

ATHABASCA UNIVERSITY

ENHANCING THE DIGITAL LEARNING POTENTIAL FOR YOUNGER LEARNERS

BY

ROBERT W. THOMPSON

Submitted to:

Dr. Marti Cleveland-Innes

Dr. Elizabeth Childs

Dr. Doug Hamilton

Dr Kathleen Bortolin

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Approval of Dissertation

The undersigned certify that they have read the dissertation entitled

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EXPLORING THE DIGITAL LEARNING POTENTIAL FOR YOUNGER LEARNERS**

Submitted by:

Robert Thompson

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The examination committee certifies that the dissertation
and the oral examination is approved

Supervisor:

Dr. Martha Cleveland-Innes
Athabasca University

Committee Members:

Dr. Elizabeth Childs
Royal Roads University

Dr. Doug Hamilton
Royal Roads University

External Examiner:

Kathleen Bortolin
Vancouver Island University

May 11, 2023

Abstract

This Doctoral research project began in an era of discordant debate. Education Consultant Marc Prensky had published two short papers on the cusp of this new century (2001a; 2001b). In the first paper (2001a), Prensky outlined the learning preferences and proclivities of a young cohort yet to enter the education system – but who would enter said system with an engrained proclivity for, and skillset in, the uses of digital media. This cohort he labelled ‘Digital Natives’. In the second paper (2001b), Prensky outlined the preferences and proclivities of some educators extant in the system – who were less interested and adept at uses for digital media. This cohort he labelled ‘Digital Immigrants’: arguing the challenge in this new education culture would be the Digital Immigrants. Digital Immigrants responded harshly, often with vitriol, to Prensky’s description of education’s future. As a teacher at a secondary school in Canada, this researcher was in the right place-time to watch the transition to digital media in hallways and classrooms. This research project resulted, starting in 2013: seeking the adaptations needed to achieve success for schools, teachers, and students. The research questions for this study were: (1) What characteristics, preferences, and/or proclivities make Generation Z different from earlier generations? And (2) What changes to the education systems should be considered, given the technology proclivities of this “Generation” Z? The research method was exclusively Qualitative, to ensure data collected were the unrestricted thoughts of participants rather than the selected, restricted ‘multiple choice’ responses engrained in Quantitative research. The findings of the research potentially enhance our understanding, and process, for education in this century and beyond: a time when both students and instructors are likely to be ‘digitally native’. Those findings include but are not limited to strong inferences: that ‘digitally native’ learners now inhabit our education system in significant proportions, both as students and soon as instructors; that these learners are the ‘Digital Natives’ projected by Prensky; and, that the education system must adapt to this phenomenon in progress quickly and comprehensively in order to meet the needs of students, the education system and our culture overall.

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Chapter 1: Focus and Framing

This chapter outlines the study and provides a frame for the reader. The problem and rationale for the study are outlined, as are the scope and context. Definitions with contextual explanations are supplied for key terms used commonly throughout the document.

This qualitative research study investigated the existence of key indicators that suggest Generation Z students might be the first digitally native cohort. The focus of this study was to explore the hypothesis that a new generational group of learners now does exist for whom early access and use of digital media technology has created a paradigm, as defined by Kuhn (1962), that is, in effect, digitally native.

The rationale for this study was that developing learning experiences to use the technological proclivity of Generation Z should encourage enhanced learning for this age cohort. Within this context, this research explored indicators that exist to suggest Generation Z might be the first digitally native cohort.

Overview and Background

Beyond the technology vision being developed in British Columbia, within the Cabinet, in concert with the Ministry of Education, for the province, the global projections are for a substantial diversion of public education funding from traditional modalities to development of technology-mediated environments and experiences (Ambient Insight Research, 2010, 2015). These are resources that will be devoted to entirely new learning experiences, developed, in the case of Kindergarten to Grade 12 (K–12) and undergraduate institutions, for a target market that requires further adequate study and, therefore, is yet to be understood. This research suggests that this target market is Generation Z—the digitally native cohort.

Purpose

The broad rationale for this study was that increasing insight into Generation Z should assist educators in developing appropriate learning experiences, and over-arching pedagogical approaches, that better use the technological attributes of this generation, thereby encouraging enhanced learning for this age cohort. In this context, this qualitative case study was conducted with learners enrolled in K–12 distance education coursework in British Columbia. The focus was on the exploration of the characteristics and experiences of these learners in the context of their learning preferences, attributes, and proclivities.

Determining the existence, or not, of a generation of digitally native learners entails first establishing the acceptable guidelines for applying the term generation. To establish a working definition of the term, “generation”, it is fundamental to acknowledge that an average human generation traditionally is defined as the average age of parents at the time of birth of their children (“Generation,” n.d.-b). Specifically, it is the average age of the female parents at the birth of their female children (Poston & Micklin, 2005). For the most part, anthropologists accept the time interval between the procreation of mothers and their daughters to be the important variable (“Generation,” n.d.-b; Harper, 2010; Kertzer, 1983; Kick, 2005). This accepted interval tends to be 15 to 20 years (“Generation,” n.d.-b; Poston & Micklin, 2005).

More recent definitions of the term generation have been developed from factors other than the traditional mother-to-daughter procreation interval. Strauss and Howe (1991) posited that it is feasible to define generation more in connection to the shared experiences of a particular age cohort. Prensky (2001a) argued that a generation, in the developed nations of the late 20th and early 21st century, could be delimited and described by the shared access to,

and proclivity for the use of, specific technology or technologies. Prensky (2001a) posited the generation referred to in his construct is delineated by an individual's early-life access to and use of digital media technologies and can be defined, therefore, by his observation that "computer games, email, the internet, cell phones and instant messaging are integral parts of their lives" (p. 1). Prensky's (2001a) construct of the Net Generation, and his metaphorical depiction of this cohort as "digital natives" (p. 1) was challenged by a broad spectrum of individuals, commentators, and academics, who shall be discussed later in this report.

Those challenging Prensky's (2001a) arguments posited age is not the significant variable in determining an individual's *digital nativeness* (i.e., an individual's proclivity and/or aptitude for the use of digital media technology); rather, it is truly and solely an individual proclivity. Therefore, they argued, Prensky (2001a) was not correct in identifying a specific age cohort for his construct (Bullen, Morgan, & Qayyum, 2011).

The dialogue surrounding these concepts and terms is not focused entirely on semantics. Prensky (2001a) and others posited early exposure to the particular technologies supporting digital media, a characteristic of digital natives, may influence physical brain function and/or thought patterns (see also Tapscott, 2008; Wendover, 2010). Bullen et al. (2011) countered, stating these assertions are inaccurate and early exposure does not affect the user; however, acceptance of the idea that it might influence the user has potentially expensive implications for organizations that adopt Prensky's (2001a) premises. In the intervening interval of nearly a decade, since these self-identified Net-gen-skeptic studies, Linne (2014) and Teo (2013, 2016), and the empirical functional near-infrared spectroscopy (fNIRS) research of Chojak (2019) supported by Cipora, Szczygieł, and Hohol (2014), Gogolak (2013), Kostyrka-Allchorne, Cooper, and Simpson (2017), Takeuchi et al. (2015,

2016), and Wobe (2013) have debunked the skeptics and presented the prospect of a systemic lack of response to an opportunity to promote effective learning.

The timing for this renewed dialogue is significant. For much of the 20th century, numerous scholars and commentators argued that the traditional system of education applied in developed nations was outmoded and, therefore, increasingly ineffective in promoting learning (Illich, 1971; Mead, 1958; Nellen, 1999; Toffler, 1989). Scholars and commentators from the early 21st century agreed with this assessment, frequently advocating increased use of new digital media technology (Carr, 2001; Linne, 2014; Oblinger & Oblinger, 2005; Prensky, 2001a, 2001b; Tapscott, 2008; Teo, 2013, 2016; Wendover, 2010). An illustration of the spread of this belief is the fact the Province of British Columbia (BC), Canada, formalized and distributed a new vision for K–12 education that supports the assessment of the scholars and commentators critical to the traditional system of schools in the province by emphasizing enhanced uses for these new forms of technology (Government of BC, Ministry of Citizens Services, n.d.; Government of BC, Premier’s Technology Council, 2010).

Implementing this newly developed vision in BC will entail substantial alteration in the curricular, and potentially physical, structural and the pedagogical approach of traditional (i.e., predominantly face to face, vertical transmission of learning) schools within the province, with concomitant adjustments in the distribution of both human and financial resources (Government of BC, Ministry of Citizens Services, n.d.). The same concerns about expense and potential disruption to process voiced by the opponents of the NetGen concept with respect to postsecondary education and training (Bullen et al., 2011) are applicable in the K–12 system. Arguably, therefore, there is a need for continued exploration within the K–12 system as this new direction is being implemented.

Problem Statement

The debate with respect to differences in the proclivities and/or aptitudes of successive generations is not merely semantics. Bullen et al. (2011) argued changes to the uses of digital media and technology at postsecondary institutions were inappropriate without study. The new seemingly apparent directions for the K–12 system in BC demand that no less consideration be given to students in younger age cohorts. Research already conducted in the early decades of this century into digital natives, by Prensky (2001a, 2001b, 2010), Bullen et al. (2011), and others, tends not to be useful in this current K–12 context. These studies were conducted at postsecondary institutions with cohorts (i.e., generations) much older, and therefore born much earlier in the ‘cycle’ of technology proliferation, than the recent and current K–12 students. Given that the potential implications in the K–12 context are both financial and societal, this doctoral study was significant for both potentially defining “generations”, as outlined above, and exploring the possible differences in proclivities between specific age group cohorts – “generations”.

Generational conceptual frameworks proliferate because they serve a purpose. Similar to other analogous constructs in education and related social sciences, they provide classifications, frequently complete with charts, diagrams, and tables, that can serve as foundations for some understanding of complex concepts and ideas (Bruner, 1960). Later decades of the 20th-century proved to be an era of significant and rapid economic transition (Smith, 2001) for those countries referred to as developed nations, generally considered to be Canada, United States, Australia, New Zealand, Japan, and the countries of Western Europe (Organisation for Economic Co-operation and Development [OECD], 2006; Smith, 2001). These conditions created concomitant pressure for education and training in those regions to

make a congruent reorganization (Smith, 2001) in order to ensure continued prominence for the nations involved. As a result, generational theory (Strauss & Howe, 1991) has gained credence as one rationale to support the desired systemic changes.

Adapting the more established anthropological definition for a generation from the procreative interval between mother and daughter, generally considered in an historical context to be 15 to 20 years (Poston & Micklin, 2005), Howe and Strauss (2000) posited, because of the increasing pace of technological and social developments, generational cohorts should now be identified by shared experiences and by cultural influence. Divergence from the more traditional definition of the mother–daughter procreative interval does not necessarily constitute an error; however, removing this factor entirely from the construct has not yet proven to be a sound practice. Skepticism with respect to the newer concept of generations is justified to some extent, in that the popular press, media sources, and consulting companies have used the construct of generational cohorts, as defined in Strauss and Howe’s (1991) terms, to reap considerable profits. These successive generations, in particular Generations X and Y, have also been assigned increasing skill levels in the manipulation of digital media technology (Tapscott, 2008; Wendover, 2010).

Strauss and Howe (1991) described Generation Y—or millennials, which is the term they preferred—to be a specific-age cohort requiring particular attention because of this cohort’s early life exposure to digital technology. Technology that Strauss and Howe (1991) connected to the Information Age, positing that millennials would have superior skills and increased comfort when working with technology specific to communication and the gathering and dissemination of information. Strauss and Howe’s (1991) work in this area gained a considerable following amongst educators and academics, with colleges and

universities even going so far during the first decade of this century as to post lists of descriptors for the millennials-Generation Y cohort on their host websites, with advice for how faculty from previous generations could more effectively educate this new generation (DePaul University, 2010; University of Wisconsin, Faculty Alliance for Creating and Enhancing Teaching Strategies, 2005).

Prensky (2001a) refined the Strauss and Howe's (1991) concept when he described Generation Y—or Net Gens, the identifier he preferred—to be the age cohort of digital natives because of what he claimed to be their early life exposure to digital technology. By comparison, in Prensky's (2001a) construct, all previous generations were “digital immigrants” (p. 3) because they gained access to this particular level of technology later in life. Prensky (2001a) alluded to the acquisition of linguistic diversity, especially diversity in spoken languages, as analogous to the acquisition of digital application skills.

As will be explained in more detail in Chapter 2, linguistic research indicates an individual exposed from birth to more than one language and encouraged to use more than one language for oral communication develops the capacity to process information, internally, in more than one language (Harley, 1998).

To establish a clear set of terminology, the term *digitally native* is used rather than *digital natives*, as a result of the emphatic debate relating to the concept of digital natives. In this respect, therefore, the *digitally native child* is similar to the *multilingual child*, as both enjoy a comfort level and increased facility that is not available to those who have not been exposed either to multiple languages or to digital media technology until later in life and, therefore, later in the cycles of learning as defined by Piaget (1952) and Bruner (1960) and Chojak (2019). As a result, it seems unlikely that those selected as research participants in

the early studies of the Prensky (2001a) concept would be age-appropriate to the purpose of those studies.

To facilitate this exploration, this study used the term Generation Y, as it is the most consistent identifier amongst a spectrum of optional labels for the age cohort that according to demographers began with the slow onset in 1974 of what was to become the baby boomlet (Statistics Canada, 2019a), but which other theorists argued started in 1978 (Tapscott, 2008), 1982, or later (Bullen et al., 2011; Strauss & Howe, 1991), or a range of even later alternate dates suggested by other theorists. Given the broad divergence in apparently possible onset dates for the Generation Y cohort, it is not surprising to find a similar range of suggested end dates.

This study was designed to explore the onset and end dates of Generation Y, with the intention of clarifying the probable onset dates for the ensuing generation (i.e., Generation Z). This study also was designed to explore the possibility that both Prensky (2001a) and those countering his concept (e.g., Bullen et al., 2011) identified the incorrect generation and that Generation Z is the actual digitally native cohort—the generation to whom digital media technologies were introduced sufficiently early in life to provide enhanced digital abilities.

In order to do so, this doctoral study attempted to first address the inaccuracy and the confusion resulting from the varying definitions of generations of the digital natives Prensky (2001a) identified. The review in this area was limited because, although there is a significant volume of literature on this topic, it tends to target the same age cohort in each instance and, therefore, has drawn similar overall conclusions. The next step in this study was to explore the characteristics and proclivities of the latest generational cohort of learners, Generation Z, to determine whether or not they truly are digitally native in the sense that they are the age

cohort, at least within the developed nations, immersed de facto in digital media technology from infancy.

The intent of this study was to more accurately describe, and ascribe, the traits of learners with aptitude for digital media technology and to begin to fill the void of theory and literature connected to a cohort effectively overlooked to date. A cohort (i.e., Generation Z, potentially) that now holds increased significance to proposed change within the system of education and training, because Generation Z is currently the dominant age cohort in K–12 and is becoming the dominant age cohort at college-undergraduate institutions.

As part of the review of literature, an analysis was conducted into the important incidents in the actual history of the development and implementation of the communication structure now known as the Internet. A pervasive institution now, the Internet, in fact, is a recent entity—the study of which assisted in developing a working operational definition for the age cohort of Generation Z because it is the Internet, at a certain juncture in time, that facilitates access to and sharing of digital media across a sufficiently large spectrum of society to create the critical mass proportion of a generation necessary for the digitally native cohort to emerge.

With these criteria and this definition in mind, the demographic significance of Generation Z becomes evident. This is a significance founded in their dominance in the K–12, in fact in the K–16 system of education (i.e., K–12 plus 4 years of postsecondary education), in particular their dominance over the past 10 to 12 years, the period when fundamental changes in this system began.

In this context, this qualitative case study was conducted with learners currently enrolled in K–12 distance education coursework in BC. The focus was on the exploration of

the characteristics and experiences of these learners in the context of the learning preferences, attributes, and proclivities of the current generation of learners.

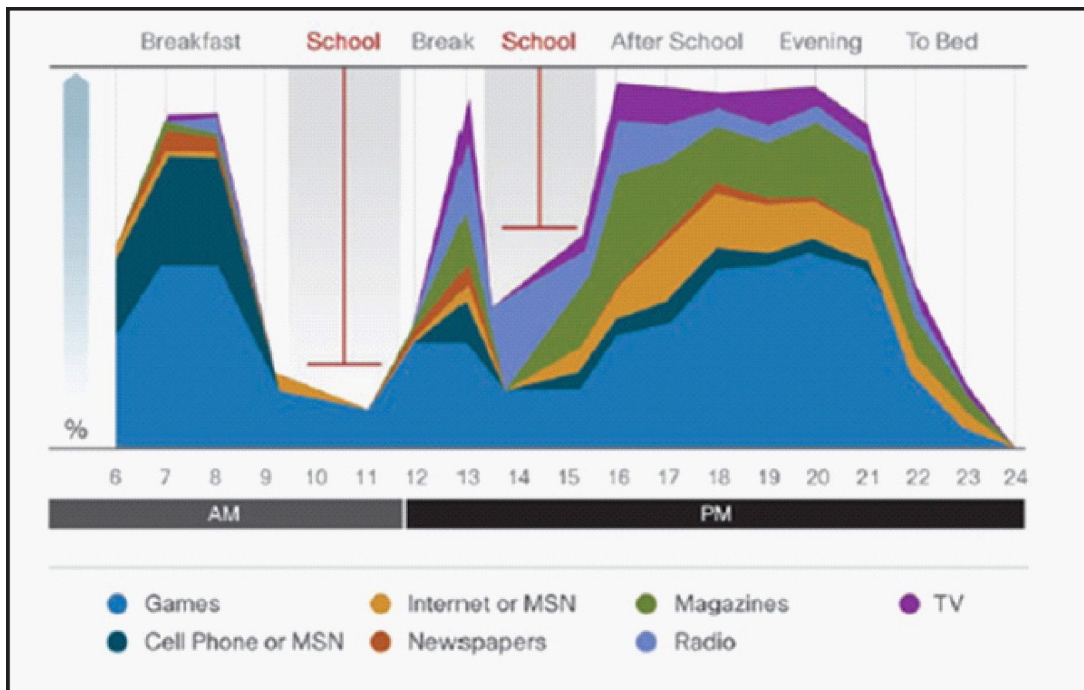


Figure 1. Media consumption by percent and time.

Note. From *A Vision for 21st Century Education* (p. 25), by Government of BC Premier's Technology Council, Victoria, Canada: Queen's Printer. Copyright 2010 by Government of British Columbia. Permission pending.

Figure 1 is drawn from usage by the general population but indicates significant spikes in consumption of online games, cell phones, and Internet usage before school, after school, and during breaks in the traditional school day when learners had the opportunity to access digital media. The logical contention to be drawn for this is that school-age (i.e., K-12) learners were already substantial consumers of these forms of digital media technologies at the onset of this latest decade. The concomitant suggestion is that the absence of usage (i.e., the valleys reflected in the graph in Figure 1) represents a lost opportunity to apply a cohort proclivity effectively in learning situations. This is one instance of failing to explore and adapt appropriately to Generation Z dominant-predominant proclivities. The

results of some early studies of this century were unfortunately confused by less careful reports focused on as-yet-undeveloped aptitudes and untaught skills.

As such, this study was designed to explore the contention that the current generation of learners is a distinguishable generational cohort, the majority of whom live in developed nations in North America, Europe, and Asia-Australasia and who have been immersed from an early age in various forms of digital media and, therefore, are self-confident and perhaps more adept in a wide spectrum of usages for digital media technology. The reasonable assumption given this premise is that learning experiences designed to use these skill sets will allow learners to accommodate and assimilate knowledge, skills, and aptitudes more quickly and more thoroughly than those experiences applied in more traditional modalities for learning (i.e., those institutions identified as vertical transmission schools). Moreover, it now seems reasonable to hypothesize that if educators understand the attributes and aptitudes of these new learners and design experiences accordingly, the learners will be encouraged to use their existing and potential facility for digital media to further enhance their own experiences and overall learning acquisition.

Prior to the midpoint of this second decade of this century, however, there was far too little empirical research into this younger age cohort to do more than suggest strongly—and far too much at stake, given the apparent directions proposed for education (Government of BC, 2011; Government of BC, Ministry of Citizens Services, n.d.; Government of BC, Premier’s Technology Council, 2010), to justify speculating. This doctoral qualitative research exploration attempted to provide insight and encourage a congruence of perspective between this current decade’s K–12 learners, their educators, and future researchers.

Research Questions

As outlined in previous sections, the research questions for this qualitative case study investigation were: (1) What characteristics, preferences, and/or proclivities make Generation Z different from earlier generations? And (2) What changes to the education systems should be considered, given the technology proclivities of this “Generation” Z?

The focus of this study was to explore the hypothesis that a new generational group of learners currently exists for whom early access and use of digital media technology has created a paradigm that is, in effect, digitally native. The rationale for this study was that developing learning experiences to use the technological proclivity of Generation Z better should encourage enhanced learning for this age cohort. Within this context, the research questions were derived from the inquiry into the research problem and the related literature.

The methodology for the study was a qualitative case study, interpretive in approach (Bhattacharya, 2008). This selection of methodology was appropriate because (a) generations are described and delineated as distinctive subgroupings within the culture, making qualitative methodology accepted practice in data collection (Merriam, 2002, 2009); (b) it was a complex, real-life, evolving situation, making case study an appropriate methodological approach (Yin, 1994) with an interpretative focus (Smith, 2008); and, finally, (c) the sheer volume of overlapping terms and posited definitions created an organic need for interpretive assessment and cross referencing of said terms and definitions.

Context for the Study

Digital media technologies and their applicability, or lack thereof, are topics of particular interest in the current educational context, as both scholars and commentators have recognized the lives of the current generation of learners are different from earlier

generations because of early-age access to these technologies. Some scholars and commentators argued the influences, when translated into the educational context, are not as substantial as might be anticipated (Bullen et al., 2011; Cameron, Bennett, & Agostinho, 2011; Thompson, 2013; Wood, Barnes, Vivian, Scutter, & Stokes-Thompson, 2010). Some scholars and commentators argued the influences, once the technologies are properly integrated in an educational context, could be far more important than educators have yet realized (Carr, 2001; Oblinger & Oblinger, 2005; Prensky, 2001a, 2001b; Rosen, 2010a, 2010b; Tapscott, 2008; Wendover, 2010). At times, this conversation has resembled the chorus of the divided villagers at Anatevka, in the musical production of *Fiddler On The Roof*, shouting back and forth, “Horse! Mule! Horse! Mule!” (Bock & Harnick, 1990, para. 89–92; see also Harnick & Bock, 1971), and in the process threatening to lose cognizance of the fact the animal in question in the aforementioned musical has four legs, not two, and as a consequence it already is affecting the function of the collective village. Moreover, as the volume increases with each conflicting response within the chorus, the extended corollary is that the divisive character of the debate now has taken on potentially distracting and damaging ramifications for the culture and society.

Cameron et al. (2011) posited, “There is no doubt technology influences the way we live and has affected many aspects of our lives” (p. 3392). The analogous circumstance to the animal with four legs (i.e., digital media technology) is recognized to be in the village of Anatevka, even according to those skeptical with respect to Prensky’s (2001a) construct of digital natives.

Therefore, the conversation becomes one of grave significance, one that will involve how much benefit, real and immediate, or potential for the future, digital media technology

might have in promoting learning. Learning that is considered essential for any culture or country intending to retain the potential to be a developed nation, as defined by the international organizations measuring performance in the modern context (OECD, 2010, 2016; Smith, 2001). Learning for which substantial sums of money are now starting to be diverted from this traditional system into alternative models and formats for learning (Ambient Insight Research, 2015; Carbol, 2009; Government of BC, Ministry of Citizens Services, n.d.). This transition in funding is being fostered actively, and officially, by formal educational authorities (Government of BC, 2011; Government of BC, Ministry of Citizens Services, n.d.; Government of BC, Premier’s Technology Council, 2010).

The conversations that took place through this inquiry were significant as they involved the target age cohort who appear to be more comfortable and adept with digital media and technology than any previous cohort (See Appendices B, p. 187; F, p. 195; H, p. 202; I, p.220, for evidence to support this effect). The conversation must continue, despite being delayed and threatened with truncation by the ongoing Anatevka-style debate, potentially to the detriment of future learning and cohorts of learners.

Significance of the Study

This study explored the possibility of a transition to more virtual-online-hybrid modalities for K-12 education. These changes are important to us, as educators, to understand. In a parallel context, O’Neill (2020) argued, “experience at scale changes culture” (41:13) before positing, “experience at scale [persisting] is culture” (41:18). Translated, any element achieving critical mass within any cultural grouping, or cultural segment, becomes a fundamental building block of that particular culture and/or cohort.

