha scores of .887 for the deep learning approach scale, and .879 for the surface apathetic approach scale. Table 1 displays the overall mean scores, sample size, and standard deviation for each scale, as well as descriptive statistics for each scale by generation.

The mean scores shown in Table 1 proved to be consistent with the proposed hypotheses. A one-way ANOVA was conducted to determine whether or not the differences found between groups were significant. Both of the overall ANOVA tests were significant at the $p < .001$ level. Scheffe post-hoc comparison tests were then used to test the hypotheses, the results of which are displayed in Table 2.

Each of the six hypotheses was supported, as post-hoc comparison tests found the differences in mean scores between generations significant in each case at the $p < .001$ level. The first two hypotheses proposed that Baby Boomers would exhibit a stronger deep learning approach when compared with Gen Xers and Millennials. Hypothesis 1 and 2 were strongly supported, and relatively large effect sizes were noted as Baby Boomers averaged a mean score which was 7.79 higher than that found with Millennials and 5.722 higher than the deep learning score computed for Gen Xers. The third hypothesis proposed that Generation Xers would exhibit a stronger deep learning approach, but only when compared to Millennials. While differences were again significant and in the direction expected, the effect size of 2.067 was smaller, suggesting that the differences between Generation X and Millennial generations are not as substantial as the differences between Baby Boomers and the other two generational cohorts.

Hypotheses 4 through 6 investigated the degree to which a surface apathetic learning approach was embraced by each generation. Specifically, hypotheses 4 and 5 proposed that Millennials would demonstrate a stronger surface apathetic approach to learning when compared with both Baby Boomers and Gen Xers. As the results indicate, both hypotheses were supported, though the effect size for the Millennial/Baby Boomer comparison was much higher at 6.27 than the effect size of 2.429 which was found for the Millennial/Gen Xer comparison. Finally, hypothesis 6 proposed that differences would exist in the surface learning approach between Gen Xers and Baby Boomers. The results indicate that Gen Xers are more prone to a surface learning approach than are Baby Boomers, while the effect size of 3.84 again suggests that differences between Baby Boomers and Gen Xers tends to be of a greater magnitude than differences between Gen Xers and Millennials.

5. CONCLUSIONS

This study examines the learning preferences for three generational cohorts—Baby Boomers, Generation Xers, and Millennials. In general, our six hypotheses propose that older generations will prefer deep learning, while younger generations will rely more on surface learning. The results support all six hypotheses. Baby Boomers have a stronger preference for deep learning than their Generation X and Millennial counterparts. Leonard and Swap (2005) suggest that deep smart is based on a collection of first-hand experiences. It is possible that Baby Boomers have had more opportunities to learn from others and their own successes and failures, thereby strengthening their deep learning approach. As for Generation Xers, they fare slightly better than Millennials regarding their preference for deep learning.

Millennials were found to be more surface-oriented learners than both Baby Boomers and Gen Xers. Labeled as the “dumbest generation” yet, partly because of their heavy dependence on technology, Millennials have had less time in the workplace to acquire experience-based wisdom and expertise (Bauerlein, 2008). Due to this limited amount of organizational knowledge, it appears that Millennials are more inclined than previous generations to use a surface learning approach in order to access information quickly and get things done (Leonard & Swap, 2005).

Our results suggest that Boomers are the last generation of deep thinkers. As Leonard and Swap (2005) note, this means that organizations may suffer tremendously from a lack of deep smart. That said, a counter argument may be that as change accelerates, the shallow learning mindset held by Millennials may be our only hope for survival in a world of instantly and readily available infinite information.

5.1 Practical Implications

The practical implications of this study are numerous. At a time when unemployment rates are high and employers are expressing dissatisfaction with newly minted business school graduates, this study shows there is a strong difference in learning approaches for the Baby Boom, Generation X, and Millennial generations. Student learning and knowledge acquisition preferences influence pedagogy choices by university instructors and corporate trainers, particularly when critical thinking is a fundamental classroom objective. Therefore, universities and other institutions of higher education would be well advised to develop new delivery methods to encourage deep learning.

Corporate recruiters and trainers should also take note and develop alternative means to instill deep smarts in their workers. It might require a new collaborative model within industries, as the Millennials and Gen Xers tend to move from job to job after only a short tenure. Furthermore, headhunting consultants may become increasingly relied upon by firms seeking applicants for positions requiring deep thinkers, and some firms may choose to hire their own retirees as consultants for special projects requiring deep thinking skills. Training may not pay off for the organization funding the training, but if an entire sea of knowledge can be raised within an industry, all firms may benefit. A final implication area relates to parenting. By limiting technology access and dependency as children enter their formidable years, parents may help students engage more directly with information in a way that encourages deep learning.

5.2 Limitations and Future Research

This study is not without limitations. First, the data was collected from a convenience snowball sample and may not represent the general population. Even though snowball sampling has its criticisms, this sampling technique allowed us to capture a large number of responses across different age groups (Atkinson & Flint, 2001; Bjorkhaug&Hatloy, 2009; Sadler et al., 2010).Second, we used self-report techniques which limit reliability and bring into play social desirability bias.Numerous reliability measures such as reverse-coded items and IP address verification were used to lessen this effect. Third, the survey items used were initially designed and tested for students, though some of the respondents did not fall under this category. In anticipation of this, we provided additional instructions to allow non-students to answer as if they were a student attending class.