There appears to be a rationale, therefore, in both practice and theory, for this transition in modality to one emphasizing digital media technology. The practical rationale for this transition exists in measurable results from the traditional school system. For several decades, there appears to be evidence that the system is not meeting the needs of learners, in that in some developed nations almost 40% of the enrollees fail to graduate from secondary school and thus do not receive foundational certifications recognized as essential to the majority of careers (Statistics Canada, 2019a, 2019b).

Meanwhile, the theoretical rationale for this transition also exists in the strong inference from this study, supported by numerous commentators and academics, that learning is not necessarily congruent with the traditional school system of education. Traditional, in this context, refers to the primarily face-to-face pedagogy applied in a graduated step-by-step gamut for students to work through and complete, as preparation for taking an effective role in the ‘industrial model’ economy dominant through the 20th century in most Western-Developed countries. There appears, therefore, at this stage late in the second decade of the 21st century, to be a movement away from the traditional school system based on substantive evidence of the need to do so (Linne, 2014; Rosen, 2007, 2010a, 2010b; Smith, 2001; Statistics Canada, 2019a, 2019b; Teo, 2013, 2016; Toffler, 1989).

This transition is occurring in an era of rapid overall change for developed nations, with a cohort of learners who have not yet been studied adequately. It was to this end, and with the perspective of starting to address this absence of valid data, that this study was initiated.

Limitations

The following limitations underlie this doctoral study:

1. The literature that served as background for the key topic of this study was itself limited.
2. Digital media and, in particular, digital media learning environment tools are in a constant state of flux.
3. The study focused on one (K-12 online) institution in one Canadian province; therefore, the findings cannot easily be generalized.
4. As the participants are students enrolled in an online program at the time of the study, they may be more engaged with technology and more likely to use digital media-technology than their age peers in the general population.

Definition of Key Word Terms

For clarity and consistency, this section presents generally accepted definitions to establish a clear set of terms for the inquiry.

Andragogy is a learning design, process, and structure appropriate for adult learners (“Andragogy,” n.d.).

ARPANET is the historical predecessor to the Internet, secretly operated initially in the United States for the sharing of military, defence, and scientific information and projects (Abbate, 1999; Zakon, 2010).

Cognitive mapping is the process through which the brain stores and retrieves information based on actual physical location in the textual resource (Hickey, 2011; Webb, 2011).

Developed nations are those described as the most sophisticated in their use of technology for economic and cultural purposes (OECD, 2006, 2014; Smith, 2001).

Digital Age is the late 20th-century era when computer (digital media and communication) access and implementation started to become relatively widespread (Clinton, 1995; Prensky, 2001a).

Digital immigrants are the older age cohort who find digital communication to be foreign and, therefore, must be adapted to (Prensky, 2001a, 2001b).

Digital media are forms of electronic media in which data are stored, transmitted, and/or communicated in digital, as opposed to analog, binary, or other earlier formats (“Digital Media,” n.d.). Digital media technology, therefore, is that which produces data in a digital format. Delimiting to more specific technology-labels (e.g., smart phones, tablets, computers, high-definition television, etc.) was inappropriate for the purposes of this study because new technological developments fitting this umbrella definition are being developed constantly. The significant element in this definition is the format of transmission. That is, the media output can now be adapted, manipulated and produced or repackaged with the same equipment with which it is received, making basic applications simpler for those familiar and comfortable with the appropriate technology.

Digitally literate is someone predisposed to be comfortable in the use of computers, the Internet and digital communication technologies for a variety of purposes (Bullen et al., 2011).

Digital natives are specifically identified younger age cohort members who were thought to find digital communication to be more natural and, therefore, something innate for them operationalize (Prensky, 2001a).

Digitally native describes individuals (of an age group or younger cohort) exposed to digital communication at an appropriate phase in their learning development to develop preferences, proclivities, and potentially skills and aptitudes in the uses of said technology.

Education is the effort to systematize learning (“Education,” n.d.).

Generation is an age cohort of specific parameters and social, historical, and demographic context (“Generation,” n.d.-a, n.d.-b; Strauss & Howe, 1991).

Internet is the current, most public incarnation of the accessible network that began as the “ARPANET” (Zakon, 2010, 1966 section, para. 2; see also Abbate, 1999).

Lateral transmission is the conveyance of knowledge, skills, and aptitudes amongst peers in a learning situation (Mead, 1958).

Learning is the act or process of acquiring a knowledge or skill (“Learning,” n.d.).

Neuropedagogy is when neuroscience and education meet, and whose scientific aims are to learn how to stimulate new zones of the brain and create connections for enhanced learning (“Neuropedagogy,” n.d.)

Pandemic is (a disease) prevalent over a whole country or the world: in this instance Covid-Coronavirus (“Pandemic,” n.d.).

Pedagogy is the learning design, process, and structure appropriate for child learners (“Pedagogy,” n.d.-a, n.d.-b).

Proclivity is a tendency to choose or do something regularly, an inclination or predisposition towards a particular thing (“Proclivity,” n.d.).

School is a systematic, structured educational environment intended to foster learning (“School,” n.d.).

Vertical transmission is the conveyance of knowledge, skills, and aptitudes from a superior, frequently senior, individual in a learning situation (Mead, 1958).

Chapter Summary

This chapter set the stage for this study and provided a frame for the reader. The problem and rationale for the study as well the scope and context were outlined. Finally, definitions with contextual explanations were supplied for terms used commonly throughout this doctoral study. The subsequent literature review, Chapter 2, provides a more comprehensive view of the theoretical underpinnings of the study as a whole.

Chapter 2: Literature Review

This qualitative case study explored the following primary research question: What indicators exist to suggest Generation Z might be the first digitally native cohort? The focus of this study was to explore the hypothesis that a new generational group of learners now exists for whom early access and use of digital media technology has created a paradigm that is, in effect, digitally native. The rationale for this study was that the development of learning experiences that include the technological proclivity of Generation Z should encourage enhanced learning for this age cohort. Within this context, and the primary research question above, and the exploration of the literature, led to the sub question: What characteristics, preferences, and/or proclivities make Generation Z different from earlier generations?

The purpose of the study, therefore, was to explore the proclivities, skills, aptitudes, and potential of Generation-Z learners, the latest generational cohort to enter our education system. Cautionary notes that were considered during the study include (a) the suggestion that digital media technology usage might not be as universal as argued (Cameron et al., 2011) and (b) the arguments that technology usage might alter the structure and/or function of the brain (Prensky, 2001a, 2001b; Tapscott, 2008).

Prior to exploring the key subject areas included in this chapter, a brief explanation of how the literature was obtained is presented here. The search strategy for the literature of import to this study was comprehensive and multiphased over both time and subject matter. Initial searches at the time of the data collection were divergent yet focused, using resources such as Google Scholar and specific search engines connected to the libraries at Athabasca University, Royal Roads University, the University of Victoria, the University of British Columbia, as well as, to a lesser extent, several other reputable institutions and the librarian

assistance process at the London Library. Search processes in all instances concentrated on a spectrum of keywords, appended over time by citations from studies already perused as a result of the keyword and library assistant procedures. At the time of data collection, the results of this search primarily produced papers skeptical to Prensky's (2001a, 2001b) theoretical concepts of digital natives and digital immigrants.

A second search, over the most recent 18 months, followed similar processes and procedures. This search continued to produce papers of a skeptical cast but also garnered more balance in the frames (Goffman, 1974) with which a growing proportion of authors and researchers began to view the work of Prensky (2001a, 2011b).

The literature reviewed in this chapter is diverse yet purposeful. The objective was to determine some descriptors and indicators for the research subtopics, which are presented in three main sections: (a) literature supporting themes, (b) non-supporting literature, and (c) the concept of digitally native.

The first section, literature supporting themes, includes the following subtopics:

- A review of Prensky's (2001a) framework
- Toward a definition of learning (and education)—for the purpose of outlining core principles pertaining to learning and learners,
- Toward a definition of generation—for the purpose of outlining core principles pertaining to specific age cohort generational groupings,
- Generation Z invented: The “newest” learners—for the purpose of defining Generation Z as a cohort, and
- Generation Z located: Distinguishing these “newest” learners: For the purpose of identifying, as accurately as possible, the age grouping constituting this cohort.

The non-supporting literature discusses both the views of skeptics and studies presenting mixed results. Finally, the Concept of Digitally Native section explores the paradigm of these “newest” learners for the purpose of developing literature and argument focused on the potential of this age cohort. Additional literature is included in the ensuing chapters to support the proposed methodology of the study and the proposed approaches to data analysis.

Literature Supporting Themes

This section features literature primarily supportive of the themes derived from early research into the conceptual framework proposed by Prensky (2001a, 2001b). This begins with a review of Prensky’s (2001a) framework.

A review of Prensky’s framework. Prensky (2001a) proposed the concept of digital natives, stating in the process that functional understanding of this transition in learners was “very serious, because the single biggest problem facing education today is that our Digital Immigrant instructors, who speak an outdated language (that of the predigital age), are struggling to teach a population that speaks an entirely new language” (p. 2).

Skeptics proliferated, attacking Prensky’s (2001a) concept throughout the next decade and beyond. Bennett and Maton (2010), Bullen et al. (2011), Bullen and Qayyum (2014), Cameron et al. (2011), Gilewicz (2011), and Wood et al. (2010) were but a few who launched assaults on the concept, attacking seemingly every nuance. In particular, Prensky’s (2001a) suggestion that “it is very likely that our students’ brains have physically changed – and are different from ours – as a result of how they grew up” (p. 1) drew especially strident criticism and continues to do so.

Chojak (2019) affirmed this premise of Prenksy and argued,

Concepts of “network children” and “digital natives” are now widely known and used. Their creators have been hypothesizing that the brains of children who have grown up in the world of new technologies have functioned differently than their peers, who have had limited contact with the TV or computer. The development of modern brain research techniques has helped confirm these assumptions. (p. 1)

Chojak (2019) cited numerous empirical studies (e.g., Cipora et al., 2014; Gogolak, 2013; Kostyrka-Allchorne et al., 2017; Takeuchi et al., 2015, 2016; Wobe, 2013), as part of her own research supporting Prensky’s (2001a) contention that early exposure to digital media for the children he labelled as “digital natives” (p. 1) would affect the actual structure of their brains (p. 12).

Chojak (2019), supported by numerous empirical studies, contended that this early media exposure is harmful. While this is clearly cause for concern, and deserving of further immediate study intent on action, the key for the purposes of this dissertation was that empirical fNIRS neuroscience examinations show that significant “structural and functional” (Chojak, 2019, p. 1) alterations of brain structure clearly did occur for children exposed early and regularly to media—destroying the last vestiges of argument on this matter for Prensky (2001a) skeptics.

At the time of this doctoral study data collection, the members of Generation Z had yet to be studied to any significant degree, despite this generation’s pivotal location in the evolution of education and learning and, therefore, in the evolution of our culture.

The result was an overall negative response to the theoretical concept offered by Prensky (2001a, 2001b). However, during the intervening years since that first search,

increasing numbers of scholars and educators have begun to suggest strongly that despite the evident flaws in Prensky's (2001a) initial study, in that his cohort of focus was too early in the evolution of digital technology in North American culture, the overall tenets of his publications appear to show some strong elements of truth. Elements seemingly now supported by the work, research of Chojak (2019, 2020), in the area now being described as 'Neuropedagogy.'

The proliferation of publications on the topic of Prensky's (2001a, 2001b) theoretical concepts outstrips the reasonable capacity to list them all in this summative passage.

Representative of the broad spectrum of reaction, however, are the following:

- Like many of Prensky's (2001a) skeptics, Thompson (2013) argued digital natives do not exist. This paper, however, like others of similar frame, was based on a comparison of skills application as opposed to proclivities (ignoring the education precept that skills must be acquired, mentored, and constructed, as opposed to simply evolving through some undefined form of osmosis).
- Linne (2014), like others of similar frame, pays basic homage to Prensky (2001a), at least in broad characterization, by arguing that digital natives can be categorized into two tiers: Web 1.0, those born between 1980 and 1994 (i.e., roughly matching Prensky, 2001b), and Web 2.0, those born after 1995 (i.e., roughly matching Prensky, 2001a).
- Teo (2013, 2016), who is a prolific author on this and other related topics, has developed and proliferated the digital natives assessment (DNAS): eschewing age significance in relation to the phenomenon while positioning his quantitative measurement tool.

- Barbour and Labonte (2019) discussed variations on a theme at volume, providing facts related to the topic of online education and similar useful information from a credible source.

While all of these scholars were valuable when undertaking this research, because they encapsulated broad bases of current frames of thinking, they also demonstrated how fractured this important conversation had become.

Having reviewed Prensky's (2001a, 2001b) framework, the focus now turns to defining key terms such as learning and education. This includes a review of Piaget's (1952) research as well as other scholars' work on brain research (Kolb & Fantie, 2009; Kulman, 2014) and extending the constructs beyond the work of Piaget to technology-mediated learning.

Toward a definition of learning (and education). For most of the past century, individuals of eminence and reputation, diverse both in cultural background and discipline, have argued for a transformation in the leadership and systems of education (Downes, 2008; Illich, 1971; Mead, 1958; Rosen, 2007, 2010a, 2010b; Tapscott, 2008). Aside from minor alterations, more in form than in process and content, these commentators and academics argued little of substance within the systems of education has changed (Nellen, 1999; Prensky, 2010). Mead (1958), an anthropologist, called for an evolution away from the exclusive vertical transmission of knowledge, skills, and aptitudes from teacher to student, traditionally practised in schools in developed nations, to more lateral transmission from peers and mentors (Carr, 2001; Downes, 2008; Mead, 1958; Nellen, 1999; Rosen, 2010a; Tapscott, 2008). It is an argument for moving toward pedagogies and instructional settings that will free both the culture and the system of education to distinguish primary education,

with its supervisory core and more disciplined approach to curriculum, from secondary education, which is better suited to more fluidity and a more advanced level of learning that should be available “in any amount . . . at any time in a person’s lifetime” (Mead, 1958, p. 166). This proposed transformation, in turn, posits a new direction, supported by numerous 20th and 21st century theorists and is fundamental to the thesis that educators should spend more time comparing the young adults currently in the secondary system (i.e., those aged 15 to 18 years, and, therefore, arguably those at the upper age range of Generation Z) with “mature” adult learners, rather than confining them in the learning modalities better suited to toddlers and children (Carr, 2001; Mead, 1958; Nellen, 1999).

Illich (1971) argued that Western culture confuses education and learning with “time served” and that the result is a measurement framework founded on an “ageist mindset” (p. 112). As a consequence, education and learning are seen by some to be more a matter of some concept of maturation rather than a measurable base of competencies connected to learning. A key element in the confusion reflected in this generalized concern is the apparent inability to define and, therefore, to measure learning. Mead (1958) argued that learning, amongst other attributes, should be a positive contributor to the sustainability of the culture that is the context for that learning. By extension, the learning in question needs to be measured in the context of this contribution.

The OECD (2006) emphasized the need for measurable learning, identifying effective education as a critical element in maintaining the economic and therefore cultural viability of a country. In a more recent report, the OECD concluded that computer-use competencies and skills are closely linked to the economic, cultural, and social capital of the student and to the society of the country inhabited by that student (OECD, 2010). The recommendation is that

governments should clearly convey the message that computer use matters for the education of young people and raise the frequency of computer use to a level where it becomes consistently relevant, because only in these circumstances will clear correlations between technology use and educational performance emerge (OECD, 2010). Additionally, and perhaps not coincidentally, this emphasis on technology-mediated learning also promotes the extension of lateral transmission, advocated by Mead (1958).

In this context, in developed nations, resources are now being diverted from the traditional system of schools into technology-mediated learning environments in a trend meeting the early projections for growth (Ambient Insight Research, 2010; Carbol, 2009; Government of BC, n.d.-a; Government of BC, Premier's Technology Council, 2010; OECD, 2010). This circumstance is understandable in that a substantive change has occurred in the culture of developed nations of the early 21st century, a substantive change involving digital media technologies taking on almost ubiquitous availability in general life circumstances and applications for the average person in these nations (OECD, 2010). A situation now substantiated further by the current (2020) COVID -19 enforced 'pivot' from face-to-face to virtual processes in so many vital areas, including all levels of education. A 'pivot' for which the possible, and much needed, research is not available.

The argument that these technologies may not have educational value is no longer viable and learning to use the technologies has become an established life and employment skill recognized internationally (OECD, 2010). To ask public education not to participate in the important function of technology-mediated learning on the strength of studies of restricted focus is detrimental to already potentially disenfranchised learners (Government of BC Premier's Technology Council, 2010; OECD, 2010).

Piaget and emerging developments in brain research. The basic application of digital media is perceived to fit in the lower stages of Bloom's (1956) hierarchical taxonomy of function, in that applications of this type are one step above base-level memory operations, but below both analysis and synthesis operations, and applications of this level of sophistication also correlate with Piaget's (1952) preoperational stage of development (see also Kolb & Fantie, 2009; Kulman, 2014). Piaget described four generally accepted development stages, and their chronological equivalents, as follows: (a) sensorimotor stage, from birth to 2 years of age; (b) preoperational stage, from 2 to 7 years of age; (c) concrete operational stage, from 7 to 11 years of age; and (d) formal operational stage, from 11 to 16 years of age.

Kolb and Fantie (2009) reviewed literature and studies in emerging research into pediatric brain development. Their paper was of particular interest to this doctoral study because they linked several established theories and constructs to the work of Piaget (1952).

Although Kolb and Fantie (2009) were careful to refrain from direct claims, preferring, because of the complexity of this field of study, to apply the term "inferred" (p. 36), they suggest a case for likely connections between brain growth in phases and skill and aptitude development paralleling Piaget's "Stages of Development" (p. 19). Emphasizing the preoperational phase, Kolb and Fantie make reference to language development, suggesting by 24 months the average healthy child demonstrates considerable vocabulary development and the physical brain growth to sustain these phenomena—and that by 36 months both demonstrated skills in this area as well as physical growth are considerably more substantial. They relate this directly to the actual physical dexterity at similar intervals, suggesting that the physical maturing of the brain and adeptness in physical operations also

match closely. Kolb and Fantie suggested that Piaget's background as a biologist assisted him in relating child development via stages to spurts in brain growth, maturation, and sophistication.

Regarding Kolb and Fantie's (2009) inferences, what can be said now is that more recent empirical fNIRS neuroscience examinations mapping brain development appear to strongly support their projected pattern of development. This researcher considered these recent studies during the course of this inquiry.

Piaget (1952), like most high-profile theorists, has been subjected to wide-ranging critiques. Amongst the challengers to his constructs on child development, which is the main topic of interest to this study, Spencer et al. (2006) focused on children under 12 months old and Repacholi and Gopnik (1997) emphasized tasks for children between 14 and 18 months, and, like so many others, they argued that their interpreted differences in their results from those of Piaget should negate the latter's constructs overall. The most significant perceived counter position to Piaget, advocated by so many, including Tudge and Rogoff (1998), is that of Vygotsky (as cited in Tryphon & Vonèche, 1996) and his construct of the zone of proximal development.

Support for Piaget (1952) is equally diverse and substantial. Lourenço and Machado (1996) counter 10 specific criticisms of Piaget and argued that in some instances (a) these criticisms of Piaget are formulated on flawed logic, (b) the core principles of the critical arguments are founded incorrectly, and (c) the basis of the critical arguments misconstrue the philosophy of Piaget. Arguments now made less urgent by the evolution of the work, and apparent findings, of Chojak (2019, 2020).

Lourenço and Machado (1996) further argued that Piaget's critics tend to remove his work from context and, in so doing, expose more flaws in their own arguments than in those of Piaget. Mayer (2005) comprehensively responded to critics of Piaget's (1952) methodology, countering those who prefer, again, to take out of context what Mayer suggested to be developing work on a continuum leading, stage by stage, to more nuanced and substantial conclusions. Bruner (1960), argued Piaget's pre-eminence in the field, and in Bruner's (2008) own ongoing, sustained dialogue on culture provided solid support for the perspective of Piaget's framework, while Lourenço (2012) argued that it is not Piaget versus Vygotsky but rather Piaget and Vygotsky in that "each was able to attribute much meaning to the dimension his colleague did not choose to study or explore" (Lourenço, 2012, p. 293). L. Smith (1996) summarized the support for Piaget when he argued that Piaget-based pedagogy demonstrates measurable success.

Kolb and Fantie (2009) emphasized the work needing to be done to overcome the deficiencies created by injuries and illnesses, which damage the brain of a child. They cautioned, "It is futile to look for any specific growth process that might explain language acquisition" (Kolb & Fantie, 2009, p. 33), certainly in relation to repairing or remediating damage, but they also infer very strongly the links between growth within a healthy brain—and both language and physical dexterity developments—between 18 and 60 months (i.e., during Piaget's preoperational stage). A construct now seemingly supported by Chojak (2019, 2020).

Their paper provides evidence that preoperational stage development should be equated with the introduction of application-level functions (e.g., language acquisition, usage of digital media/technology, etc.), in terms of creating conditions needed to develop a

generational cohort of digitally native individuals (Kulman, 2014). This is an age much earlier than the user data supplied in one study, which gives even the “youngest” of the frequently studied, older Generation Y cohort consistent access to computers and digital media/technology no sooner than the age of 10 or 12 years (Hargittai, 2010).

Extending the constructs of Piaget in the context of technology-mediated learning.

The difference between digital media technology, learned at the preoperational stage, and other forms of technology that children can learn to apply at a similar stage (i.e., a pencil) is that the latter has a limited spectrum of uses, whereas digital media technology can extend its usefulness into an almost infinite arena of possibilities. The debate surrounding digital media technology in the context of education is founded primarily in this diverse arena of possibilities and whether the technology has the potential to enhance learning of the types perceived to be in the higher orders of Bloom’s (1994) taxonomy and the more advanced stages of Piaget (1956).

With these possibilities in mind, this author is developing a research agenda to explore emerging learning potential in the context of a newly developed model of Bloom’s Taxonomy (Thompson & Barclay, 2019). See Appendix A for the Bloom “basics” applied model.

Gilewicz (2011) suggested, “as an example, the ability to chat online with a professor is not engaging, rather the chat session itself is—the technology itself is transparent and ubiquitous to a generation of students who have grown up using it” (p. 2). Gilewicz, like others who presented studies and arguments intended to counter the NetGen as Digital Natives construct (Bullen et al., 2011; Cameron et al., 2011; Wood et al., 2010) and the advocates of digital media for education (Prensky, 2001a, 2001b; Tapscott, 2008; Wendover,

2010), are focused on the age cohort of Generation Y. Yet, as presented below in the discussion of Bullen et al. (2011), these scholars frequently seemed to find at least some evidence of potential enhanced digital media knowledge, skills, and aptitudes amongst Generation Y over those demonstrated by previous generations. Linne (2014) gave later voice to this seeming transition in his phases (i.e., Web 1.0 and Web 2.0).

Learning appears to be occurring, therefore, in technology-mediated environments, using digital media. The education system may be no closer at present to measuring precise overall learning and education effectively than it was when Illich (1971), Mead (1958), and others began expressing concerns, but evidence exists that learning is occurring (Carr, 2001; Gilewicz, 2011; Nellen, 1999). The OECD (2010) suggested only by making technology-mediated learning environments commonplace in education contexts will the “patterns of technology use and learning emerge” (p. 1).

The OECD (2010) argument is that digital media technologies are pervasive, ubiquitous, and vital in developed societal economic structures and, therefore, their operation represents essential knowledge, skills, and aptitudes for any individual to succeed within that culture. For learning and education in the early 21st century to foster the symbiotic relationship between a successful society and its citizens, therefore, the implementation of digital media technologies appears to be necessary.

The exploration of this implementation is important to maximize the constructive influences possible from the transition, namely those influences that have been suggested in studies of the age cohort known as Generation Y, and now appear to grow more pronounced, in the age cohort of our newest learners, Generation Z. Generation Z, then, is potentially the

generation to have experienced increased access to digital media during Piaget's (1952) preoperational stage and, therefore, the extant generation most likely to be digitally native.

Toward a definition of generation. Once one expands from the basic familial definitions of mother-to-daughter procreation (Harper, 2010) into the field of cultural generations (Strauss & Howe, 1991), clear discrimination between the dates of onset and closure for specific generations becomes difficult to achieve with any degree of agreement. Even when evidence of a demographic nature can be established, the complexities are significant. A relatively simple example of the potential complications in this respect can be found in the onset of the baby boomer generation.

The baby boomer generation is commonly defined as those children born in the aftermath of World War II. However, World War II was in fact two overlapping wars. The war fought in Europe ended on May 7, 1945, while the war fought in Asia continued to August 15, 1945. Many of the soldiers from North America and Australasia had been absent from home throughout the 1940s. Allowing time for the painstakingly slow demobilization of the troops from these two distinct conflicts and for the transportation of these former troops to their respective home countries, it becomes evident that the onset births of their children, those in the generational cohort now known as baby boomers, would occur significantly later in North America or Australasia. Moreover, European demographers, due to the nature of this war, and the fact many Europeans remained on home soil throughout, often date the onset of the baby boomer generation in Europe as early as 1943 (Kick, 2005). Therefore, it can be posited that within the acknowledged developed nations the adjacent generational cohorts commonly referred to as the baby boomers and the silent generation (the

predecessors of the baby boomers) overlap in time and that precise discrimination and description by date is difficult if not impossible.

Some overlap between generations is common, making the precise definitions of generational cohorts complex and frequently contentious. Some demographers have suggested that with geography and other factors the transition period from one generation to the next can be as much as 3 to 5 years (Kick, 2005). This cautionary note seems particularly apt where the terminology used to label, distinguish between, and describe the characteristics of generations is most applied—in the developed nations of North America, Europe, and Asia-Australasia. For all that, however, there are apparent patterns to be considered and acknowledged; patterns that can be useful in that they categorize diverse elements, increasing our understanding of this particularly complex situation (Bruner, 2008).

Digital media and cultural generations. Strauss and Howe (1991) posited what is now referred to as the Strauss-Howe generational theory. According to this and subsequent work expanding and enhancing the construct (Howe & Strauss, 2000, 2007; Strauss & Howe, 1997, 2007), there are distinct cycles in American history, and, by extension, in the collective histories of other developed nations of similar eras. The shared experience created by these cycles, argued Strauss and Howe, result in ‘social generations’: the aggregate of all people born in a span of roughly 20 years, who become a cohort grouping based upon three established criteria. First, the members of any given generational cohort share what Strauss and Howe called an ‘age location in history’, in that they encounter the same critical historical events and the same social trends while living through similar chronological and biological phases in their own respective lives. Second, because members of any given generation are influenced by these shared events and trends, they are inclined to hold similar

beliefs and behaviours. Third, because members of any given generation are aware they share both experiences and beliefs, they also are inclined to identify themselves as sharing a ‘perceived common membership’ (Strauss & Howe, 1991) in a distinct generational cohort. This latter facet of the construct has been elaborated upon again more recently with specific reference to the usage of digital media technology (Rosen, 2007, 2010a, 2010b). Overall, the Strauss and Howe (1991, 1997) construct for identifying generational cohorts has gained credibility in recent years and has become accepted for citation in dissertations and theses (Hicks, 2007; Yonekura, 2006).

Within this framework, several early 21st century commentators and scholars have argued generational definitions and distinctions based specifically on the usage and potential implications of digital media technology. Tapscott (2008), an advocate of generational theory, emphasized the effects of technology on the more recent generational cohorts: “Growing up digital has had a profound impact on the way this Net generation [the term he uses for Generation Y] thinks, even changing the way their brains are wired” (p. 10). In this statement, Tapscott echoed Prensky (2001a, 2001b) in suggesting actual physical change. Unfortunately, like Prensky (2001a, 2001b), Tapscott offered no discernible evidence for this latter statement. However, substantiation for this concept may be interpreted from the work of Kolb and Fantie (2009) and may be further inferred by studies in cognitive mapping (Hickey, 2011; Webb, 2011) and the even more recent fNIRS physical mapping of the brain (Chojak, 2019, 2020).

Prensky (2001a, 2001b) created a thematic stream amongst educators when he coined the phrase digital natives, in juxtaposition to digital immigrants, with the former being

those who were born into what Prensky (2001a) defined as the “digital age” (p. 1), while the latter, in effect, grew into this putative digital age later in life:

Digital Natives are used to receiving information really fast. They like to parallel process and multi-task. They prefer their graphics *before* their text rather than the opposite. They prefer random access (like hypertext). They function best when networked. They thrive on instant gratification and frequent rewards. They prefer games to “serious” work . . . But Digital Immigrants typically have very little appreciation for these new skills that the Natives have acquired and perfected through years of interaction and practice. These skills are almost totally foreign to the Immigrants, who themselves learned – and so choose to teach – slowly, step-by-step, one thing at a time, individually, and above all, seriously. (Prensky, 2001a, p. 2)

Herein lies the core of the ongoing debate—the root of which had grown into the analogous chorus of discord to that occurring in the divided fictional village of Anatevka (Bock & Harnick, 1990) and the stridency of which threatened to poison the well (Raja, 2007; Walton, 2006) and truncate a conversation of critical importance. There are those who acknowledge the possibility of this altered paradigm and those who reject the possibility, with some even arguing there was no need for further research in the area (Bennett & Maton, 2010; Bullen et al., 2011). One consequence of this strident debate is the paucity of timely literature.

For supporters of the construct of digital natives, this reliance upon and affinity for using digital media technologies becomes a foundational pillar in meeting the criteria for a generational cohort (i.e., Generation Y) as defined by Strauss and Howe (2007). See also Prensky, (2001a) and Tapscott, (2008). For Prensky, this meant a generation whose early applications of digital technology, like early applications of multiple languages, may lead to

considerably increased facility and fluency throughout the lifetime of the learner (Prensky, 2001b). For Tapscott (2008), this meant the suggested guidelines for establishing effective Generation Y learning environments should involve a transition:

Instead of focusing on the teacher, the education system should focus on the student.

Instead of lecturing, teachers should interact with students and help them discover for themselves. Instead of delivering a one-size-fits-all form of education, schools should customize the education to fit each child's individual way of learning. Instead of isolating students, the schools should encourage them to collaborate. (Tapscott, 2008, p. 122)

In providing these suggestions, Tapscott (2008) echoed the theories of Illich (1971), Mead (1958), and Piaget (1952), amongst other scholars and educators of the late 20th and early 21st centuries. Tapscott also is supported, more recently, by the work of Linne (2014) and Teo (2013, 2016) and seemingly now by Chojak (2019, 2020). In comparison, some scholars and researchers were, and some remain, less sanguine with the Prensky (2001a) construct of digital natives–digital immigrants.

Jones and Healing (2010) reported on a 2-year study that was conducted at the Open University, Milton Keynes, in the United Kingdom. The prime purpose was to determine whether or not learners now practise increased mobility in their selection of learning environments. The methodological approach was mixed methods that included three surveys and interviews with faculty and students. One of the purposes of this study also was to determine time of day related to learning. To facilitate this, 24 volunteers in first-year courses as well as those who agreed to participate in the follow-up study as second-year students, received text messages at random times and were asked to record with video cameras, and/or

with notes, their activity at the time the messages arrived. The data for this study were apparently thorough and complete, but it should be noted that specific ages were not supplied for the participants (who are identified merely as “Net Gen” or “Older” students). When the data were compared to a similar study conducted in 2002, Jones and Healing found differences in behaviour—both in location of the recorded learning activity and in the time-of-day learning was reported. However, these differences were described as insufficient to conclude that students born after 1983 were more mobile than older students in their perspective on learning. It should be noted that no quantification of the “variations” (Jones & Healing, 2010, p. 374) between 2002 and the more recent 2010 study were supplied, nor were any estimates provided for what variations might have been considered sufficiently significant in this context to constitute mobility in student learning from the perspective of the authors. What can be said is Jones and Healing’s study showed some trend toward differences of apparent import in learning preferences and these trends were noted in learners over 18 or 19 years of age.

Wood et al. (2010) published the results of a study conducted at the University of South Australia. The specific study in question was designed to examine the potential for virtual learning environments in enhancing student engagement, lifelong learning, and employability (Wood et al., 2010). Wood et al. offered a survey to all students, both undergraduate and graduate, and 812 students responded. Although the largest number of participating subjects born in a single year (15.8%) were born in 1991, unfortunately, no breakout of data were provided specific to this age grouping, except to indicate that subjects from this birth year were amongst the most active groupings in “practical uses” (Wood et al., 2010, p. 1114) and least active groupings in “asynchronous uses” (p. 1114). The definitions

for these terms are vague, however, which impacts how these data may be interpreted. Instead, Wood et al. placed the emphasis of analysis on the cohorts by the mean birth year for the respondents (i.e., 1984), and while the study did find differences between the age cohorts within these parameters, it should be noted that no quantification of the “differences” (p. 1109) between cohorts was supplied, nor was any estimate provided for what “differences” (p. 1113) might have been considered sufficiently significant in this context. Once again, Wood et al.’s study focused on Generation Y, with apparent trends that do show potential discrepancies from previous generations in characteristics that now seemingly have grown to be more significant in later and younger cohorts of learners.

Bullen et al. (2011) purported to refute the principles of Prensky (2001a), Tapscott (2008), and others in their study conducted at a postsecondary institution in BC, Canada, in 2009. The two parts of this study were intended to gain insight into both the formal and informal use of digital technology by a particular generation, and, in so doing, “to determine the extent to which students fit the typical net generation (i.e., Generation Y) profile” (Bullen et al., 2011, p. 6).

To facilitate their study, Bullen et al. (2011) synthesized from literature the following list of characteristics they argue are consistently attributed to Generation Y: digitally literate, connected, multitasking, preference for experiential learning, preference for group or teamwork, preference for images over text, need for structure in learning, social, community-minded and goal-oriented. This list appears to match Prensky’s (2001), description of the traits of digital natives (Prensky, 2001a), as outlined earlier. Therefore, this list serves well as a fundamental, bottom-step framework against which this doctoral study could develop and examine potential thematic areas considering the new data collected.

Bullen et al. (2011) conducted their study at a postsecondary institution in Western Canada offering 2-year diploma and bachelor's degree programs. From an institution enrolling approximately 43,000 students, 69 students were interviewed, and the results were used to create a survey provided to 438 students. The authors concluded, "One of the most significant findings of this study is that there is not a generational divide in the student body of this post-secondary institution" (Bullen et al., 2011, p. 17) and, "when compared according to the most commonly-cited net generation (i.e., Generation Y) characteristics, students born before and after 1982 are not significantly different" (Bullen et al., 2011, p. 17).

However, the authors of the report did acknowledge that the "difference between the two groups was statistically significant" (Bullen et al., 2011, p. 13) for four of 10 characteristics the authors cited as attributable to generational differences. The phrase "whether someone was net generation or not explained the 3.2% variance in how connected students felt to friends" (Bullen et al., 2011, p. 13) was followed by the phrase "whether someone was net generation or not explained the 2.0% variance about student multitasking" (p. 13) and, in turn, by the phrases "whether someone was net generation or not explained the 1.7% variance about students' preference to work in groups" (p. 14) and "whether someone was net generation or not explained the 2.0% variance about whether students enjoyed reading (less than images)" (p. 14). In other words, according to the data analysis conducted by these authors, Generation Y, as they defined it, produced statistically significant results in the analysis of the characteristics of connected, multitasking, preference for group or teamwork, and preference for images over text (Bullen et al., 2011).

While the differences were not large (i.e., the variances ranged from 1.7% for preference for group or teamwork to 3.2% for connected, with multitasking and preference for images over text at 2.0% each), Bullen et al. (2011) described these differences as statistically significant. Also, while these items represent a minority of the characteristics listed, numerically, these are four important areas in the potential design and pedagogy of education experiences, especially with the largest identified difference being that for connected. In the area of general communication, the authors did not find significant differences in the appeal of email but did find that those of the identified (i.e., Net Gen) age cohort preferred “synchronous communication options such as text messaging, phone and instant messaging” (Bullen et al., 2011, p. 15), and this was the highest effect size for generation found in the study. Combined with the preference for the characteristic of connected, while some will argue the evidence is not strong, it does provide some preliminary evidence that younger students do use digital media differently from previous generational cohorts. A difference confirmed in later studies (Linne, 2014; Teo, 2013, 2016).

Bullen et al.’s (2011) study is only one of numerous inquiries on this topic, emphasizing the cohort of Generation Y or Net Gen. While Bullen et al. concluded that the concept of Net Gen as digital natives has not been demonstrated in their study, their conclusions appeared to confuse the ongoing debate with respect to generational differences founded in the usage of digital media technology. Bullen et al. found characteristics where valid statistical differences exist, which they assigned in the specific phrase quoted above to generational differences (pp. 13–14). Moreover, the characteristics with these valid statistical differences appear to correlate with those outlined by Prensky (2001a) as primary descriptors for digital natives. This serves to demonstrate the complexity of the debate.

It should be noted that Bullen et al.'s (2011) study had a sample average of 24.2 years of age. Therefore, it is a cohort (i.e., Generation Y) already-in postsecondary institutions (Bullen et al., 2011). As with the research of Prensky (2001a), Tapscott (2008), and others, this doctoral study was designed to explore the possibility that Bullen et al. were in fact researching a generation of digital immigrants, albeit early adopters of net technologies, thus making the generational differences they did enumerate even more significant in that these characteristics proved to be the onset of a trend that now can be followed into the learners of a younger age cohort.

Several other studies of interest emerged during this research of the Net Gen as digital-natives literature. Bennett and Maton (2010) offered a literature review of 68 papers ranging in date from 1986 to 2010, with nearly 20% of them authored or coauthored by Bennett and Maton themselves. Bennett and Maton premised the paper on the principle that “recent research has shown flaws in the argument that there is an identifiable generation (of Digital Natives)” (p. 321). The compiled literature, therefore, reflected this premise, focusing, according to the authors, not on generational differences but rather on claims made about young people and their experiences with technology (Bennett & Maton, 2010). Amongst other conclusions drawn from the readings, the authors claimed, “Content creation activities are consistently lower than might be anticipated given many claims about what students are doing with technology” (Bennett & Maton, 2010, p. 324), while accessing information and communicating via the Internet and mobile technology are becoming frequent activities. These conclusions are posited, however, without reference to age cohorts beyond the generic Net Gen cohort construct and, therefore, without basis for comparison. Bennett and Maton did argue that “it is difficult to compare the findings about access

between school-aged children and university students on the basis of data currently available” (p. 323), but they also stated that certain studies into “technology based activities have begun to highlight significant differences across age” (p. 324). Bennett and Maton also echoed other studies (e.g., Reeves & Oh, 2007) in the suggestion that current studies focused on universities might be too limited in scope.

Bennett and Maton (2010), as part of their conclusion, suggested it is time to move beyond the concept of digital natives, despite the recognition of apparent differences across age spectrums in technology-based activities. Bennett and Maton’s paper did echo the threads of possible transition in technology proclivity, however, with the conclusion that Internet and mobile technology usage are becoming frequent, despite being founded in works directed toward the older age group (i.e., NetGen). Therefore, like Bullen et al. (2011), Bennett and Maton appeared to confuse the debate they suggested should be ended.

Hargittai (2010) published one of the potentially most promising early studies. Conducted in 2007, Hargittai surveyed first-year university students at a public college in the United States with a large sample size of respondents (1,060 students) that was diverse in gender and background, with 97% of the respondents either 18 or 19 years of age. The survey investigated computer access by gender, socioeconomic grouping, and parental education. The results indicated that some usage differences can be found specific to this younger age cohort but little evidence is available in the published document from which to formalize this conclusion. Given that the focus of the Hargittai’s study was on demographic differences in technology usage, the author’s primary analysis suggested instead that gender and socioeconomic or racial equity variables as these factors relate to access will require continued attention, even amongst learners in this age (i.e., Generation Y) cohort.

A more salient element of Hargittai's (2010) paper for the purpose of this doctoral study is the computer background data. The results of Hargittai's study showed, for students born in 1988 or 1989 (i.e., those 18 or 19 in the year of the study, 2007, and therefore ages 29 and 30 currently, in 2019), the mean number of years that they had used computers was only 6 to 7 years with males averaging 6.56 years, and females averaging 6.19 years. This would indicate that even later Generation Y cohort learners (i.e., those born several years after 1983) did not have access or use of computers and the Internet until age 12 or 13, some 6 years minimum beyond the preoperational stage identified by Piaget (1952). The Piaget preoperational stage being an age bracket inferred as the critical period for learning such applications by research into pediatric brain development (Kolb & Fantie, 2009) supported by the mapping studies (Hickey, 2011; Webb, 2011) and the more recent empirical fNIRS neuroscience studies (Chojak, 2019, 2020).

Recalling that Prensky's (2001a, 2001b) definition of a digital native refers to an age cohort (e.g., requiring congruence of proclivity and activity from a significant proportion of an age cohort), it is evident that any break point needed to represent critical mass for a generation of potentially digitally native would have to be later than 1990. Therefore, identified members of the Generation Y cohort, even the youngest members of this cohort, are digital immigrants rather than digital natives.

Emerging elements of the mosaic of Generation Z. Oblinger and Oblinger (2005) are cited both favourably and otherwise by authors and academics. The studies featured in their publication targeted cohorts at least 18 years of age or older prior to publication in 2005, making the lowest age group today, 2022, at least 35 years old.

One unique element in the Oblinger (2008) canon is the injunction against assuming that the proclivity for using digital media technology necessarily equates to proficiency in the use of these technologies, an analysis which opens the potential conversation that preference and proclivity may not automatically result in efficiency, and that learning may need to include how best to use the technologies in a learning context as well as the content of the proposed learning itself. This premise is based on one of the studies quoted in Oblinger and Oblinger (2005). This is a study for which the research methodology is outlined clearly, and the data are provided for examination. More than 4,000 students were surveyed, from 13 universities in five states in the United States (Oblinger & Oblinger, 2005). The authors also conducted follow-up interviews for clarification, with the data and analysis provided (Oblinger & Oblinger, 2005). The purpose of Oblinger and Oblinger's study was to discover what technologies students used and how the technologies influenced their undergraduate experience. The authors offered the following conclusions: "We expected to find that Net Generation students would demand greater use of technology in teaching and learning in the classroom. They did not. What we found was a moderate preference for technology" (Oblinger & Oblinger, 2005, p. 7.17), and while the researchers "expected students to already possess good IT [information technology] skills in support of learning. . . . What we found was that many necessary skills had to be learned at the college or university" (p. 7.17). However, despite these findings, "many students acknowledge that technology has improved learning" (Oblinger & Oblinger, 2005, p. 7.13).

The differentiation between proclivity and preference for technology usage as well as facility for effective usage of technology without training or refinement was not a prevalent theme in the early extant digital native literature—either from supporters or from those

skeptical of the construct. Given that younger or child language learners need to be facilitated and mentored in the appropriate application of the terms used in the languages they are learning, as do learners in every other discipline and area of study, this oversight seems substantive.

In this doctoral study, the emphasis was on proclivity and preference for digital media technology, inclusive of the need for training and design of such training. Both of which should be emphasized in future research.

Reeves and Oh (2007) reviewed the research and popular literature that examined the evidence, or lack of evidence, to substantiate the suggestion that instructional designers should accommodate generational differences. Some 21 papers and studies are reviewed, ranging in date from 1971 to 2006, with no papers authored or coauthored by Reeves and Oh themselves. The authors noted, “One of the most frustrating aspects of the research focused on . . . differences among the . . . generations is that for the most part it is based on small, highly selective surveys rather than national datasets” (Reeves & Oh, 2007, p. 300). Thus, Reeves and Oh raised quite reasonable concerns with respect to the narrow target grouping serving as the subject of many studies in the field of generational differences, echoing other studies in this respect (Bennett & Maton, 2010). Reeves and Oh argued that a narrow band of professional and university arts and sciences students have been studied too frequently, leaving gaps in researchers’ understanding of other career fields, socioeconomic groups, and international learners. Scholars in the field have also quoted studies exclusively targeting Generation Y.

Reeves and Oh (2007) concluded that instructional designers working with this age cohort (i.e., Generation Y) should be cognizant that what they described as “generalizations

based on weak survey research and the speculations of profit-oriented consultants should be treated with extreme caution in a research and development context” (p. 302). However, Reeves and Oh also concluded, “There may be merit in examining the preferences of today’s generation of college students and workers for instructional designs that utilize video games, instant messaging, podcasts, and other cutting-edge technologies in higher education and the workplace” (p. 302). Despite the generational cohort being examined, Reeves and Oh offered more support for the concept of differences that now seemingly have grown to the status of measurable and applicable.

The aforementioned studies, and a considerable number of others of similar emphasis, focused exclusively on learners older than 18 years of age (e.g., Bullen et al, 2011; Oblinger & Oblinger, 2005; van den Beemt, Akkerman, & Simons, 2010, 2011). Despite this age focus, while results tend to be mixed, at least a slight trend of inclinations for the application of digital media technology did emerge. This doctoral study was intended to explore the potential extension of this trend into the younger age cohort of Generation Z: the age parameters for which will be established as less than 18 years of age.

Researchers van den Beemt, Akkerman, and Simons (2010, 2011) have published two papers based on a comprehensive study conducted in the Netherlands, in 2008–2009. In one paper, these authors reported on a study involving a survey of 2,138 students between 9 and 23 years of age: “Rather than following the assumption of a distinct Net Generation, this study investigate[d] diversity in interactive media use among youth” (p. 419). The sample, therefore, evidently defined youth as up to 23 years of age in 2008–2009.

The purpose of van den Beemt et al.’s (2011) study was to determine what, if any, consistency of usage patterns for interactive technologies exists amongst these students. The

study sampled across a range of schools, from primary education to postsecondary education. It focused on “clusters of interactive media users” (van den Beemt et al., 2011, p. 421), “traditionalists, gamers, networkers, and producers” (p. 430), and tracked each cluster through four categories of usage, which were identified as “interacting” (p. 430), “performing” (p. 430), “interchanging” (p. 430), and “authoring” (p. 430).

Their data supported the conclusion that these four clusters and the four categories of activity are worthy topics for further research (van den Beemt et al., 2011). However, the authors offered no distinction between age cohorts within the sample, other than identifying the predetermined clusters (i.e., traditionalists, gamers, networkers, and producers) within these cohorts (i.e., school levels) and, therefore, no discernible evidence in this study supported the conclusion that “radically different patterns of knowledge creation and sharing” (van den Beemt et al., 2011, p. 113) are not occurring “for (students in) a wide range of educational levels” (p. 113). No evidence was provided that students in lower grades (i.e., 18 years of age and under) are not engaging in knowledge creation and/or would not engage given the facilities and facilitated encouragement.

In a second study, van den Beemt et al. (2010) outlined a qualitative study that extended the original quantitative study discussed above. The sample for this study was 11 Dutch students 14 to 15 years of age, all of whom were interviewed, presumably in 2008–2009, although no dates were disclosed for this study. The thread of clusters of users (i.e., traditionalists, gamers, networkers, and producers) continued, with at least one example of each cluster represented.

The authors’ conclusions varied (van den Beemt et al., 2010). Students credited friends and family with initiating their interest in specific media (van den Beemt et al., 2010),

and “all students develop a trial-and-error attitude in learning to use” (p. 432) specific forms of media. These authors suggested the results “imply reservations in the use in the application of interactive media as a learning tool” (van den Beemt et al., 2010, p. 431) in that “the students’ wish always to combine interactive media in class with books, assignments and explanations by teachers” (p. 431). Based on the information collected, van den Beemt et al. (2010) concluded young people are more interested in the Internet as a communication avenue than as a learning tool, but they also recognized that the study is limited in scope and argued further research with a greater number of older students was needed.

The second van den Beemt et al. (2010) study provided some possible guidance for structuring this doctoral study. However, the conclusions are vague and there is no reason to presume this age cohort (i.e., 14–15 years in 2008–2009) should not be subject to the injunction against confusing the proclivity to use digital media technology with proficiency in the use of these technologies (Oblinger, 2008) and assuming that critical skills will not have to be taught (Oblinger & Oblinger, 2005) at the appropriate level for the learners in question. The data collected were encouraging, but the demographic patterns underpinning this doctoral study suggest the grouping requiring further study was not those older in age but rather those younger in age. This latter age group (i.e., Generation Z) has not yet been studied adequately.

These studies, and a considerable number of others of similar emphasis, focus exclusively on learners older than 18 years of age by or before the year 2010. Despite this age focus, a trend of proclivities for the application of digital media technology appeared to emerge in many instances. Generation Y members are said to be more inclined toward instant

communications (Bullen et al., 2011), and more inclined to use the full range of applications on their smartphones, while more broad trends also emerged as certain studies into “technology based activities have begun to highlight significant differences across age” (Bennett & Maton, 2010, p. 324). These are a few examples. This doctoral study explored the potential extension of this apparent trend into the younger age cohort of Generation Z.

For the purposes of this study, it also is sufficient at this stage to recognize that generational age cohorts beyond those of the traditional mother-to-daughter procreation timelines have gained acceptance and usage in modern academic theory and publication. Some overlap and, therefore, some potential confusion with respect to where a particular age cohort ends and another begins is to be expected, whether the construct in use is the original concept of mother-to-daughter procreation timelines or the concept of social generations. The confusion created by the apparent initial misidentification of the digital natives cohort is less acceptable, but it does not detract from the existence of identifiable generational cohorts, nor did it detract from the seemingly successful attempt at the identification of, and the beginning efforts to study, the cohort which is potentially the genuine digitally native (i.e., Generation Z).