If this study were replicated, we would recommend some changes. Future research should be based on a better controlled, more proportionate sample and tested survey items that can be related to non-students. The study should also include the Veteran generation, those born between 1920 and 1940. A sufficient number of Veteran respondents exist in the workforce, particularly in academic circles, thereby making it possible to expand the sample. This type of four generation study would allow future researchers to further distinguish between the generational cohorts and their preference for deep versus surface learning.

Table 1
Descriptive Statistics by Generation

Generation Groups	Deep Approach to Learning Scale (Chronbach alpha = .887)			Surface Approach to Learning Scale (Chronbach alpha = .879)		
	Mean	N	Std. Deviation	Mean	N	Std. Deviation
Baby Boomers	54.04	134	9.089	43.25	134	8.350
Generation X	48.32	414	9.962	47.09	414	9.589
Millennials	46.26	1242	8.388	49.52	1242	8.814
TOTAL	47.32	1790	9.006	48.49	1790	9.204

(Each scale is comprised of 16 items. Minimum scale score = 16; Maximum scale score = 80)

Table 2
Hypothesis Test Post-hoc Comparisons

Dependent Variable	(I) Generation Groups	(J) Generation Groups	Mean Difference (I-J)	Std. Error	Sig.	95% Confidence Interval	
						Lower Bound	Upper Bound
Deep Approach to Learning	H1: Baby Boomers	Millennials	7.790 [*]	.815	.000	5.79	9.79
	H2: Baby Boomers	Generation X	5.722 [*]	.891	.000	3.54	7.91
	H3: Generation X	Millennials	2.067 [*]	.509	.000	.82	3.31
Surface Apathetic Approach to Learning	H4: Millennials	Baby Boomers	6.270 [*]	.803	.000	4.30	8.24
	H5: Millennials	Generation X	2.429 [*]	.501	.000	1.20	3.66
	H6: Generation X	Baby Boomers	3.840 [*]	.877	.000	1.69	5.99

*. The mean difference is significant at the 0.05 level.

Deep Approach to Learning Scale Score

Scheffe^{a,,b}

Generation Groups	N	Subset for alpha = 0.05		
		1	2	3
Millennials	1242	46.26		
Generation X	414		48.32	
Baby Boomers	134			54.04
Sig.		1.000	1.000	1.000

Means for groups in homogeneous subsets are displayed.

a. Uses Harmonic Mean Sample Size = 280.812.

b. The group sizes are unequal. The harmonic mean of the group sizes is used. Type I error levels are not guaranteed.

Surface Approach to Learning Scale Score

Scheffe^{a,,b}

Generation Groups	N	Subset for alpha = 0.05		
		1	2	3
Baby Boomers	134	43.25		
Generation X	414		47.09	
Millennials	1242			49.52
Sig.		1.000	1.000	1.000

Means for groups in homogeneous subsets are displayed.

a. Uses Harmonic Mean Sample Size = 280.812.

Surface Approach to Learning Scale ScoreScheffe^{a,b}

Generation Groups	N	Subset for alpha = 0.05		
		1	2	3
Baby Boomers	134	43.25		
Generation X	414		47.09	
Millennials	1242			49.52
Sig.		1.000	1.000	1.000

Means for groups in homogeneous subsets are displayed.

a. Uses Harmonic Mean Sample Size = 280.812.

b. The group sizes are unequal. The harmonic mean of the group sizes is used. Type I error levels are not guaranteed.

APPENDIX**Deep Approach**

Seeking meaning

- I usually set out to understand for myself the meaning of what we have to learn.
- When I'm reading an article or book, I try to find out for myself exactly what the author means.
- When I am reading I stop from time to time to reflect on what I am trying to learn from it.
- Before tackling a problem or assignment, I first try to work out what lies behind it.

Relating ideas

- I try to relate ideas I come across to those in other topics or other courses whenever possible.
- When I'm working on a new topic, I try to see in my own mind how all the ideas fit together.
- Ideas in course books or articles often set me off on long chains of thought of my own.
- I like to play around with ideas of my own even if they don't get me very far.

Use of evidence

- I look at the evidence carefully and try to reach my own conclusion about what I'm studying.
- Often I find myself questioning things I hear in lectures or read in books.
- When I read, I examine the details carefully to see how they fit in with what's being said.
- It's important for me to be able to follow the argument, or to see the reason behind things.

Interest in ideas

- Regularly I find myself thinking about ideas from lectures when I'm doing other things.
- I find that studying academic topics can be quite exciting at times.
- Some of the ideas I come across on the course I find really gripping.
- I sometimes get 'hooked' on academic topics and feel I would like to keep on studying them.

Surface Apathetic Approach

Lack of purpose

- Often I find myself wondering whether the work I am doing here is really worthwhile.
- There's not much of the work here that I find interesting or relevant.
- When I look back, I sometimes wonder why I ever decided to come here.
- I'm not really interested in this course, but I have to take it for other reasons.

Unrelated Memorizing

- I find I have to concentrate on just memorizing a good deal of what I have to learn.
- Much of what I'm studying makes little sense: it's like unrelated bits and pieces.
- I'm not really sure what's important in lectures, so I try to get down all I can.

- I often have trouble in making sense of the things I have to remember.

Syllabus-boundness

- I tend to read very little beyond what is actually required to pass.
- I concentrate on learning just those bits of information I have to know to pass.
- I gear my studying closely to just what seems to be required for assignments and exams.
- I like to be told precisely what to do in essays or other assignments.

Fear of failure

- Often I feel I'm drowning in the sheer amount of material we're having to cope with.
- I often worry about whether I'll ever be able to cope with the work properly.
- I often seem to panic if I get behind with my work.
- Often I lie awake worrying about work I think I won't be able to do.

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