Generation Z invented: The “newest” learners. The operational definition for this study, as outlined in the glossary, described a generation to be characterized as an age cohort of specific parameters and social, historical, or demographic context. For practical purposes, this will entail a combination of demographic factors (e.g., birth rates and mother–daughter procreation intervals) and applying possible criteria from those outlined in the Strauss-Howe generational theory (Howe & Strauss, 2000).

The broad hypothetical rationale for this doctoral study was that increasing insight into Generation Z should assist educators in developing appropriate learning experiences and further developing learning experiences to better use the technological proclivities of Generation Z should encourage enhanced learning for this age cohort.

The term Generation Z has gained credibility as a recognized label for the latest generation of children in developed and highly developed nations (Mitchell, 2008; Posnick-Goodwin, 2010; Rosen, 2010a, 2010b). This selection of writers, representing the medical, teaching, and scholarly communities, were in agreement that Generation Z exists, and they accepted the term as a useful label. Mitchell (2008), a medical professional speaking to a medical audience, described Generation Z simply as the “yet to be examined extension of Aunty Y” (p. 663). Mitchell’s comments are theoretical, without published study foundations, but it is important that he chose to distinguish this group of individuals as a discrete generational cohort while Posnick-Goodwin (2010), an educator, augmented the construct by providing a list of descriptors, including that members of this generation prefer (a) to text rather than talk; (b) to communicate online—often with “friends” they have never met; (c) computers to books; and (d) instant results.

Posnick-Goodwin (2010) also theorized that Generation Z members are unable to conceive of a world without cell phones, spend little or no time outside unless guided firmly to do so, and are growing up quickly, having never known surroundings without digital media technology or terrorism such as Columbine. This author also provided a list and a link to the traits and inclinations seeming to begin to develop in Generation Y and, as a result, a bridge to what became more evident during this doctoral study of Generation Z (Posnick-Goodwin, 2010).

The alternate labels for this cohort include iGeneration, Internet generation, homeland generation, and quiet generation (Rosen, 2010a, 2010b). These latter labels fit both with the Posnick-Goodwin (2010) outline, and with the descriptors attached to these labels. These labels were considered important in developing strategies for marketing to this cohort, employing this cohort, and, to some extent, organizing the future postsecondary education of this cohort (Center for Generational Studies, 2011). The organization of the latter (i.e., postsecondary education) is evidently being perceived as a combination of marketing, to attract youth to specific postsecondary institutions and employment, in the sense that postsecondary education and training is now deemed essential to maintaining a labour force capable of continuing the economic dominance (Smith, 2001) needed to continue to qualify as developed and highly advanced nations (OECD, 2006).

The difficulty in this diversity of labels founded primarily in marketing is now historically evident in some of the alternate labels for Generation Y (i.e., Millennials and Gen M), implying that the cohort extends into the new century. A similar absence of precision is implicit in the label iGeneration, based in the Generation Z cohort's theoretical rapport for iPhones, iPods, and iPads (Rosen, 2010a, 2010b). While the latter generalization is not accurate ("The Digital Landscape," 2011) and, therefore, caution is recommended in accepting specific labels for identified generations, skepticism with respect to accepting the existence of age cohort groupings should not necessarily be predicated on this foundation.

Rosen (2007, 2010a, 2010b) argues for the concept of generational differences in technology usage and in the process updates and refines facets of the Strauss-Howe construct of generations (Straus & Howe, 1991). Amongst other elements of his work of significance to this doctoral study, Rosen (2010a, 2010b) suggested rapid changes in technology are

shortening the duration of generational cohorts by creating the equivalent of the shared experiences based on their exposure to digital media innovations (e.g., text messaging). His argument is that specific technology applications used by significant proportions of a particular age grouping leads members of specific cohorts to identify themselves as part of the same generation (Rosen, 2010a, 2010b). This assertion paralleled the conceptual framework of Howe and Strauss (2000) with respect to the established criteria for an age cohort or generational grouping and reaffirmed the suggestion that access to digital media technology is one element in determining the onset and span of a generational cohort. Rosen (2007, 2010a, 2010b) further suggested, based on interviews with over 2,000 Generation Z (i.e., K–12) learners and their parents, that for this cohort digital media technology has become invisible, seamless, and heavily used (Rosen, 2007). Rosen’s (2007, 2010a, 2010b) position is supported by Figure 1, presented in Chapter 1, and represented in Figure 2.

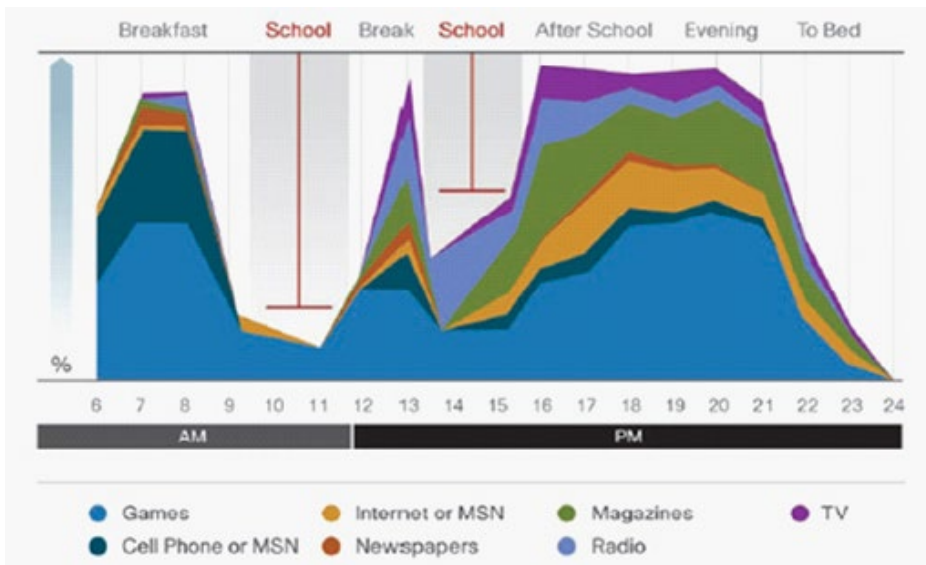


Figure 2. Media consumption by percent and time.

Note. From *A Vision for 21st Century Education* (p. 25), by Government of British Columbia, Premier’s Technology Council, 2010, Victoria, Canada: Queen’s Printer. Copyright 2010 by the Premier’s Technology Council. Permission pending.

Figure 2 emphasizes the hours of digital media technology usage in the context of the traditional school day: providing clear evidence that learners enrolled in school use this technology sufficiently for it to show clearly in the context of overall societal usage patterns (Government of BC, Premier's Technology Council, 2010). Rosen (2010a, 2010b), like Mitchell (2008) and Posnick-Goodwin, (2010) asserted the existence and growing importance of Generation Z.

One starting point in refining a more discriminating description for Generation Z proved to be the following list of characteristics, which Bullen et al. (2011) identified from literature pertaining to an earlier generation (i.e., the Net Gen, or Generation Y): digitally literate, connected, multitasking, preference for experiential learning, preference for group or teamwork, preference for images over text, need for structure in learning, social, community minded, and goal oriented.

This list of characteristics does correspond to the descriptors from Prensky (2001a), Posnick-Goodwin (2010), Rosen (2007, 2010a, 2010b), and others, and when applied to Generation Y subjects by Bullen et al. (2011) did produce statistically significant differences in the following areas: connected, multitasking, preference for group or teamwork, and preference for images over text.

These are areas of difference which the authors themselves attributed to generational differences (Bullen et al., 2011), areas in which Posnick-Goodwin (2010) and Rosen (2007, 2010a, 2010b) suggested are amongst those prominent in the attributes of the at the time too little studied Generation Z (Mitchell, 2008), and areas which are of considerable importance in the design of educational experience and pedagogy.

Generation Z located: Distinguishing these “newest” learners. Generation Z would seem to exist. The title of Generation Z has acknowledged supporters and it appears the cohort might demonstrate the specific traits and attributes needed for the grouping to be definable as a unique generation. To better explore and understand these traits, and begin to determine their applicability, it is necessary to distinguish Generation Z learners from their precursors (i.e., Generation Y).

Figure 3 is constructed specifically to establish the apparent cultural and technological context for Generation Z. To achieve this, drawing on sources frequently cited and acknowledged for accuracy (Abbate, 1999; Zakon, 2010), it emphasizes only those dates significant for clarifying the development and availability of what would become known as the Internet and other relevant digital media, emphasizing the criteria that observers posit to be significant (Mitchell, 2008; Posnick-Goodwin, 2010; Rosen, 2010a, 2010b).

The history of the Internet tends to be vague for the most part, with some debate over precise dates. The craving for credit around specific developments, always a competitive human activity accompanying successful innovations such as the Internet, leads to variations in precise details from account to account. Further complicating this particular topic are the influences exercised by the military and intelligence groups initially responsible for the creation of the framework for the Internet, in a time of acknowledged Cold War. These are organizations for which vested interest may lead to some distortion of available information. That said, the account here and the timeline presented in Figure 3 are based on public sources without apparent interest beyond the dissemination of as accurate information as possible (Abbate, 1999; Zakon, 2010), and both the figure and the analysis in this section are kept as

focused as possible to the identification of the specific generational age cohorts of Generations Y and Z.

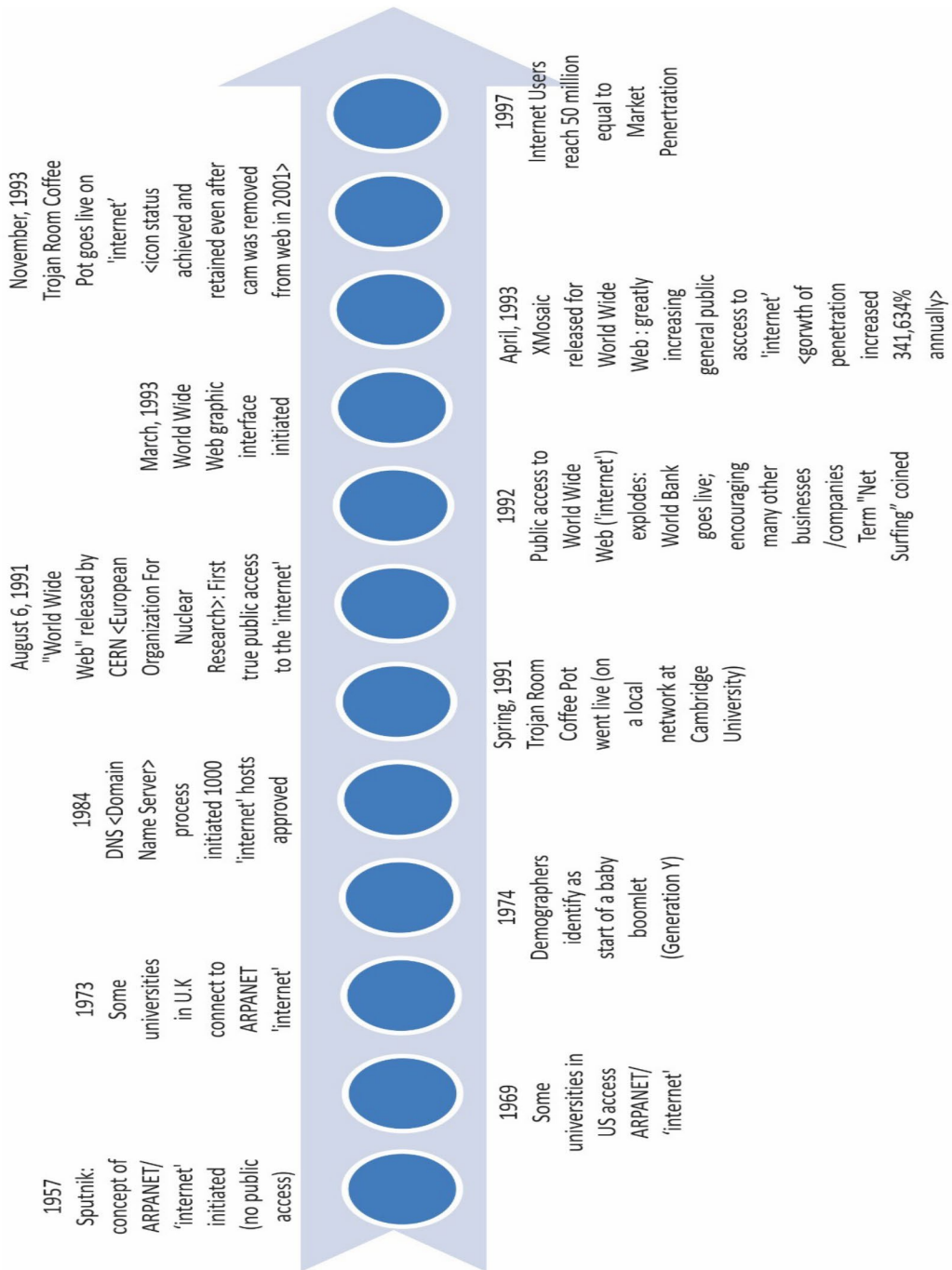


Figure 3. Timeline for Internet/world wide web development and related demographic events.

The launch of Sputnik by the Soviet Union proved the initiation point for numerous projects of a scientific/defense nature (Abbate, 1999; Zakon, 2010). The Advanced Research Projects Agency (ARPA) was formed within the United States Department of Defense and ARPANET (Zakon, 2010), the precursor of what was to become known as the Internet, was established to facilitate information sharing within ARPA. Remembering that by its very nature and purpose, therefore, it would be unwise to place overt faith in the precise dates and other details made available with respect to this obviously secret organization (i.e., ARPA), even after the fact, it appears that ARPANET expanded beyond the military command structure to include academics at several United States universities in 1969 and expanded again to include academics at selected universities in the United Kingdom in 1973 (Zakon, 2010).

While these developments show that technical progress was being made, to allow the augmentations to occur, the operations and content of the ARPANET remained secret for several more decades.

Figure 4 extends the basic timeline of Figure 3, with a focus on a potential Generation Y cohort with an onset year of 1974. Figure 4 provides key dates associated with a Generation Y cohort with an onset year of 1974, which was the first year of the slow onset of a now recognized baby boomlet—the initial births of the children of the baby boomers (i.e., post-World-War-II children)—throughout the recognized developed nations (Information Please Database, 2007; Statistics Canada, 2019a).

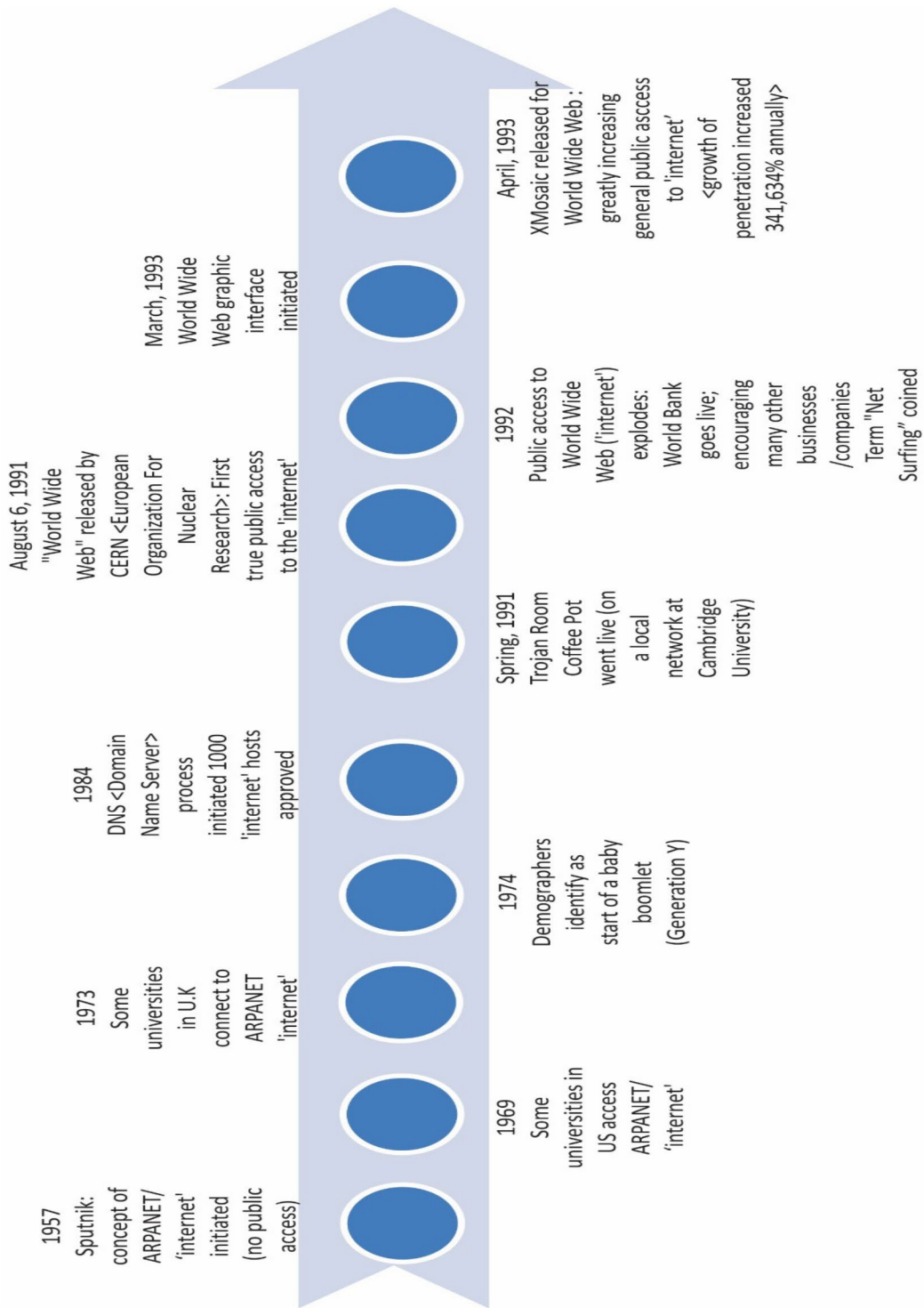


Figure 4. Timeline for Internet/World Wide Web and related demographic events for cohort with onset year of 1974.

The timeline in Figure 4 indicates that the ARPANET, as a secret defence and scientific entity for sharing projects, did not begin transforming into what is commonly referred to as the Internet until 1984, when the first few domain hosts were granted for public access. This initial access was limited and continued to be so until Conseil Européen pour la Recherche Nucléaire (CERN; i.e., the European Organization of Nuclear Research), located in Switzerland, launched the “WorldWideWeb” (Berners-Lee, 1990, para. 1) in 1990 (Abbate, 1999; Zakon, 2010).

Figure 4 demonstrates that children born to a cohort starting in 1974 would be a minimum of age 10 years before access to the Internet would be feasible for any of them through the initial limited domain hosts. They would be 16 years of age before the WorldWideWeb was initiated, age 18 years before the WorldWideWeb was available for public access, and age 19 before any reasonable graphic capability was introduced to the Internet. The latter “preference for graphics over text” (Prensky, 2001a, pp. 1–2) is one characteristic assigned as a generational difference by Prensky (2001a), Tapscott (2008), Bullen et al. (2011), and now by this doctoral study. It should be noted that, in this instance, the development of desktop and portable microcomputers, which followed soon after by the access to graphics, is greatly enhanced by the new availability of the Internet, allowing 50 million people simultaneous graphic capability, in 1997, for example, as opposed to the limited availability previously accessible through standalone computers, small computer networks, and/or hardcopy prints. It is this increased accessibility across now very large numbers of individuals, potentially simultaneously, that appears to encourage the cohort to “share a location in History” (Strauss & Howe, 2017, p. 44) and to “exhibit distinct beliefs and behavior patterns” (p. 44) across a critical mass of this particular cohort.

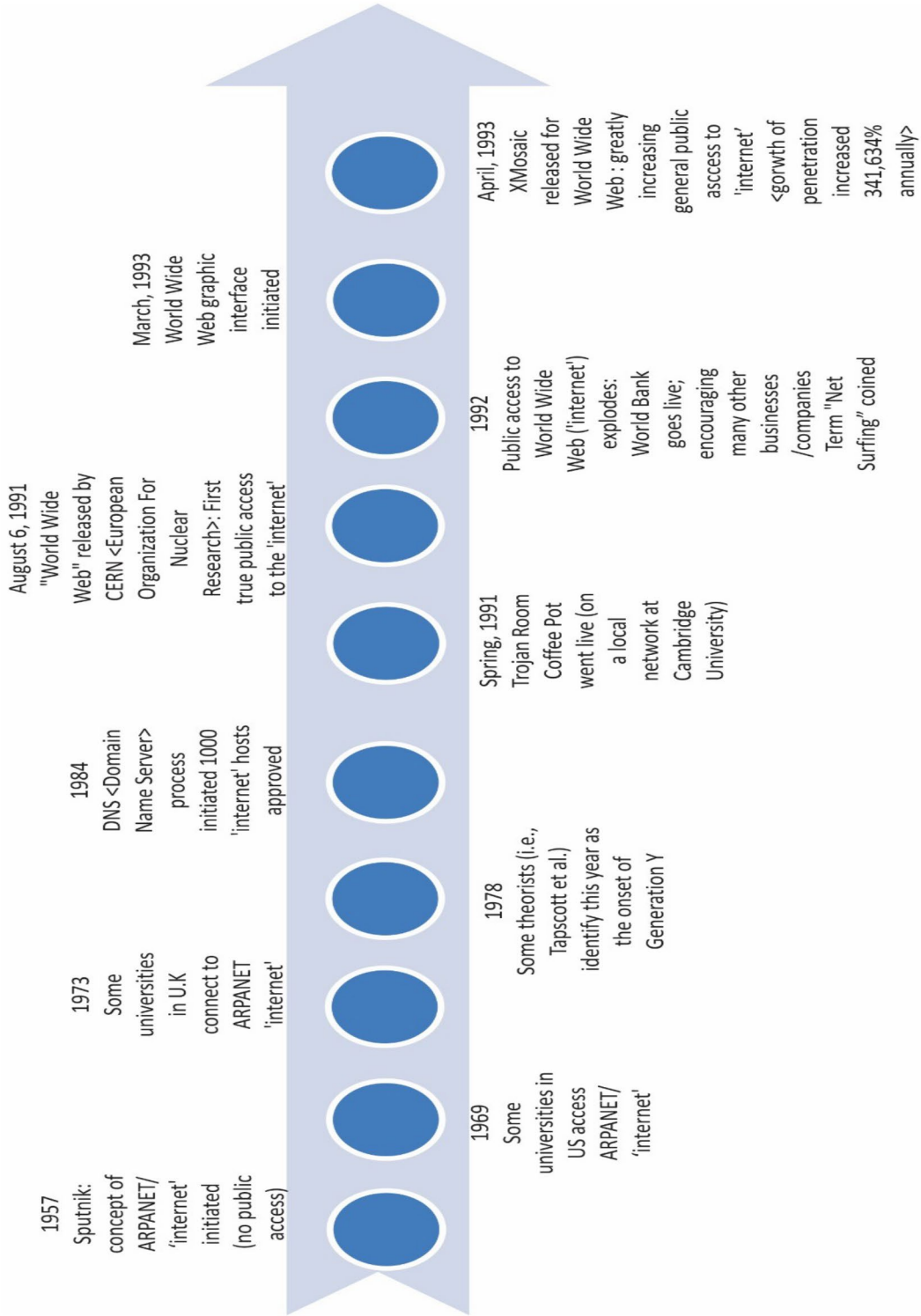


Figure 5. Timeline for Internet and WorldWideWeb for cohort with onset year of 1978.

One group of generational theorists, Tapscott (2008) being the most prominent, argued the onset date for Generation Y to be 1978. Figure 5 provides a graphic timeline of the major incidents related to technology for a cohort with the onset date of 1978. This figure presents a graphic timeline of the major incidents related to technology for a proposed cohort with the onset date of 1978.

The timeline also indicates that, although Internet usage increased in 1992, there was no graphic capability until March 1993, and no practicable access to this graphic capability until April 1993. In that Generation Y does demonstrate a graphic bias over text to a statistically significant extent (Bullen et al., 2011), these dates would seem important.

Figure 5 demonstrates that children born to a cohort starting in 1978 would be a minimum of age 6 years before access to the Internet would be feasible for any of them. They would be age 13 years before the WorldWideWeb was initiated, age 14 years before the WorldWideWeb was available for public access, and age 15 years before any reasonable graphic capability was introduced to the Internet. The latter “preference for graphics over text” (Prensky, 2001a, pp. 1–2) was one characteristic assigned as a generational difference by Prensky (2001a) and Tapscott (2008), and now is strongly indicated by this doctoral study, while Bullen et al. (2011) preferred the terminology “images over text” (p. 9).

The idea of a cohort of digital natives realistically accessing technology of the type in which they are credited to be proficient no earlier than age 13 years, at best, and most probably not until 14 or 15 years of age, seems impractical. Moreover, there are no known technological or demographic markers for this date selection with 1978 birth rates throughout the developed nations showing no discernible variance from the years either preceding or following (Information Please Database, 2007).

Another group of generational theorists, including Howe and Strauss (2000) and Bullen et al. (2011), argued that the onset date for Generation Y is 1982 or 1983. Figure 6 provides a graphic timeline of the major incidents related to technology for a cohort with the onset date of 1982.

Figure 6 presents the major incidents related to technology for a cohort with the onset date of 1982. The timeline also indicates that although Internet usage growth increased in 1992, there was no graphic capability until March 1993, and no practicable access to this graphic capability until April 1993. As Generation Y do demonstrate a graphic bias over text to a statistically significant extent (Bullen et al., 2011), these dates are important.

The timeline further indicates that Internet usage in 1997 had been established in 50 million households in the developed world. The number of households is a significant figure in that it is commonly accepted threshold for what is defined as “market penetration” (“Market Penetration,” n.d., para. 1) for a product or service (see also Internet World Stats, 2011).

Figure 6 demonstrates that children born to a cohort starting in 1982 might have access to the Internet from the age of 2 years. However, they would be 9 years of age before the WorldWideWeb was initiated, age 10 years before the WorldWideWeb was available for public access, and age 11 years before any reasonable graphic capability was introduced to the Internet. They would be 15 years when market penetration of Internet usage was achieved.

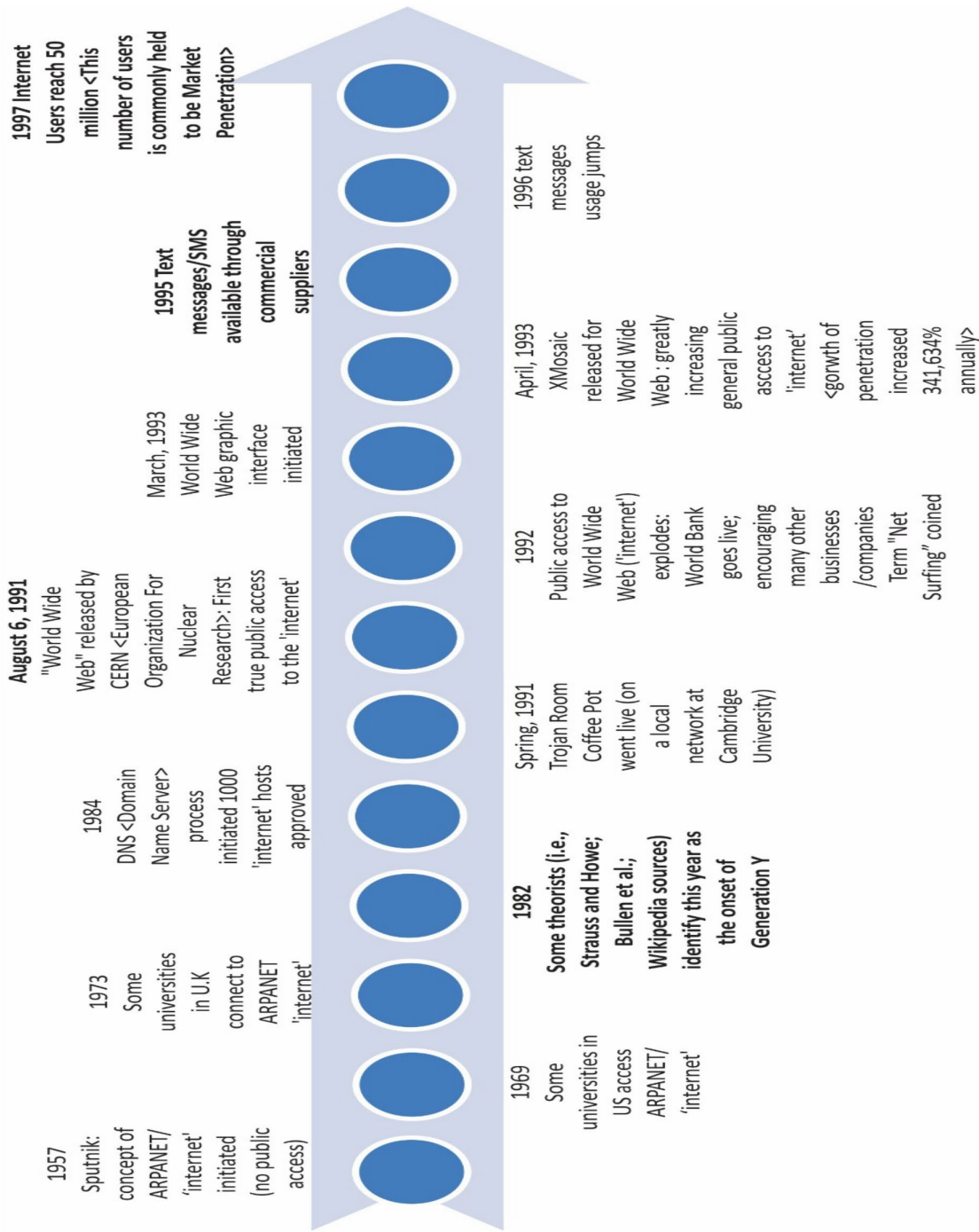


Figure 6. Timeline for Internet/World Wide Web for Cohort with Onset Year of 1982.

An additional factor applicable for this age cohort is apparent predilection for SMS-text messaging. Although the first text messages were sent in December 1992 (Veliadj-

Ostrosi, 2012), no commercial service for text messaging existed until 1995 and text messaging did not become an activity recognizable as common practice prior to 1996 (Deino, 2015; Veliaj-Ostrosi, 2012). A cohort born in 1982, therefore, would have only limited access to text messaging until age 13 or 14 years, and a cohort born in 1983 would have only limited access to text messaging until age 12 or 13 years.

The idea of a cohort of digital natives realistically accessing technology of the type in which they are credited to be proficient no earlier than age 9 or 10 years, at best, and most probably not until they are between the ages of 11 and 15 years, seems impractical. Moreover, there are no demographic markers for this date selection of 1982, as the 1982 birth rate shows no discernible increase from the preceding year (Information Please Database, 2007; Statistics Canada, 2019a) and there are no known technological developments of particular note.

Sufficient online exposure levels to constitute a transition point for an age cohort is unlikely to have been achieved prior to the WorldWideWeb (i.e., the “public” affiliate of the Internet) being released by CERN, the European Organization of Nuclear Research, in 1991 (Zakon, 2010). Conclusive evidence for access in sufficient numbers to constitute this transition point seems only to emerge in 1997 when the 50 million users prescribed to represent the construct of market penetration for any product or service is achieved (Internet World Stats, 2011; Rosen, 2010a, 2010b).

The apparent overlap between previous generations (i.e., the silent generation and the baby boomers, created by the divergent end dates and demographics of World War II) suggests that precise discrimination by date for specific generations may not be possible and that some overlap is common, between generations, making the definitions of generational

cohorts a complex undertaking. Moreover, the traditional anthropological definition of mother-to-daughter procreation interval, generally perceived as 15 to 20 years, tends to be applied with a major event as the onset or closing year of generational cohorts. The millennial (i.e., year 2001) would seem a reasonable watershed for such a process, when applied in the traditional context of history. In this instance, however, the process is occurring while the advocates for a specific identifiable cohort are extant to profit from the calculations and their theories have led to skepticism with potentially counterproductive consequences.

Theorists, commentators, and academics have argued the onset dates for this generation (i.e., Generation Y), which span almost a decade. This seems a substantial discrepancy for the onset of any generation, especially as 3 to 5 years in this context is considered the norm by demographers (Kick, 2005). There appears to be no discernible rationale for the selection of either 1978 or 1982 for the onset date of Generation Y. There are no technology advancements of particular note during or bracketing either of these years. There are no social or political occurrences of particular note in the recognized developed nations where the effects would be an immediate transition of significance. Moreover, there is no discernible justification for extending the parameters of the span of Generation Y to the year 2001 because the baby boomlet birth rate crests in 1992 for every recognized developed nation including the United States (Information Please Database, 2007), and birth rates are in significant decline for most developed nations by 1994 (Information Please Database, 2007; Statistics Canada, 2019a). Therefore, no coherent argument—cultural, social, or technological—currently exists for extending the end date for Generation Y beyond the mid-1990s. The extension of span for the cohort of Generation Y might be perceived as purely

self-serving (i.e., to utilize the marketing generated labels of millennials and Gen M) in order to be able to market books and materials by delineating this cohort as graduating high school in the year 2000 (Howe & Strauss, 2000).

There will be some Generation Y members with early-age access to the digital media because there will be some members of the age cohort in the latter years of the grouping, and, of course, in the overlap (i.e., cusp) interval, between Generation Y and the onset of Generation Z. However, Generation Y, as a cohort, appears not to have had sufficient access to digital media technology early enough to meet the criteria needed to be classified under the initial Prensky (2001a) descriptor of digital natives. They do not have access to the recognized digital media technology during the Piaget (1952) preoperational stage (i.e., prior to age 7 years).

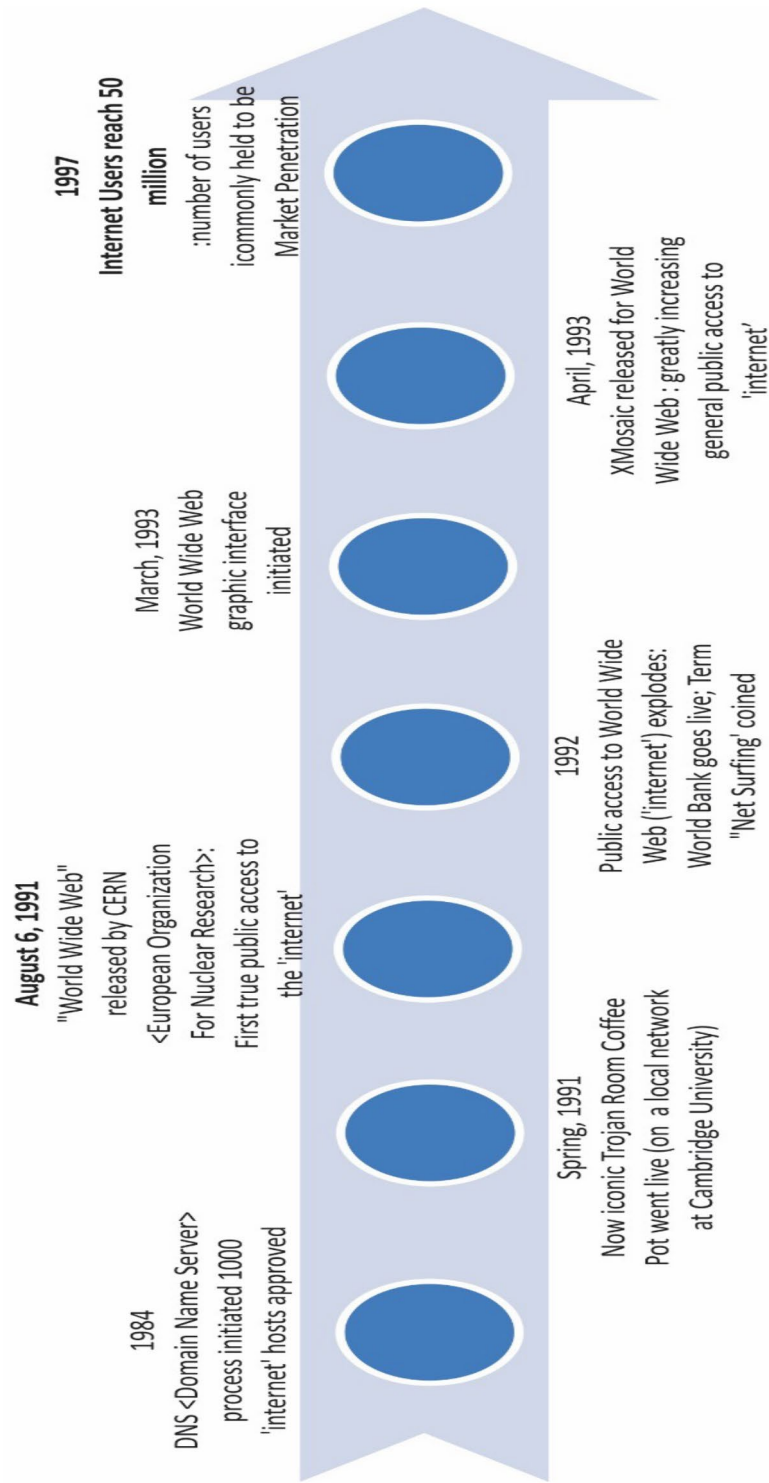


Figure 7. Timeline for Internet/World Wide Web developments related to Generation Z characteristics.

By comparison, students who do have access when in this learning stage are not sufficiently old to have reached the average age of the research studies (i.e., 24.2 years old) in 2008 (Bullen et al., 2011) being conducted at postsecondary institutions. By comparison, Figure 7 is intended to assist in being as precise as possible in beginning the process of identifying Generation Z.

The major defining characteristic of Generation Z appears to be their cohort-consistent comfort with digital technologies (Posnick-Goodwin, 2010; Rosen, 2010a, 2010b), as seemingly confirmed by this doctoral study. As outlined in Figure 7, the access to sources needed to develop these comfort levels and skill sets were available from 1991 onwards, when the release of the WorldWideWeb by CERN opened access to the Internet to the public (Zakon, 2010). The user population for the Internet increased, almost immediately, and certainly increased throughout 1992, the year when the activity on the new Web became sufficiently popular for the phrase “net surfing” (Zakon, 2010, 1992 section, para. 8) to be coined.

Another strong characteristic assigned to Generation Z is the cohort’s emphasis on visual media (Rosen, 2010a, 2010b), as seemingly confirmed by this doctoral study. The timeline depicted in Figure 7 shows that a graphic interface was added to the WorldWideWeb early in 1993, roughly the same time as a new operating system (i.e., “X/Mosaic”) further extended access and encouraged yet another increase in the number of new users on the Web (Zakon, 2010). Figure 8 is intended to further illustrate timeline sequences for developments of potential significance in defining the onset of Generation Z.

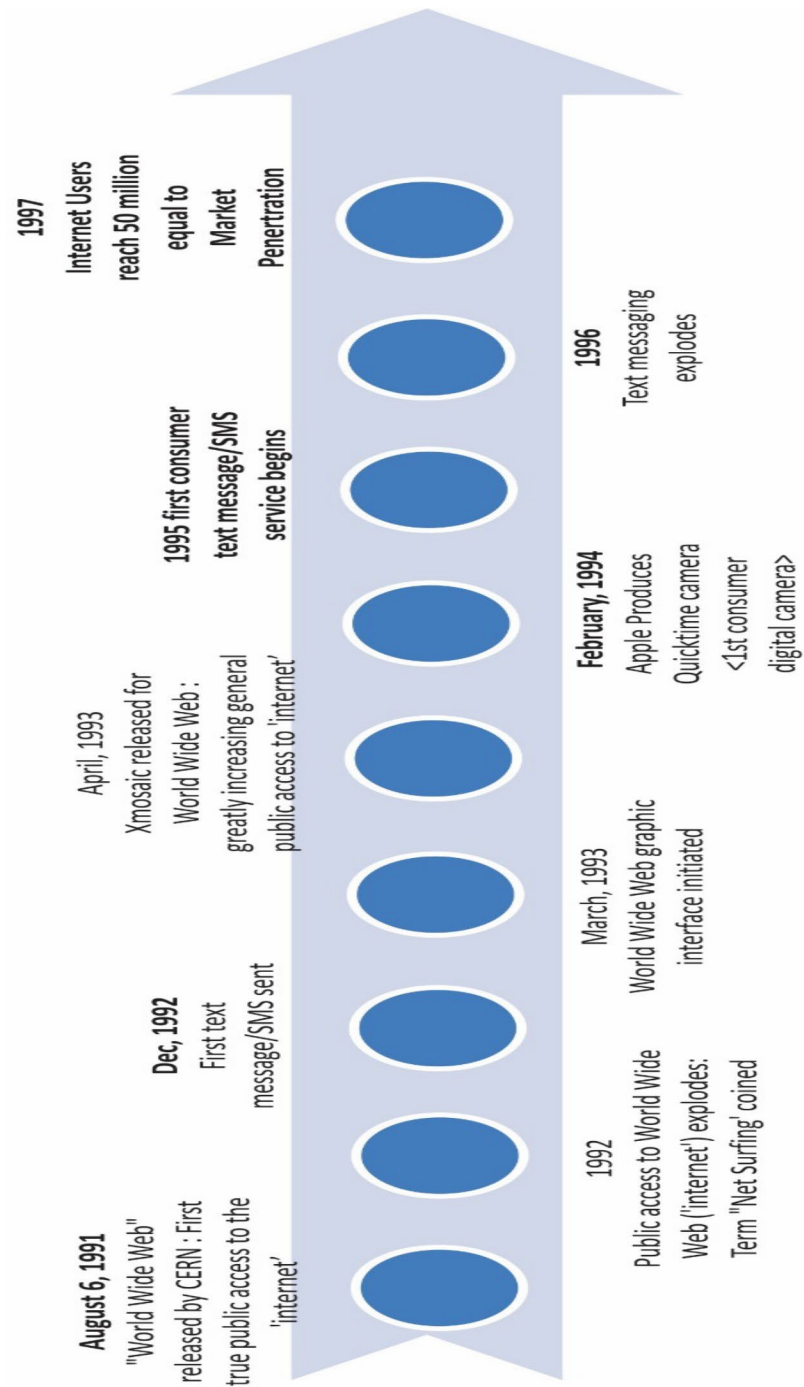


Figure 8. Timeline [enhanced] for Internet/World Wide Web developments related to Generation Z characteristics.

Rosen (2010a, 2010b) as well as this doctoral study argue that members of Generation Z hold text messaging or short message service (SMS) to be implicitly superior to

email messaging. With the advent of SMS-text messaging in 1993 onwards (Veliaj-Ostrosi, 2012), the first commercial service starting in 1995 and usage growing rapidly over the next year to become accepted practice with substantial numbers of users in 1996 (Deino, 2015; Veliaj-Ostrosi, 2012).

As noted in Figure 8, it is reasonable to suggest that several of the elements needed for the development of the early onset skills, aptitudes, and knowledge seen to characterize the proclivities overall of Generation Z had become available before the end of 1993. By this time, the Internet was becoming more accessible to the public, complete with the graphic capability perceived to be preferred to text-based materials by Generation Z (Posnick-Goodwin, 2010; Rosen, 2010a, 2010b) and with home digital creation of images (i.e., photographs, etc.) becoming available early the following year, 1994. Text messaging, or SMS, also became readily available in 1995 and grew rapidly in popularity to the point of being arguably perceived as common practice by 1996. Keeping in mind that some overlap and/or discrepancy between the concluding and onset dates of successive generations is common, it appeared that Generation Z entered the cusp period as an entity as early as 1993, and certainly by 1995, and is established firmly prior to 1997; the acknowledged date for Internet market penetration into the homes and lives of people in recognized developed nations (Zakon, 2010). Additional support for this time interval as the onset for a new generational cohort grouping appears in the demographic evidence that the baby boomlet of the mid-1970s appears to crest and begins to recede, across the spectrum of developed nations, between 1992 and 1994 (Information Please Database, 2007; Statistics Canada, 2019a).

Prensky (2001a) argued that digital natives are those with the access to develop such skills as early as possible in life, thus avoiding the need to translate these skills through an additional lens, which results too often in their teachers' inability to master "accents" (Prensky, 2001a, p. 2) and to move beyond their "outdated language" (p. 2). Experts in multilinguistic learning support this concept (Harley, 1986, 1998; Krashen, Scarcella, & Long, 1982). The primary stage needed for this access, in the form described, is Piaget's (1952) preoperational stage and, therefore, between the chronological ages of 2 and 6 years of age (Kolb & Fantie, 2009; Kulman, 2014; Piaget, 1952), further substantiating the dates for onset for Generation Z as being in the range outlined above (i.e., 1993 to 1997).

Further refinement of the onset date for Generation Z may emerge from a more intensive future analysis of this cohort's perception of its "age location in history" (Strauss & Howe, 2007, p. 45), as defined by events of significance to the individuals within the generational grouping. What can be said is that as of 2013, the date of the formal start of this study, the oldest members of Generation Z were between the ages of 14 and 18 years of age. This age range places the eldest individual members of Generation Z in secondary school and starting to enrol in undergraduate classes over the next few years as the transition to technology-mediated experiences are projected to continue to increase (Ambient Insight Research, 2010, 2015; Carbol, 2009). It also identifies the presumptive Generation Z as a cohort too young to have been studied to date, either by Prensky (2001a) and his followers, or by any of the academics and scholars focusing their studies on cohorts already enrolled in, or having completed, postsecondary studies.

It is with this apparent discrepancy in mind, and in the absence of literature and theory foundation attached to this new cohort, that this study undertook an initial exploration

in order to begin the process of understanding a generation of potentially significant influence (i.e., the digitally native cohort).

Non-Supporting Literature

Non-supporting literature, in this context, are sources supporting, or perceived to be supporting, individuals and/or groups skeptical of the Prensky's (2001a, 2001b) original construct of digital natives. A range of this particular strand of the literature is examined below.

Skeptics: Challenging digital media as a factor in cultural generations. A continuum of skepticism characterizes the response to the Prensky (2001a, 2001b) construct of digital natives. The following studies represent a cross-section of the studies critical of Prensky in terms of results, emphasis, and, in conclusion, revealingly, target age participants.

Jones and Healing (2010) argued there was limited evidence of changes in student practices in relation to the adoption of mobile technology and that students continued to use similar spaces for learning as did their predecessors of almost 10 years previously. As noted earlier, these authors did find differences in use patterns between those born after, as opposed to those born before, 1983, but they did not quantify these differences as significant (Jones & Healing, 2010).

Wood et al. (2010) argued that their findings challenged the assumption that so-called net gen students are a homogenous group. As noted earlier, Wood et al. argued that pre-existing skills in technology use are not substantiated by the research but that younger students (i.e., those born after 1984, the median age for the study) were already using digital technologies more than older students.

In their conclusion, Reeves and Oh (2007) applied phrases like “failing to meet the rigor of definition and measurement required” (p. 302) and “gross generalizations based on weak survey research and the speculations of profit-oriented consultants” (p. 302) declared generational differences to be nonexistent. However, as mentioned earlier, they distinguished between those born before and after 1970. They also suggested the narrow range of studies was potentially problematic.

These are examples of researchers skeptical of the Prensky (2001a, 2001b) construct of digital natives. What remained consistent were the age cohorts predominant in each of the studies, which are considerably older than those who participated in this doctoral study, and, it now appears, too old to have been introduced early enough to digital media to be digitally native.

Mixed results. A continuum of mixed results also characterizes the response to the Prensky (2001a, 2001b) construct of digital natives. The following paragraphs represent a cross-section of these studies.

Citing the work of Reeves and Oh (2007) and Jones and Healing (2010), Bullen et al. (2011) stated, “We did not find any evidence to support claims that digital literacy, connectedness, a need for immediacy, and a preference for experiential learning were characteristics of a particular generation of learners” (p. 18). As mentioned earlier, however, in their own analysis, these authors found generational differences statistically significant in several characteristics of pedagogical importance, including connectedness. These results were obtained, as in so many other studies, with participants much older than those now apparently identified as digitally native (i.e., Generation Z).

Bennett and Maton (2010) conducted a literature review and concurred with the skeptics in that “recent research has shown flaws in the argument that there is an identifiable generation (of Digital Natives)” (p. 321) but they stated also that certain studies into “technology based activities have begun to highlight significant differences across age” (p. 324). Moreover, Bennett and Maton did argue that “it is difficult to compare the findings about access between school-aged children and university students on the basis of data currently available” (p. 323) and they critique the studies to date for being too limited in scope.

Of considerable support to this doctoral study, Bennett and Maton (2010) recommended more qualitative research, in particular qualitative research to explore the sociological facet of generational digital technology proclivities, be conducted augment the surveys predominant in literature skeptical of the Prensky construct.

In publishing two papers, van den Beemt et al. (2010, 2011) undertook two inquiries, one quantitative and one qualitative, based on studies conducted in the Netherlands, in 2008–2009 (van den Beemt et al., 2011). The quantitative data from participants up to age 23 years in 2008–2009 indicate considerable enthusiasm for digital media applications, and while it does not supply overwhelming evidence of knowledge creation in different ages, it also does not distinguish data from participants now seemingly identified to be young enough to be digitally native. The qualitative study results show that students want to combine digital media in classroom settings with lessons and materials supplied by teachers but, again, no distinction in the age of participants is sufficient to see what trends or patterns might apply to participants in age cohort of the seeming digitally native. The focus of these studies was on

four identified clusters of digital media users, emphasizing activities primarily not related directly to education, which might account for mixed results.

Supportive to this doctoral study, van den Beemt et al. (2010, 2011) produced data emphasizing the enthusiasm of participants (i.e., at age 23 years and under) much younger than studies skeptical of the Prensky (2001a, 2001b) construct for digital media use. Moreover, the van den Beemt et al. (2010, 2011) focus provided latitude for this doctoral study to design qualitative processes of more direct application to both age cohort and education applications.

Barbour (2013) founded in his background as an encyclopaedist, compiling very useful compendiums of up-to-date distance education offerings, describes current educational technology research as “plagued with examples of teams of researchers” (p. 23) researching in areas “of more interest to the research team than the local staff, only to have the local staff at the school revert to more familiar practices” (p. 23) once the research team leaves. For the purpose of this doctoral study, this paper is useful in justifying the concluded need for more research at K–12 levels. However, it provides little assistance in the description and analysis of specific generational cohorts (i.e., Generation Z).

Beetham and Sharpe (2013) summarized, “Our digital native students may be able to use technologies, but that does not mean they can learn from them” (p. xvii). While the statement appears to provide support for the direction of this doctoral study, the age cohort referred to as digital native is not delineated. Moreover, that learning may need to include how best to use the technologies in a learning context as well as the content of the proposed learning itself (Oblinger, 2008) is not new, yet no apparent focus on this process, particular to generational cohort, emerges in the current Beetham and Sharpe edition.

Lieberman, Bates, and So (2009) provided some potential support for this doctoral study, especially when their paper summarizes two studies directly related to linguistic acquisition in younger children. However, the cited sources and studies included in the paper ranged from 1984 to 2007, with no information in context to delineate the actual age of the cohorts studied.

What is clear from these studies is threefold. First, there continues to be a paucity of research into the field emphasized in this doctoral study. Second, there needs to be increased research specific to the emphasis of this doctoral study. Third, there are indicators from existing research to suggest the trend (i.e., the onset of a digitally native generation) that this study traced through this literature review. What appears to make moot further debate on the proclivities and, indeed, the existence of a digitally native generation are the findings of Linne (2014) and Teo (2013, 2016), and the empirical fNIRS research of Chojak (2019, 2020) supported by Cipora et al. (2014), Gogolak (2013), Kostyrka-Allchorne et al. (2017), Takeuchi et al., (2015, 2016), Wobe (2013), as well the findings of this doctoral study (see Appendix B).

The Concept of Digitally Native: The Paradigm of These “Newest” Learners

The rationale for this doctoral study was that increasing insight into Generation Z should assist educators in developing appropriate learning experiences, and developing learning experiences to better use the technological proclivities of Generation Z should encourage enhanced learning for this age cohort.

Prensky (2001a, 2001b) created a thematic stream amongst educators when he coined the phrase digital natives, in juxtaposition to digital immigrants, the former being those who were born into the “digital age” (Prensky, 2001a, pp. 1–2) while the latter, in effect, grew

into the digital age later in life (Prensky, 2001b). As mentioned previously, Prensky (2001a, 2001b) did not publish his data and analysis. The implications of these distinctions, albeit theoretical, are important, however, because early applications of digital technology, like early applications of multiple languages, may lead to considerably increased facility and fluency throughout the lifetime of the learner. While Prensky (2001a, 2001b) may well be correct in his overall synthesis of the differences, and of the implications of these differences, the timeline condensed in this doctoral dissertation (i.e., Figures 2–7, inclusive) suggests strongly that he may well be incorrect to assign the label of digital natives to Generation Y (Prensky, 2001a, 2001b). Generation Y was nearing the end of its cohort term in 1993, when the critical elements of graphic versus text information were added to the Internet and when text messaging (i.e., SMS) for mobile devices was emerging as a practicable activity. Generation Y arguably had been replaced by Generation Z, by 1997, when Internet usage reached defined market penetration. Members of the Generation Y cohort did not seem to have access to the technology sufficiently early in age (Hargittai, 2010) and, therefore, in the learning cycles (i.e., during Piaget’s preoperational stage) needed for them to be digital natives (Piaget, 1952; Prensky, 2001a, 2001b). They were, it appears, by Prensky’s (2001a, 2001b) definition, digital immigrants—and this is a circumstance Prensky may well be attempting to address in a later work when he argues the “native” versus “immigrant” paradigm is less significant than the individual willingness to accept and adopt digital technology as a positive entity (Prensky, 2009). This latter construct, which he labeled digital homo sapiens, appears to be more readily supported by those skeptical of the original digital natives and digital immigrants concepts (Bullen et al., 2011) but it lacks the critical mass

effect pertinent to the transition documented, at least in part, by Linne (2014), confirmed by Teo (2013, 2016), and seemingly now also by Chojak (2019, 2020)

This doctoral study explored the possibility that both the latter work of Prensky (2010) and the works of those purporting to counter his initial construct (Prensky, 2001a, 2001b) are incorrect, given that the first true digital natives do exist. They are the digitally native cohort identifiable as Generation Z, the generational cohort most probably entering its span in the 1990s—apparently, more precisely, between the years 1993 and 1995, but almost certainly by the year 1997. Rosen (2010a, 2010b) noted, this generational cohort may well have a different paradigm, one that is supported by elements of the research from this doctoral study with respect to digital technology and its myriad applications than do the baby boomers, the age cohort known as Generation X, or, arguably, the older “Aunty” in-digital-relations (Mitchell, 2008), Generation Y. Generation Z is a cohort that seems to use technology at every possible opportunity, including seizing brief breaks in the regulated day of a traditional school and doing so in sufficient quantity to dominate entire community usage patterns, as Figure 1 in Chapter 1 depicts.

Skeptics conclude that the concepts of digital natives and nativeness have no validity. They argue simply that generation is not the issue (Bullen et al., 2011). This particular conclusion is drawn from data collected in an extensive research project conducted between 2006 and 2009, using subjects from a postsecondary institution in BC, Canada. The published mean age for this study was 24.2 years old and the study distribution charts for age show the significant preponderance of the subjects for this study were of an age consistent with Generation Y, and in some instances, the older grouping known as Generation X (Bullen et al., 2011). Studies similar to that conducted by Bullen and Qayyum (2014) argued

similar conclusions, but their sample for study also consists of these more mature-age cohorts (Jones & Healing, 2010; Wood et al., 2010).

It is possible to posit, with the evidence of the timelines of development and access to digital media technology that Generation Z: the possible true digital natives, in the previously defined sense, are currently age 20 years and younger. This age cohort is at least 14 years younger than the mean age of the subjects for the studies conducted by Bullen et al. (2011), and any studies conducted at postsecondary institutions early in this decade. Generation Z members have not been the subjects of these studies in significant numbers because they had not yet reached the postsecondary institutions where this research has been conducted. Therefore, the need to study Generation Z, given its position at the potential nexus for educational change, is important.

Opening, or more correctly reopening, the Prensky (2001a, 2001b) thematic paradigm surrounding digital natives/digital nativeness also will provide the opportunity to identify and redress some of the generalizations that critics have identified as implicit in a construct portraying an entire cohort-generation apparently acting unanimously (Bullen et al., 2011). Prensky's (2001a) construct creates a paradigm that other researchers have criticized for ignoring commonly accepted potential learning environment factors such as socioeconomic conditions, non-traditional family structures, birth order, gender, and ethnicity, (Bullen et al., 2011; Cameron et al., 2011).

Recently, Prensky (2010) created the construct of homo sapiens digital, which may well be applicable to the age cohorts of Generation Y and older. He can be credited also for arguing for the absolute necessity for wisdom because "technology alone will not replace intuition, good judgment, problem-solving abilities, and a clear moral compass" (Prensky,

2009, p. 1). Whether or not there are homo sapiens digital in the sense that Prensky described in the older cohorts was irrelevant to this doctoral study because (a) these individuals are not sufficient in number to represent a critical mass within any given cohort; (b) only in rare exceptional circumstances is their “accent” likely to be remediated effectively, making them equivalent to the genuine digital natives; and (c) in moving rapidly away from his own construct of digital natives, Prensky leaves a legacy of confusion in that there appears now to be, in fact, a generational age cohort for whom the modern technology, digital and otherwise, is quite literally a birthright; a generational cohort apparently sharing digital media technology usage as an element of their self-definition (Rosen, 2010a), and therefore as partial fulfillment of the patterns advocated for the identification of a generation by Howe and Strauss (2007). A generational cohort for whom the research needed to gain understanding has not yet been conducted in sufficient detail.

Prensky (2009) continued, perhaps alarmingly in some senses, to posit, “Given that the brain is now generally understood to be highly plastic, continually adapting to the input it receives, it is possible that the brains of those who interact with technology frequently will be restructured by that interaction” (p. 1). In this statement, Prensky echoed Tapscott’s (2008) as yet unsubstantiated claim that “growing up digital has had a profound impact on the way this net generation [i.e., Generation Y] thinks, even changing the way their brains are wired” (p. 10). These arguments have been gaining credibility from other, non-proprietary research being conducted in related fields (Government of BC, Premier’s Technology Council, 2010; Hickey, 2011; Webb, 2011) and supported by the empirical studies (Chojak, 2019, 2020). Specifically, there is research to suggest the brain function of cognitive mapping (Hickey, 2011; Webb, 2011), a facet of memory known to work in the world of hardcopy printed

documents is no longer assured in the world of digital print and text (Chojak, 2019; Hickey, 2011; Webb, 2011). As such, it is essential to recognize that although initially mislabelled, and misidentified, there is a generational cohort – Generation Z – who potentially will experience the advantages of early exposure to technology but who may also need to be monitored for signs of potential behaviour adaptations of a less positive, or, more precisely perhaps, of a less understood, nature (Chojak, 2019,2020; Hickey, 2011; Prensky, 2001a, 2001b; Rosen, 2010a; Tapscott, 2008; Webb, 2011).

There appears to be a congruence for this doctoral study in the arrival of Generation Z at the completion of secondary school and entry to the more easily researched postsecondary level, as the need to reassess current systemic models of education becomes evident, especially models that have been traditionally applied at the secondary school environments inhabited by these young-adult learners. The increase in demand for technology-mediated learning experiences correlates with this demographic development and the projections of greatly increased expenditure on technology-mediated materials, resources, and infrastructure are not coincidental (Carbol, 2009). It appears that the opportunity to implement the theories of Illich (1971), Mead (1958), and others is emerging, at a time when changing our learning and training structures is of vital importance for our economy and, therefore, for our culture (Smith, 2001). A statement substantiated further by the current (2020) COVID-19 enforced ‘pivot’ from face-to-face to virtual processes in so many vital areas, including all levels of education.

What is missing is timely research into the actual learning characteristics and preferences of Generation Z. There may be detailed studies with a focus on Generation Z, involving empirical research published for examination, but to date these studies have been

confined to Linne (2014), Teo (2013, 2016), the encyclopedic-style publications of Barbour and Labonte (2019), Chojak (2019, 2020) and this doctoral study.

Such a circumstance is not surprising. Generation Z is the newest and youngest generational cohort, and the effort to develop a research focus has been limited as well as controversial. It is vital to begin this process of delimiting, defining, and describing, and to do so carefully, with full cognizance of the complications created by errors of previous early studies and the resultant generalizations assigned incorrectly to previous generations (i.e., Generation Y in particular, also known as Millennials, Net Gens, etc.).

It is to this end, and with this cautionary perspective, that this qualitative case study was conducted. The purpose of the study being to begin to explore the skill sets, aptitudes, and potential of Generation Z: the latest generational cohort to dominate our education system, enter postsecondary institutions, and the first cohort for whom access to digital media technologies occurred during Piaget's (1952) preoperational stage of development.

Summary

As previously noted, the purpose of this study was to explore the proclivities, skills, aptitudes, and potential of Generation-Z learners, the latest generational cohort to enter our education system. In support of this objective, the researcher examined literature supporting the research themes, which included a review of Prensky's (2001a) framework, a definition of learning and education, Piaget's (1956) and other researchers' emerging developments in brain research, as well as an exploration of the context of technology-mediated learning.

Next, the researcher delved into defining the term generation and discussed digital media and cultural generations, emerging elements of the mosaic of generation Z, generation

Z invented (a discussion of the “newest” learners), and generation Z located (distinguishing these “newest” learners).

In examining non-supporting literature, the topics included skeptics—challenging digital media as a factor in cultural generations as well as studies that presented mixed results. Finally, the concept of digitally native was explored, examining the paradigm of these “newest” learners.

The next chapter examines the conceptual framework in the context of this qualitative case study. The chapter focuses on the constructivist approach chosen for the inquiry as well as the broad theoretical framework that offered insight into this case study.

Chapter 3: Conceptual Framework

Prensky (2001a) proposed the theoretical conceptual framework of digital natives in juxtaposition to the theoretical conceptual framework of digital immigrants. These frameworks were theoretical in that research reports substantiating the concepts were not published. Many researchers and scholars rejected Prensky's (2001a) premise in its entirety, sparking vehement conversation and distracting (e.g., Anatevka-style) debate.

Part of the impetus for this emphatic debate was Prensky's (2001a) contention that (a) younger generation learners were considerably different in their predilections and preferences, and therefore potentially in their functional processes, than the generations of their teachers; and (b) early exposure to digital media application would fundamentally and physically alter the structure of the brains of younger generation learners. The evidence and argument to reject these two fundamental facets of the Prensky's (2001a) construct dominated the initial literature (i.e., those studies published pre-2010, and through much of this past decade).

This researcher is constructivist and experienced in learning acquisition processes through direct formal education interactions with approximately 25,000 learners across a significant range in ages and spanning a broad spectrum of formal learning situations. These learning situations include traditional classrooms, across a spectrum from K–12 to graduate students. They also range from job preparation sites to self-organizing experiential exercises; again, across the spectrum from K–12 to graduate students. Being confronted with the additional textured layer of digital media technology interface into the process for learners created a potential dissonance, resulting in a (master's degree) research project exploring and finding viable potential in the prospects for successful implementation of digital media into

learning environments. Comforted somewhat by the suggested results from this previous research project, yet continuing to grapple with the nuances of appropriate digital media usage and implementation, particularly in learning environments faced by learners in the 21st century, led to this more extended and focused research project.

The broad theoretical framework for this doctoral dissertation study, therefore, was that increased insight into the generation potentially identified as “digital natives” (Prensky, 2001a, p. 2), should assist educators in developing appropriate learning experiences.

Experiences, which when applied, should allow this age cohort to better use their technological proclivities to support and enhance learning.

Within this context, this qualitative case study explored the following research questions:

(1.) What characteristics, preferences, and/or proclivities make Generation Z different from earlier generations? And, (2) What changes to the education systems should be considered, given the technology proclivities of this “Generation” Z?

Jabareen (2009) provided comprehensive distinguishing definitions for frequently confusing and confused terms, including but not limited to the terms concept, conceptual framework, theory, and theoretical framework. The clarity derived from this examination of nuances assisted in structuring this doctoral study.

The conceptual framework chosen for this project was constructivist, founded in the work of a broad spectrum of contributors. Piaget (1952), supported by Harley (1986, 1998), and the neuroscience of Kolb and Fantie (2009), themselves later supported by Chojak (2019), who in turn cited numerous empirical studies (e.g., Cipora et al., 2014; Gogolak, 2013; Kostyrka-Allchorne et al., 2017; Masataka, Perlovsky, & Hiraki, 2015; Takeuchi et al., 2015, 2016; Wobe, 2013), cumulatively provided a structure for interpreting the phases of

human brain development and the concomitant incremental phases of potential learning acquisition.

Prensky (2001a, 2001b), albeit seemingly erroneous in his selection of cohorts for study when supported by the language acquisition research of Harley (1986, 1998), provided a viable model for examining and classifying digital media proclivities by generational cohort. The research in this study, supported by other media usage data and related information, suggested strongly that the Prensky (2001a) framework is both viable and functioning currently amongst the youngest cohorts of Western cultures.

Bruner (1960, 2008) argued coherently and consistently for constructivist principles of learning acquisition. Building much of his work on that of Piaget (1952), Bruner (1960) argued that effective learning today is based on learning acquired and assimilated yesterday and that the learning yesterday was based on learning acquired and assimilated in the days prior to yesterday. These acquisition–assimilation steps, therefore, are perceived by Bruner (1960) to be a form of building block structures, although not as neat and orderly as, for example, a Lego set. However, in later work he began to explore the influence of cultural context as a consistent element in the process of constructing learning for any given individual (Bruner, 2008). This approach was supported by O’Neill (2020), who argued a critical mass of activity experienced on significant scale changes a culture (41:13) while this critical mass of activity proving resilient over time becomes the culture (41:18), thus establishing the effect of critical mass activity on collective groupings.

Piaget (1952) argued that the acquisition of learning is further complicated by the capability of the learner at any given stage in age and development to assimilate a specific experience in a way necessary to acquire the potential learning as a movement toward further

steps and, therefore, further learning. Piaget argued that specific stages of accessibility to learning, while inherently singular to some extent in each particular individual as that individual develops and matures, also can be generalized within reasonable parameters for a critical mass of maturing individuals of similar age in the same (or a similar) cultural setting. With this in mind, in order to reduce the possible variables, the focus of literature and research pertaining to this study was founded in Western or developed economy countries.

Of particular interest to this research project was Piaget's (1952) "Preoperational" (p. 255) stage (i.e., up to 7 years of age). Harley (1986) identified this stage as fundamental in strong second language acquisition and strong unaccented pronunciation in additional languages. This stage of development also is suggested by Kolb and Fantie (2009), and more recently by Chojak (2019, 2020), to be foundational in that it is effectively bracketed by two significant phases of physical growth for the brain of subjects in this age cohort. Kolb and Fantie (2009) further suggested Piaget's background as a biologist and, therefore, as someone who understood phases of physical growth and development of the brains of human children and adolescents, lent credence to his theory of "stages for learning and development" (p. 211): credence now seeming well founded, given the fNIRs empirical studies (Chojak, 2019, 2020).

Prensky (2001a, 2001b) postulated that a critical mass of a specific age cohort, having been exposed to digital media technology at an appropriate time in their collective development, would experience assimilation of this digital media usage in a similar manner to second language acquisition at a similarly appropriate age (i.e., Piagetian stage of development). While much maligned, the developing conceptual framework of digital natives as opposed to digital immigrants was an evident phenomenon to experienced educators, such as this researcher, in the day-to-day learning environment.

Upon closer examination, as a result of the data from this study, amongst other work in the field, it can now be strongly suggested that the fundamental conceptual framework of Prensky (2001a) was, in fact, sound in foundation. However, the age cohorts being researched, by Prensky and others of similar belief, as well as those skeptical of the Prensky framework, at or around the turn of the 21st century, were inappropriate for the purpose of establishing sufficient cohort adherence to the postulated framework because digital media access and application were not sufficiently available to create the building block experiences at the appropriate developmental stages for future learning acquisition and assimilation founded in this “new language” (Prensky, 2001a, p. 3).

To summarize, Prensky (2001a) in working with age cohorts who entered Piaget’s (1952) preoperational stage too early in the history of Western culture made a fundamental error. Prensky identified a trend to come, rather than a trend quantifiable in the age cohorts with which he was actually working at the time.

Skeptics of Prensky’s (2001a) framework duplicated this process. Persistence in researching at the postsecondary level, rather than focusing on the younger learners in the K–12 system, replicated the error made by Prensky. Those opposed to the conceptual tenets postulated by Prensky (2001a), therefore, found it relatively easy to disparage the idea of digital natives. These opponents to the conceptual framework have found it viable to continue their dismissive attitude because the actual digitally native cohort have yet to reach postsecondary institutions in sufficient numbers to effect the preponderance of research.

Moreover, the now commonly applied concept of digital literacy, with its concomitant concept of digital divide, a term apparently coined by Al Gore (as cited in Williams, 2001), is seemingly yet another distraction, in that this framework postulates that

the degree of aptitude and proclivity in digital applications most probably will vary within age cohorts and generations as does second language opportunity and utilization generally. Individuals within cohorts no doubt will demonstrate greater or lesser opportunity, reflected in greater or less aptitude and proclivity, for digital media; however, this did not prove relevant to the concept actually being studied here.

The fact the preponderance of research has been occurring so very late in the learning acquisition development of students in Western culture is regrettable. The result, it now appears, is that the initial generation of those culturally, and historically, appropriate to be classified as digitally native (i.e., those adapted to digital media proclivity) have not been prepared effectively to utilize this proclivity. This is problematic, potentially, in that Prensky's (2001a) initial contention that digital natives would experience neuroplasticity adaptations also now have seeming proof of occurring (Chojak, 2019, 2020; Takeuchi et al., 2015, 2016).

Chapter 4: Methodology

This qualitative case study explored the following primary research question: (1)

What characteristics, preferences, and/or proclivities make Generation Z different from earlier generations?

The subquestion was also explored:

Given the additional context of the associated subquestions, the focus of this study was to explore the hypothesis that a new generational group of learners exists for whom early access and the use of digital media technology has created a paradigm, as outlined by Kuhn (1962) that is, in effect, digitally native. The rationale for this study was that developing learning experiences to use the technological proclivity of Generation Z should encourage enhanced learning for this age cohort. Within this context, the primary research question and the two subquestions were derived from the inquiry into the research problem and the related literature.

Research Design

The methodological framework used in this inquiry was a qualitative case study (Creswell, 2007a; Merriam, 2002; Yin, 2009), employing an interpretive approach (Benner, 1994; Creswell, 2007a; Smith, 1989). This research was classified as a case study because it was conducted at a single intersection in time at one site for the specific purpose of exploring the possibility that a cohort of learners could meet the criteria of the digital native conceptual framework as outlined by Prensky (2001a, 2001b). This case study also incorporated elements of interpretive methodology (Benner, 1994; Creswell, 2007b; Smith, 1989) to better

test the complex, often overlapping lists, of possible digital natives' proclivities and attributes.

Creswell (2007b) argued, "Today qualitative research is legitimate in its own right and does not need to be compared [i.e., to quantitative, or experimental, or any other methodology of research] to achieve respectability" (p. 16). Creswell (2007b) further contended, however, that when a researcher embraces qualitative methodology she or he is accepting the idea of multiple realities. Multiple realities in the sense that "when researchers conduct qualitative research, they are embracing the idea of multiple realities" (p. 16), as do the participants of the study. That said, the multiple realities-multiple perception is precisely what is sought from the participants of a qualitative research project. In the instance of this research study, the potentially disparate views of the participants were most definitely sought in order to better explore the subtle complexities inherent in the research questions: (1) What characteristics, preferences, and/or proclivities make Generation Z different from earlier generations? And (2) What changes to the education systems should be considered, given the technology proclivities of this "Generation" Z?

Bearing all of this in mind, this doctoral study also was designed and conducted with particular care to the concepts of credibility, dependability, and confirmability as defined by Mitchell (2008). The inquiry criteria were further enhanced in application by the later study publications of Linne (2014) and Teo (2013, 2016).

Research Methods

Creswell (2007a) argued for the application of both interviews and focus groups in the instance of exploring constructivist research (p. 22). In this instance, the decision to apply focus groups first, followed by individual semi-structured interviews, was made to explore

the more general paradigm of each contiguous age cohort before focussing on individual proclivities within the age cohort for comparison and finalization of both layers of collected data. More details of each procedure is outlined below, with connections to actual data collected and presented in the Appendices C through to I. The result of this process, both order and procedures, was greater clarity in the analysis of each cohort.

Creswell (2007a) argued for the application of “sequential data collection” (p. 39) of two or more phases where “one phase builds on another phase ... to first explore in order to develop an instrument, to identify categories, taxonomy for follow up” (p. 39). In this study, the literature was explored first and parsed for the themes. Then the emergent themes from the literature were set aside temporarily as data collection commenced. As outlined earlier, this study first used focus groups and individual semi-structured interviews in a deliberate design to achieve greater clarity in the overall described analysis of the proclivities and preferences of each cohort.

Focus groups. Focus groups are a deliberate process to allow the individuals within a group to build upon the thoughts of other group members. Researchers “undertaking pedagogic research might decide to use focus groups when they need to know about student experiences of a particular teaching and/or assessment method” (Breen, 2006, p. 464). Such a frame fits well with the exploration of student proclivities and preferences for both learning and/or integrating material and with the acceptance or not of any particular modality providing the student with access to material to be learned and/or integrated. This study involved the latter (i.e., qualitative data derived from student experiences in the specific modality of online-virtual uses of digital technology). The greatest difficulty with focus groups in a face-to-face modality is having everyone in a given group present at the same

time to engage in the sharing that is core to focus group success. In this study, the focus groups were conducted online, with timelines deliberately designed to allow the participants ‘staged access’, if needed, over a several week time period, as needed, to complete the process.

In this instance, the focus groups were hosted on an asynchronous online tool called Collaborate Blackboard: in effect, an online bulletin board that allows individuals to contribute to the group-think as it evolves. Each focus group was protected by, first, the firewall encompassing Blackboard within the server of SIDES (i.e., the South Island Distance Education School): the hosting institution for the study, and the participants in the study. Each focus group also was password protected, allowing only members of each focus group access to the particular content being developed by their individual group. Several weeks were allowed for the asynchronous contributions of each group to be completed, to accommodate individual subject life schedules, with a sustained hiatus in activity determining the conclusion of this stage in the process.

Interviews. The final stage in data collection was the semi-structured individual interviews. Semi-structured, in-depth interviews are commonly used in qualitative research:

This method typically consists of a dialogue between researcher and participant, guided by a flexible interview protocol and supplemented by follow-up questions, probes and comments.... The method allows the researcher to collect open-ended data, to explore participant thoughts, feelings and beliefs about a particular topic and to delve deeply into personal and sometimes sensitive issues. (DeJonckheere & Vaughn, 2019, p. 1)

The greatest difficulty with interviews is coordinating the timing of attendance to complete the data collection process. In this study, the interviews were conducted online, with timelines deliberately designed to allow the participants scheduling control, if needed, over a several week time period, as needed, to complete the process. Volunteers from the focus groups specifically agreed to participate in this process, which was conducted one on one with the researcher in the synchronous Blackboard Collaborate tool: in the order of the individual appointments agreed with each participant.

Employing these methods in conjunction with the literature review allowed for triangulation. See the “Data Analysis” section of this chapter for more information regarding triangulation.

Sampling Process

The sampling used for this study was a purposive procedure that is referred to as judgment sampling (Robson, 2002). An identified set of criteria was established as the basis for the sample. These criteria consisted of (a) age (for cohort distinction relating to key dates in the history of digital media developments), (b) gender, and (c) self-selection to participate. Diversification did occur amongst the participants, especially with respect to gender, but also to a lesser extent in relation to cultural backgrounds. This profile was achieved because the research was conducted entirely online with participants who were enrolled (and were given the opportunity to self-select) at South Island Distance Education School: an institution with an enrolment at the time of the study of 4,000 students (K. White, personal communication, October 12, 2014), including international students.

South Island Distance Education School (SIDES) is located in Victoria, BC, Canada, but, as a distributed learning institution, attracts voluntary enrollees from throughout the

Province of BC and across Canada. These learners enrol in courses from K-12 and are working toward high school graduation. As such, the learners at SIDES represent a cross section of those attempting to achieve the secondary school graduation, which consistently eludes significant proportions of the population of Canada during the critical age bracket of 15–19 years (Statistics Canada, 2019a, 2019b).

SIDES has offered distributed learning for more than 20 years and more than 95% of current learners enrolled at SIDES work in technology-mediated environments (K. White, Principal: SIDES, personal communication, October 12, 2014). It has expanded to a staff complement of 62 people (K. White, Principal: SIDES, personal communication, October 12, 2014). The learners at this institution have access to electronic learning environments in both synchronous and asynchronous formats and, consequently, possess the competencies that facilitated the completion of the data collection tasks.

Beyond the technology process of the study itself, there were clear reasons for selecting SIDES as a highly appropriate research setting. The institution offers courses from K–12, meeting the criteria for selecting a range of samples from which to identify the potentially correct age cohort (i.e., Generation Z). The institution affords students the opportunity to learn with the most recent digital modalities at the learner’s individual pace, potentially meeting the initial criteria for reversing the previous trend of limited pedagogy and format. In doing so SIDES meets the criteria of intentional change, as advocated by many educators and commentators (Illich, 1971; Mead, 1958; Nellen, 1999; Toffler, 1989), through the implementation of electronic learning environments, as advocated by other educators and commentators (Carr, 2001; Oblinger & Oblinger, 2005; Prensky, 2001a, 2001b; Tapscott, 2008; Wendover, 2010). It, therefore, represents the opportunity to access

learners self-selecting the type of learning experiences predicted for, and starting to enter, general implementation for K–12 education over the past 10 years (Ambient Insight Research, 2010, 2015; Carbol, 2009; Government of BC, n.d.-a, 2011; Government of BC, Premier’s Technology Council, 2010). In addition, SIDES includes instructors who have opted to pursue their careers in this particular environment.

Participants self-selected for this study by replying via email to SIDES to a simple statement of intent notice, a document outlining the most basic of information about this study that was posted on the SIDES course portal page (see Appendix C). This statement was similar in wording and framework to numerous statements for topics ranging from sporting and recreation activities, to special events, and so forth, which are posted every month for learner information. This was the equivalent of an online bulletin board on which both submitted materials and responses were vetted by SIDES administration and/or staff. Of the more than 50 potential participants who replied to the study notice, 12 individuals and their families were eventually invited based on the criteria outlined above, and each replied with informed consent, thereby deliberately accepting the opportunity to participate in this study.

Bounding The Case Study

The purpose of this study was to explore the possibility that a cohort of learners could meet the criteria of the conceptual framework of the digital native (Prensky, 2001a, 2001b). The research questions, as outlined at the start of this chapter, constituted the areas to be explored and prescribed the de facto boundaries of the case study.

Literature on the digital native concept proliferated, both for and against, in the wake of Prensky’s (2001a, 2001b) initial publications. Proponents and opponents began to unpack a list of attributes and proclivities as assignable to the digital native generational cohort. Most

of what they deemed to be characteristics had not been examined efficiently, and researchers noted deficiencies in (a) selecting ‘examples’ and/or participants in the initial studies from age cohorts congruent with the necessary components of the original construct, (b) structuring studies appropriate to explore the possibilities effectively, and (c) evincing frame anomalies effecting approaches to the topic overall (Goffman, 1974).

The first task for this study, therefore, was to explore the contextual conditions that would potentially lead to an age cohort of the type described by Prensky (2001a, 2001b). This journey seamlessly grew into an examination of the attributes and proclivities of any individuals who could reasonably be considered digital natives, and from there into the full exploration of the topic as outlined in the research questions: (1) What characteristics, preferences, and/or proclivities make Generation Z different from earlier generations? And (2) What changes to the education systems should be considered, given the technology proclivities of this “Generation” Z?

The interpretative approach (Benner, 1994; Creswell, 2007a; Smith, 1989) evolved organically from this initial exploration of the literature, and when combined with early data from the study itself, it became apparent that the characteristics of the digital-native cohort were not always congruent to, and potentially were more comprehensive than, what initial commentators had described. The result, for the purposes of clarification with respect to the complexities emergent as data collection analysis evolved during this study, was the creation of the following three broad, overarching thematic categories:

- data supporting anticipated themes (i.e., those themes derived from literature in the field and supported by data from this study);

- data not supporting anticipated themes (i.e., those themes derived from the literature in the field but not supported by data from this study); and
- data proposing: unanticipated themes (i.e., those themes apparently emerging from the data and not yet given formal consideration in the canon of literature in the field).

In this instance, despite the variables, the research was a single case study set at one set educational site. Final bounding of the case was decided when data saturation was considered complete because data reflecting the multiple elements above had been collected in sufficient quantity to test both existing and potential future evolving, conceptual frameworks associated with digital natives to be explored within the context of the study research questions. All data were collected online using the approaches and methods outlined later in this chapter.

Steps of the Research Project Process

Figure 9 presents a graphic representation of the research steps and processes, which included two phases. In Phase 1, primary data were collected in a web-based environment. Phase 2 involved data coding across the participant cohorts. Each of these phases is detailed in this section.

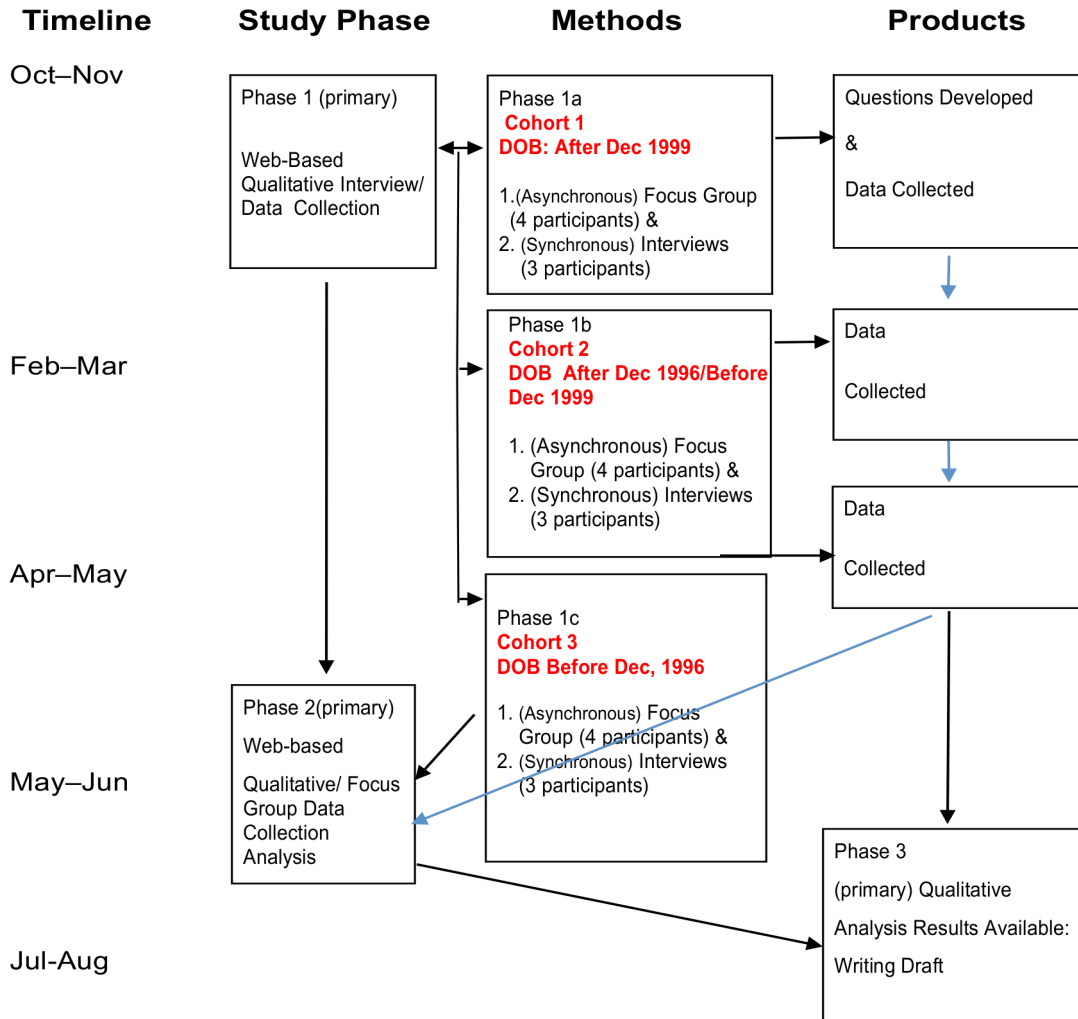


Figure 9. Research design with timeline.

Phase 1, the primary web-based data collection, involved development and implementation of four sets of discrete focus group questions, followed by 12 questions applied in an electronic semi structured interview environment to individual participants. These questions were developed to explore traits apparently, based in the literature studied, perceived to be characteristics and/or proclivities of learner cohorts tending toward digital native proclivities and tendencies.

Phase 1 included three sub-phases:

- Phase 1a included Cohort 1 (participants born after December 1999). This phase included the first cohort-age subset of the case study invited to undertake the focus groups and interviews. The participants taking part in Phase 1a were the cohort for whom the questions were developed and the first cohort from which primary data were collected.
- Phase 1b included Cohort 2 (participants born after December 1996 and through December 1999). This phase included the second cohort-age subset of the case study invited to undertake the focus groups and interviews. As a cohort, these participants received the identical questions in the same format as Cohort 1. They were the second cohort from which primary data were collected.
- Phase 1c included Cohort 3 (participants born before December 1996). This phase included the third and final cohort-age subset invited to undertake the focus groups and interviews from which primary data were collected.

In each sub-phase of Phase 1, the participants first took part in the focus groups. They were then invited to volunteer to continue as participants in the project undertook the interviews. As such, not all focus group participants were interviewed. All facets of the Phase 1 data collection were conducted online, as described in detail in this section.

The questions, therefore, were applied to the three cohorts beginning chronologically with the youngest age grouping and ending with oldest age grouping. This order allowed the researcher, an experienced educator, to frame questions understandable to the youngest age grouping and immediately test this effective level of understanding. The time between data collection with Cohorts 1 and 2 was approximately 3 months, which allowed for initial

themes to be confirmed with participants, thus double-checking comprehension. When none of the youngest cohort expressed confusion, confidence was established in the validity of the questions, allowing the identical questions to be applied to, next, the middle age cohort and, finally, to the oldest age cohort.

Phase 2 (i.e., data Coding across cohorts) began within 2 months of the completion of the overall Phase 1 data collection. In each subphase, coding began as a discrete process within a specific cohort (i.e., first Cohort 1, then Cohort 2, and last Cohort 3). Coding followed the constant comparison method (Creswell & Plano Clark, 2011; Maykut & Morehouse, 1994; Ryan & Bernard, 2003; Strauss & Corbin, 1998). This process started with open coding to create thematic categories, followed by axial coding to clarify and elaborate further on the emerging thematic categories and their respective contextual potential. As anticipated, data were increasingly rich in texture with each successive chronological cohort due to the graduated age increase of the cohort participants.

The content and the form of the questions was a mixture of visual and textual material. Decisions in respect to question format and content were based on the characteristics and proclivities for potential digital native learners as outlined in the literature. This allowed for practical cross checking by format concomitantly to the content of the self-reported replies to the questions. Additional decisions, as outlined above, were based on the comfortable understanding of participants in all age cohorts.

The order of the focus groups, from youngest to oldest, enabled the researcher to ensure the lack of confusion from the youngest participants, thus allowing the use of identical questions with all participants in all age cohorts. The questions are available in Appendix D.

The focus groups themselves were conducted in Moodle forums (Dougiamas, 1999), an asynchronous series of firewall-protected electronic environments familiar to and comfortable for the individual participants. Each focus group, beginning with the youngest cohort, was given time sufficient (i.e., between 7 and 20 days, depending on the schedules of individual self-selecting participants) to complete the process.

The interview questions were also delivered to participants in an online environment familiar to and comfortable for the participants. This environment, known as Collaborate (Blackboard Collaborate, 2012) is a synchronous tool allowing real-time communication, behind secure firewalls for the preservation of integrity of data and privacy of participants. In this instance, only the researcher and each individual were present in the environment at the time of the interview, allowing the participants to concentrate on the content of the individual questions without distraction. The environment recording function was used to collect and safely store all data collected (i.e., visually, textually, and orally) from each individual participant session. The questions can be found in Appendix E and more detail elaborating on the rationale is provided further in this and later chapters.

The data were then recorded, preserved by the researcher, and only the researcher, and processed according to established and recognized techniques outlined later in this chapter. The results of the data analysis are explored in Chapters 5 and 6 of this study.

The advantage of this process to coding and identifying data was the ability to organize data to privacy-preserved individuals. This enabled the researcher to report out results, during this and later chapters, with the increased understanding of the type of textured data qualitative research is intended to produce.

The data from each participant were then processed, as outlined later in this chapter, according to well-established and accepted techniques. The results, interpretation, and analysis of the collected data were also processed through accepted and established techniques.

The data were used (a) for interpretation and analysis in its own right and (b) to assist in drafting the questions for the Phase 2 (i.e., primary web-based data collection) interviews. As previously noted, the researcher proceeded through the focus groups from youngest age cohort to oldest age cohort. The questions again were a mixture of visual and textual material, formulated to explore perceptions based in the literature of the potential aptitudes and proclivities perceived to be traits of potential digital native learners. The questions were also intended to explore the depth of material emerging from the focus groups.

The focus groups extended through four sets of discrete, sequential questions, each of which was intended to build upon information gathered in the previous question sets and to cross check already existing data. Several students from any one cohort were engaged in the question sets simultaneously.

The semi-structured interviews consisted of 12 questions, some of which had multiple parts. These questions were intended to build upon information gathered in the previous question sets and developed to cross check and refine already supplied information. The questions were presented as Microsoft PowerPoint slides and consisted of simple black lettering on a white background. The slides were uploaded into Collaborate (Blackboard Collaborate, 2012) and shown to the participant in the usual manner for this tool (i.e., using the whiteboard function) with the participant directed to type both the question (number, and if applicable, letter) and her or his response to each discrete question in the chat-box feature

supplied by the tool. Participants were also directed to keep their microphone open and to ask questions for clarification and/or to add anything in addition to the typed material.

Participants: Extrapolated Profiles

As part of the process, in the focus group, each participant was given a short series of identical prompts. These prompts were utilized in both the focus group and interview question sets (see Appendices D and E). Questions marked with two asterisks (i.e., **) were included to assist in creating an extrapolated profile for every participant. The data were then compiled and synthesized by the researcher who assigned a participant code (i.e., CIM1, C1F1, etc.) to each participant before the data for the extrapolated profile was confirmed during a member check (Sandelowski, 2008) process to be the validated descriptors provided by each participant. Maxwell (1992) described this as a key step toward ensuring “theoretical validity” (p. 279) as defined for practice in the field. At no time did the other participants access the data used in this codifying approach. Nor did they have the opportunity to confirm the participant codes of any participants other than him or herself. At no time did anyone other than the researcher, who kept voice notes and memos during the process, have access to confirm the codifying and identity information of individual participants.

Within this context, the researcher subcategorized the participants into the three cohort groupings: Cohorts 1, 2, and 3. Participants’ cohorts, participant codes, and profiles are presented in Appendix F.

The cohort graduated age distinctions were chosen with intention, based on the literature and related technological developments (as outlined in Chapter 2). Cohort 3 was composed of participants with a date of birth prior to December 1996. These individuals were born at the time of the establishment of visuals and graphics as a facet of digital

connection on the Internet through the implementation of XMosaic (National Center For Supercomputing Applications, 1993), the release of QuickTime (Apple, 1994), digital cameras, and other similar developments from 1993–1995, and the recognized official penetration of the market by the Internet throughout 1997. Cohort 2 was composed of participants with a date of birth after December 1996 and through December 1999. These individuals were born just before, during, or just after the recognized official penetration of the market by the Internet occurring in 1997. Cohort 1 was composed of participants with a date of birth after December 1999. These individuals were born after the recognized market penetration by the Internet (occurring in 1997) and before the Year 2000 (Y2K), but who are old enough at the time of the study to be entering, or fully engaged in, the more formal operational phases of learning capability, as described by Piaget (1952) and supported by Kolb and Fantie (2009), with apparent recent confirmation via fNIRS neuroeducation studies (Chojak, 2019, 2020).

Participants for the study represented a diversity of age, gender, and interests beyond online schooling and digital media usage (as outlined in Appendix F, mentioned earlier in this chapter, and as developed further in the profiles included in Chapter 5 as well as the scenarios in Chapter 6). Moreover, the sample size for each cohort grouping was sufficient in achieving saturation. As such, any themes that prevailed during the analysis phase proved to be credible findings (Fusch & Ness, 2015).

Data Collection

Once participants had self-selected, both the participants and their parents were emailed an informed consent letter and informed consent form (see Appendix G) to initiate the data collection process. After the researcher received the signed informed consent forms,

participants received the invitation and link via email to interact with the initial level of questions in the asynchronous focus group for their cohort. The focus groups were hosted on a discreet, entirely separate portion of the SIDES Moodle site (Dougiamas, 1999), giving the participants access to the questions from the privacy of their own homes and computers at any time. Each cohort completed four sets of questions as their focus group activity. When completing Question Set 4 of the focus group, each participant was approached separately by email and invited to take part in the follow-up semistructured interviews. Participants who chose to take part in the interviews were emailed a link to the Collaborate synchronous room (Blackboard Collaborate, 2012), again hosted on a discreet, entirely separate portion of the SIDES Moodle site, and were provided with a time when to meet the researcher in the Collaborate room for the interview. When the participant met online with the researcher, the researcher shared the following:

- The questions for the interview were included on a slide presentation to be controlled by the researcher, using the normal technique for this process.
- The participant was to use the text chat box supplied by Collaborate to type responses to the questions.
- The participant could use the microphone-voice function of Collaborate to request clarification of a question, to append information to the participant's typed response, and/or to merely verbalize generally at any point or throughout the process (with the understanding that only information intended to answer the question would be transcribed).

- The interviewer would respond only to clarify questions and/or address any concern not directly related to specific questions, so as not to influence responses from the participant in any way.

Identical questions were used, both in the focus groups and in the semi-structured interviews, for each participant regardless of cohort. Since the researcher has significant experience and expertise with the age groups of the participants for this study, the questions were framed effectively to mitigate any misunderstandings about the data collection process. This provided a level of consistency in the data collection and in the data collected. As a footnote, few, if any, questions provoked expressions of confusion or required clarification and no confusion seemed to be the result of the age or maturity level of the participant.

Given the reality that data cannot be anticipated accurately by the interviewer, Creswell and Plano Clark (2011) recommended researchers employ questions of an open-ended nature, as those not easily answered with yes or no replies are advantageous. This design was applied whenever possible for both the focus groups and the semistructured interviews. Creswell and Plano Clark (2011) further argued that, in instances in which interviewee self-perception is central to the data being collected, scenarios and third-person reflections (e.g., “How do other people perceive you in this context”) can be helpful in cross referencing for validity. Questions of this type and format were applied as appropriate cross checks as a matter of consistent practice throughout the process of the study.

The focus group sessions lasted between 7 and 20 days and were spread out over a period of 5 months. Variations in both length of time per focus group and the overall duration of specific sessions were the result of availability of the participants within each cohort.

In-depth interviews that were 25 to 30 minutes in duration, as outlined by Creswell and Plano Clark (2011) and Robson (2002), were conducted with each of the 12 participants who volunteered for this portion of the study. The short duration was deliberate because of the age range and diverse maturity level of the participants. Interviews were carried out by use of a recording function in Collaborate (Blackboard Collaborate, 2012). Every participant was informed in advance that recording would occur. Verbal consent to proceed was obtained and recorded for each participant before the interview proceeded. At the end of each interview each participant was asked to confirm their health and well-being and was invited to send an email or other communication later should fresh ideas occur that the participant wished to share. Every participant confirmed her or his well-being at the close of the interview and expressed contentment with the process.

One participant followed up with a separate communication. In this instance, the content consisted of a very short (i.e., 6–7 second) gif-like video of the subject firing an arrow from a bow and then catching the arrow upon its return from orbit under the subject's right arm. To follow up appropriately, a query was forwarded to the school counsellor, with an outline description of the video contents. The counsellor replied in due course, confirming that no breach of confidentiality had occurred in pursuing the inquiry into the video and there had been no evident inclinations toward self-harm on the behalf of the subject in question. This video was treated as significant because the participant was a member of the youngest cohort in the study. On the advice of the school counsellor, no follow up was conducted to determine the meaning of the content; however, the length of the video was considered under the topic thread "Instant Results."

After each interview, the recording was acquired via secure link and the information it contained was transcribed into a Microsoft Word document and then coded to preserve the anonymity of the participant. To ensure security, the researcher performed both the transcription and the coding. The recording links and initial transcribed data were stored on password-protected flash drives in safe locations on the researcher's secured laptop.

Bracketing is a critical element to the process of interviewing and, therefore, was significant in the focus groups and semistructured interview sessions. Also known as *epoché* (Moustakas, 1994), this process involved the separation of the researcher from any preconceived ideas that he had about the topic under study. The researcher kept a series of voice notes to track and refresh his perspective in this respect, prior to and during the process of data collection, as well as to clarify other potential anomalies in process and content.

Data Analysis

Creswell and Plano Clark (2011) argued qualitative inquiry and research design should be meaningful and provide detailed data to add to the existing literature. The greatest strength of any process or system is often, coincidentally, its greatest weakness. The flexibility of qualitative research creates the opportunity for deeper, more textured interpretation of collected data while simultaneously creating more opportunity for confusion in both collection and analysis of data. Qualitative researchers, in response to this circumstance, spend substantial time and energy seeking some unanimity in processes and terminology.

Ryan and Bernard (2003) analyzed various techniques in light of factors such as levels or textures of data acquisition, expertise and experience of the researcher, and, finally,

in the audience and the intent of the study itself in the context of validity and credibility.

They identified specific techn

iques as more labour intensive than others but with digital data this was found to be less significant. Given that the participants for this study were young and that *thin* data (defined as a paragraph or two maximum per response) were more common as a result, Ryan and Bernard's analysis suggested that validity concerns mitigated against some techniques.

The remaining two variables in decision making, according to Ryan and Bernard (2003), are found in the intent of, and the audience for, the study, and the expertise and the experience of the researcher. The audience for this study, given the academic focus and implications for either success or failure, can best be characterized as conservative. The intent of the study was to begin the exploration of a newly emerging and to date underresearched cohort (i.e., Generation Z).

Given that this doctoral research was conducted on the cohort hypothesized to be the potential first digital natives, the study was structured to search for basic, first-step, broad themes (i.e., the proclivities anticipated for digital natives) or a lack thereof. Ryan and Bernard's (2003) construct, when applied to this type of cumulative process, indicated that the most appropriate techniques were pawing (i.e., cutting and sorting), repetition (i.e., keywords in context), and similarities and differences (i.e., constant comparison). In line with the information Ryan and Bernard (2003) presented, the experience and expertise of this researcher, which is best described as process and context orientated, served to confirm the appropriateness of these three techniques.

Ryan and Bernard (2003) argued, in "theme discovery, more is better" (p. 103) at the outset of a study. They suggested that refining themes and reducing them in number through

ongoing process is superior in practice to looking to add themes that concrete data may not support.

With this in mind, combined with the Ryan and Bernard's (2003) suggestion that multiple techniques increase validity, the following series of specific operations were implemented:

- “pawing” (Ryan & Bernard, 2003, p. 88) to establish initial themes for examination,
- “keywords in context” (Ryan & Bernard, 2003, p. 96) to broaden the thematic parameters, and
- “similarities and differences” (Ryan & Bernard, 2003, p. 1000), also known as constant Comparison (Creswell & Plano Clark, 2011; Maykut & Morehouse, 1994; Ryan & Bernard, 2003; Strauss & Corbin, 1998), was a valuable and efficient overall support process in coding (both open and axial) analysis.

Creswell and Plano Clark (2011) also argued for a multistage analysis process in working with qualitative data. In the first stage, they posited that the focus should be on teasing out main themes through pawing and keywords in context (Creswell & Plano Clark, 2011). In the second and concluding stage, and ongoing thereafter, Creswell and Plano Clark advocated the “constant comparative method” (p. 290) in which an individual strand of data (i.e., Theme 1) can be compared with other individual strands of data in succession (i.e., Themes 2, 3, 4, etc.) in a sequence that sees each individual theme compared and contrasted with every other theme. Creswell and Plano Clark argued the purpose of this process was to establish any additional themes or threads that may have been overlooked, while also substantiating the consistency of the initial individual themes. The results of this study,

which are outlined in more detail in Chapter 5, seemingly confirmed this contention, as several potential thematic areas for future research emerged during this process.

Working online provided data in digital format. Parsing and thematic organization enabled the researcher to apply the processes of (a) open coding to develop a comprehensive list of initial themes and topics as they emerged from the data and (b) axial coding to incorporate similar themes, where appropriate, into overarching themes and topic areas for both inductive and deductive analysis (Creswell & Plano Clark, 2011; Maykut & Morehouse, 1994; Ryan & Bernard, 2003; Strauss & Corbin, 1998).

Although each of the stages and coding procedures outlined above were conducted over several weeks, and in one instance of axial coding over almost 2 months, methodical applications of the data were relatively simple in digital format, using processes outlined previously in the “Data Collection” section of this chapter. Copies of the original data were made and stored securely and steps were taken to preserve the original digital data in the process for as long as possible (Crichton & Childs, 2005), thus retaining access to nuances not transferable to the alternate (i.e., written and written description) formats of working data.

Once the data were collected, as described, the researcher initiated the processes outlined earlier, as defined by Ryan and Bernard (2003) and Creswell and Plano Clark (2011), and then both open and axial coding (Creswell & Plano Clark, 2011; Maykut & Morehouse, 1994; Ryan & Bernard, 2003; Strauss & Corbin, 1998) were carried out as follows:

1. Create digital statements from the gathered and transcribed material.
2. Arrange the statements in themes and subthemes.

3. Connect the themes and subthemes to create (a) general expressions of experience, (b) descriptions of these experiences, and (c) descriptions of how these experiences might prove influential in expressing participant-age cohort proclivities.
4. Extrapolate the personal meaning of these experiences for each participant to create transferable subject themes.

Throughout these steps, the researcher focused on the importance of being consistent in approach and continuing to follow each new potential theme or subtheme in an unbroken, easily explained sequence of processing, following an injunction common to researchers in the field of qualitative research (Merriam, 2002, 2009; Strauss & Corbin, 1998; Yin, 2009). In addition, the researcher was cognizant throughout the inquiry process of how each step could lead, potentially, to the distortion of the original data and, therefore, to less reliable analysis results. To help mitigate this possibility, the original data were maintained intact, securely, yet available for constant comparison as the process was implemented.

The open and axial codes, themes, and topics were then applied in the inductive analysis (Fox, 2008) phase to compare and contrast the study findings with the predicted proclivities expressed in the conceptual framework of Prensky (2001a, 2001b). These processes also were applied to the literature founded in the research seemingly done with age cohorts too early in the history of the Internet for a critical mass to access the technology in context (Bullen et al., 2011; Bullen & Qayyum, 2014), as outlined in Chapter 2 of this dissertation. In the process, this consistent inductive analysis constant comparison, comparing this study's result with the predicted proclivities and preferences founded in early

literature, also identified and clarified the inappropriate nature of potential rival hypotheses and alternative explanations for the results.

Triangulation refers to the use of multiple methods or data sources in qualitative research to develop a comprehensive understanding of phenomena (Patton, 1999). Triangulation also has been viewed as a qualitative research strategy to test validity through the convergence of information from different sources (Carter, Bryant-Lukosius, DiCenso, Blythe, & Neville, 2014). In this study, triangulation was applied because, while thin data were an expectation for any one item of inquiry, given the age groups of the study participants, the combination of the research questions were anticipated to produce comparatively complex data overall. Once the literature was reviewed, focus groups and interviews followed (see Figure 9, which outlines the research project process with timelines), thereby allowing for triangulation.

Ethical Considerations

All research undertaken complied with the parameters established by the ethical review policies and procedures authorized by Athabasca University and the organization supplying the participants (i.e., South Island Distance Education School and School District 63: Saanich). Steps were taken by the researcher during the data collection process to protect the participants and the integrity of the study. Informed consent information and consent forms (see Appendix G) were applied with all parties concerned at every stage. Only once informed consent forms were completed did the process of data collection occur. The researcher, who was not known to any of the participants in advance of the study, conducted all data collection personally, using discrete mechanisms, as described previously. The researcher processed, analyzed, and interpreted all data personally and also stored both

original and uncoded data securely, in appropriate, password-protected environments under his exclusive control. The researcher also kept voice notes and memos with comments on potential anomalies. This is a standard process; however, in this instance no such anomalies were found or proved.

As the participants were under the legal age of majority, the researcher deliberately took considerable pains to explain each and every step of the process. Participants, and their parents or guardians, were assured both verbally and in writing that the participants could withdraw from the study at any time without concern either for the privacy of the information supplied or for their continued education at SIDES or any other institution. No participant chose to withdraw, although three participants, one from each cohort, chose not to continue beyond the focus group stage. Participants, and their parents or guardians, again because of the age of the participants, were assured support would be supplied should any distress or disturbance result from the process of the study. No support was requested by any participant or their parents or guardians. Participants were surveyed at the conclusion of each step in the process to ascertain their current well-being and state of mind. All participants confirmed, either in writing or on the recording of the sessions, that they were well and happy.

The one incident of the gif-like video was followed up, through SIDES counselling and was determined to be benign in relation to the student's well-being. The video was treated as data to the extent possible, without recontacting the student in question—an action not recommended by the counsellor.

Summary

In summary, Chapter 4 has detailed the qualitative case study methodology that was applied as the research framework for this inquiry. Methods, data collection, ethics considerations, and recruitment have all been discussed in this chapter.

Results, discussion of results, conclusions, and recommendations are discussed in the following chapters. In addition, given the new literature emerging rapidly as this doctoral study reached its conclusion, the author proposes to continue research on this important topic in future studies.

Chapter 5: Results

The purpose of this qualitative case study was to explore the perceptions, beliefs, and proclivities of the participating adolescent cohort of learners (i.e., 12 participants total; with dates of birth ranging from before December 1996 to after December 1999 in three discreet age-distinguished cohorts) with respect to digital media applications and their day-to-day usage of digital media. This chapter consists of three primary sections, each presenting results unique to the categories of (a) data supporting themes, (b) data not supporting themes, and (c) data supporting unanticipated themes. The data that drove the construction of these three categories included both the first phase-data gathered from the focus groups and the second-phase data gathered from the semi structured interviews.

It is important to note that the empirical evidence in this study was based (a) on preponderance, or significant proportion, of the aggregate cohort (i.e., the critical mass of the age grouping of the participants) and (b) on textured data collected during both focus groups and interview processes, as outlined in Chapter 4 of this report. Data collection and analysis followed a previously described timeline and, as hypothesized, the results strongly suggest a potential refined understanding of the current generational cohort of learners: utilizing the data collected and analyzed during this research process and the findings of this study, grounded in the literature,. The remaining chapters describe in detail the result of the interpretive (Benner, 1994; Creswell, 2007a; Smith, 1989), constant comparison (Creswell & Plano Clark, 2011; Maykut & Morehouse, 1994; Ryan & Bernard, 2003; Strauss & Corbin, 1998), and inductive (Fox, 2008) approaches to augment deductive data analysis processes. The final chapters also provide discussions of the findings, the conclusions, and the

recommendations that comprise the remainder of the report. This chapter concludes with a summary of the key findings.

Research Questions

This qualitative case study explored the following research questions: (1) What characteristics, preferences, and/or proclivities make Generation Z different from earlier generations? And (2) What changes to the education systems should be considered, given the technology proclivities of this “Generation” Z? The focus of this study was to explore the hypothesis that a new generational group of learners now does exist for whom early access and use of digital media technology has created a paradigm, that is, these learners are in effect digital natives (Prensky, 2001a, 2001b). The rationale for this study was that the development of learning experiences to use the technological proclivity of Generation Z should encourage enhanced learning for this age cohort.

Major Themes in the Existing Literature

As discussed in detail in the review of literature, key traits already elicited for the potentially digitally native were drawn from previous studies and publications. The established literature, primarily Bullen et al. (2011) and Bullen and Qayyum (2014), suggested the following potential variations in participant preferences apparently specific to generational cohorts: connecting, multitasking, working in groups or teams, working with images rather than text, receiving instant results, text messaging over email and/or talk, and computers over hardcopy books. Therefore, it was reasonable to employ these seven thematic areas as a starting point (i.e., Stage 1) for deductive analysis, particularly given that “deductive analysis is less common in qualitative research but is increasingly being used” (Pope, Ziebland, & Mays, 2000, p. 114) for this purpose, before applying interpretive (Benner, 1994; Creswell,

2007a; Smith, 1989), constant comparison (Creswell & Plano Clark, 2011; Maykut & Morehouse, 1994; Ryan & Bernard, 2003; Strauss & Corbin, 1998), and Inductive (Fox, 2008) processes (i.e., Stage 2) to seek out any and all remaining themes emerging from the data.

Data collection and analysis followed the described timeline and, as hypothesized, the results strongly foreshadow a potential refined understanding of the current generational cohort of learners resulting from utilizing the data collected and analyzed during this research process, grounded in the literature, and utilizing the findings of this study. The three cohorts of this study included Cohort 1 (those born after December 1999), Cohort 2 (those born before January 2000 and after December 1996), and Cohort 3 (those born before December 1996).

The established literature sets the ‘watershed year’ for the Internet, in terms of growth and establishment as a reasonably accessible entity, at or around the market penetration designation of 1997. The year 1997 was also the approximate midpoint for births for those participating in this study.

Participants: Expanded Extrapolated Profiles

For the sake of clarity, readers are reminded no data were collected face to face, but rather via synchronous online methods, including the online synchronous interviews where cams were turned off during this study, and all data collection for this study took place behind secure firewalls in the online environments, using Collaborate for the interviews and Moodle Forums for the focus groups. This process meant that all participant identities remained screened, even from the researcher (me). As part of the process, in the focus group, each participant was given a short series of identical prompts. These prompts were utilized in

both the focus group and interview question sets (see Appendices D and E). Questions marked with two asterisks (i.e., **) were included to assist in creating an extrapolated profile for every participant. The data were then compiled and synthesized by the researcher who assigned a participant code (i.e., CIM1, C1F1, etc.) to each participant before the data for the extrapolated profile was confirmed during a member check (Sandelowski, 2008) process to be the validated descriptors provided by each participant. Maxwell (1992) described this as a key step toward ensuring “theoretical validity” (p. 279) as defined for practice in the field. At no time did the other participants access the data used in this codifying approach, nor did they have the opportunity to confirm the participant codes of any participants other than themselves. At no time did anyone other than the researcher, who kept voice notes and memos during the process, have access to confirm the codifying and identity information of individual participants. The paragraphs that follow introduce the participant codes and provide a brief profile for each participant.

During the interview, Participant C1M1 was quick, efficient, and seemed to know exactly what he wanted to say. Later, he sent a short gif-type video, mentioned in Chapter 4, which was merged into collected data, albeit without reliable, concrete interpretation.

Participant C1M2 was born after December 2000. During the interview, he was quick yet thoughtful and very careful to be clear about what he was saying.

Participant C1F1 was born after December 1999. A full-time online learner, she had the microphone on throughout the entire interview. Although she talked constantly, clarifying the questions, she never once supplied a verbal answer to the questions themselves.

Participant C1M3 took part in the focus group session only. He is an active, focused, competent young man. Born after December 1999, he displayed an excellent sense of humour.

Participant C1M4, born after December 1997, is concerned about the impact of social media on relationships and quite proud of deliberately not having a Facebook page. During the interview, he proved to be a classic multitasker. His microphone was open all the time, clarifying every question, and he was determined to get it right, including punctuation, capital letters, and spelling in the written responses.

Participant C2F1, born after December 1997, is a full-time online learner, quick and very careful during the interview. She left her microphone off and focused on written responses, working hard to get everything correct, including punctuation, capitalization, and spelling. She said she likes to finish things well, and her contribution substantiated this comment.

Participant C2F2, born after December 1996, is proud of being online virtually all of the time. She is a full-time online student and she was very careful to point out her intent is “not to do harm.” During the interview, she had her microphone off and her head down, metaphorically speaking. She was quick and correct in every detail.

Participant C2F3, born after December 1996, seems content to multitask only in the evening (i.e., at the time of this study, on Tumblr or Facebook) with NetFlix or Wii sports open as well.

Participant C3M1 was the eldest of the participants. Born before December 1996, he was very quick throughout the interview. His microphone was open and he chatted but made no verbal comments directed to the questions.

Participant C3M2, born before December 1996, freely admits to not reading often and to changing his favourite music frequently. He was calm when working through a variety of possibilities, both Mac and Windows, when we had trouble getting the interview started. When the technology continued to fail, he was perfectly content to work through the researcher, dictating for the researcher to transcribe his thoughts into the interview room.

Participant C3F1 is an athlete. A full-time student, born before December 1996. Very composed during the interview, she did not even mention that the whiteboard was invisible until we reached the “visual question.” She prefers face-to-face relationships and was very clear and thoughtful in her responses to the interview questions.

Participant C3F2 took part in the focus group session only. Born before December 1996, she prefers to multitask only in the evening, with music in the background while she “plays” on her phone and computer.

Figure 10 provides a graphic depiction of the dates of births for all individual study participants in perspective to the developments of the then evolving Internet.

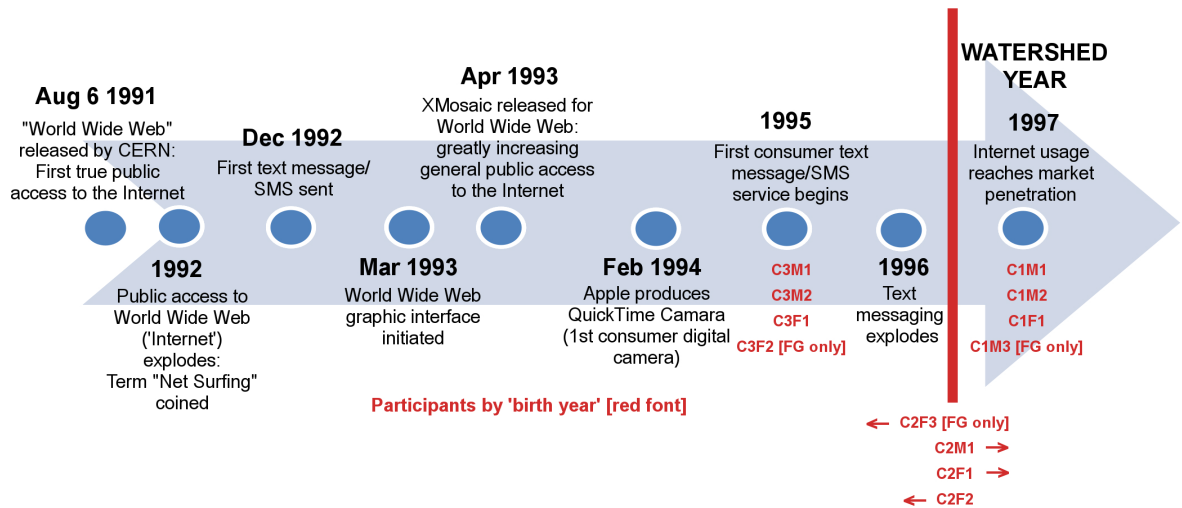


Figure 10. The relative dates of birth of study participants in the context of technological availability and access on the Internet.

Data Supporting Anticipated Themes

Data applied deductively to the effect of calling into question Bullen et al.'s (2011) and Bullen and Qayyum's (2014) list of digital native traits. The results strongly suggest a potential refined understanding of the current generational cohort of learners.

Being connected. Data from this study provided information in topics specific to the thematic area of "Time Online," in that the participants in this study "Spend Significant Time Online" (i.e., several hours in a session more than once each day) in 12 of 12 instances. Data from this study provided further information in topics specific to the thematic area of the "Time Online" in Tables H1 to H3 in Appendix H.

Participants consistently preferred to "Spend Significant Time Online" daily, but with different perceptions about the quantity of time involved. Data from this study provided further information in topics specific to the thematic area of the "Comfort Level While Offline" in that none of the 12 participants in this study expressed "Comfort in being Offline for Substantial Time Periods" (i.e., being offline regularly for more than 10 successive hours average at a time). Data from this study provided specific further information with respect to "comfort being offline," as shown in Table H4 in Appendix H.

Tables H5 to H8 in Appendix H clearly indicate a disparity of considerable time length ranging from shortest "patience" level (i.e., a term used by a majority of the participants) in Cohort 1 to considerably longer patience level in Cohort 2 to significantly longer patience-comfort level while offline for Cohort 3, the oldest cohort in the study. Data from this study provided further information in topics specific to refining the thematic area of the "Comfort Level While Offline," which are presented in Tables H9 to H12 in Appendix H.

Substantial periods of time for the purpose of this question were deemed to be more than 10 successive hours average at a time. The members of Cohort 1 were born after December 1999 ($N = 4$); members of Cohort 2 were born between December 1996 and December 1999 ($N = 4$); members of Cohort 3 were born before December 1996 ($N = 4$). The participants, unanimously, across all three cohorts, demonstrated discomfort while offline for substantial periods of time as defined above.

There was a notable absence of comfort amongst the participants at being offline for significant time on a regular basis. Data from this study provided further information in topics specific to refining the thematic area of the “Comfort Level While Offline,” in that the average time participants expressed “Comfort and/or Ability to Stay Offline” during an average school-work-week day was approximately (a) 9.5 hours for those born before December 1996, (b) 7 hours for those born between December 1996 and December 1999, and (c) 6 hours those after December 1999.

There was variance in the absence of comfort with being offline for significant time attributable to age cohort. Data from this study provided further information in topics specific to refining the thematic area of the “Comfort Level While Offline,” as shown in Table H5 in Appendix H.

There was an increased absence of comfort with being offline for significant time amongst the participants in this study during school–work holidays. Data from this study provided further information on topics specific to refining the thematic area of the “Comfort Level While Offline” in that the average time participants expressed “Comfort and/or Ability to Stay Offline” during a break–holiday from an average school-work-week day was approximately (a) 10.5 hours for those born before December 1996, (b) 7 hours for those

born between December 1996 and December 1999, and (c) 5.5 hours those born after December 1999.

There was variance in the absence of comfort with being offline for significant time attributable to age cohort. Cohort 1 (i.e., those born after December 1999) were persistently least comfortable in all categories discussed. Data from this study provided further information in topics specific to refining the thematic area of the “Comfort Level While Offline,” as shown in Tables H13 and H14 in Appendix H.

There was an increased preponderance in absence of comfort with being offline for significant time amongst the participants in this study during weekends. Data from this study provided further information in topics specific to refining the thematic area of the “Comfort Level While Offline” in that the average time participants expressed “Comfort and/or Ability to Stay Offline” during an average weekend day was approximately (a) 13.5 hours for those born before December 1996, (b) 6.5 hours for those born between December 1996, and December 1999, and (c) 6 hours for those born after December 1999.

There was variance in the absence of comfort with being offline for significant time attributable to age cohort. Data from this study provided further information in topics specific to refining the thematic area of the “Comfort Level While Offline.” Participants were asked, “What is the Longest Time you can Recall Going Without Checking Online?” Their replies varied from “3 full weeks” (C3F1) to “Only a few hours” (C1M1).

The average time participants recalled “Going Without Checking Online” was approximately (a) 10.3 days for those born before December 1996, (b) 5 days for those born between December 1996 and December 1999, and (c) 1.5 days for those born after December 1999.

There was significant variance in the absence of comfort with being offline attributable to age cohort. This suggests confirmation, as a pattern overall, that Cohort 1 (i.e., the youngest cohort at the time of the study), had the lowest tolerance-patience for being offline.

Thematic area “Connecting.” Data from this study provided further information in topics specific to refining the thematic area of the “Connecting,” in that the participants in this study defined “Their Activity During a Long Trip” (in their own words), as discussed in the paragraphs that follow.

Cohort 3. For Question 11, participants were asked, “During a long trip (plane, car, etc.) what do you do?” Participants in Cohort 3 (three interviewees born prior to December 1996) responded that they enjoy “reading, enjoying the view, or resting” (C3M1), “music, movies, [online] games” (C3M2), “reading or being online” (C3F1), and one participant noted they preferred something else, but did not list what that preferred activity was.

For Question 12, participants were asked, “Which of the #11 activities would you do most (time) for the trip?” The participants from Cohort 3 replied “reading” (C3M1), “movies” C3M2, and “reading” (C3F1). In summation, only two of 11 activities selected by this cohort involve “Connecting.”

Cohort 2. For Question 11, participants were asked, “During a long trip (plane, car, etc.) what do you do?” Participants in Cohort 2 (three interviewees born after December 1996 and prior to December 1999) responded that they enjoy reading, playing games, listening to music, being online, and something else (not listed).

Cohort 2 participants shared the following statements:

- “Listening to music. For me travelling is the best time to listen to music as you can really focus on it. I also listen to podcasts and read” (C2M1).
- “I will alternate between reading, playing [online] games, and listening to music” (C2F1).
- “Reading and listening to music” (C2F2).

For Question 12, participants were asked, “Which of the #11 activities would you do most (time) for the trip?” The participants from Cohort 3 replied “reading” (C3M1), “movies” C3M2, and “reading” (C3F1).

For Question 12, participants were asked, “Which of the #11 activities would you do most (time) for the trip?” The participants from Cohort 2 replied “listening to music” (C2M1), “playing the game” (C2F1), and “music” (C2F2). In summation, only one of nine activities selected by this cohort involve “Connecting.”

Cohort 1. For Question 11, participants were asked, “During a long trip (plane, car, etc.) what do you do?” Participants in Cohort 1 (three interviewees born after December 1999) responded that they enjoy reading, playing games, listening to music, being online, and something else (not listed). For example, Cohort 1 participants shared they enjoyed “being online . . . Yes” (C1M1), “listening to music” (C1M2), and “reading or being on a computer-phone” (C1F1).

For Question 12, participants were asked, “Which of the #11 activities would you do most (time) for the trip?” The participants from Cohort 1 replied “iPad, . . . Yes” (C1M1), “listening to music” (C1M2), and “being on a computer” (C1F1). In summation, a majority six of nine activities selected by this youngest cohort involve “Connecting,” thus suggesting confirmation of the proclivity for this particular cohort (see Table H15 in Appendix H).

For participants in the youngest Cohort 1 and cusp Cohort 2, there was a significant preponderance of preference for “Connecting” regularly and often in the digital environments available to the participants, while the oldest Cohort 3 showed a marked contrast in this preference. Data from this study provided further information in topics specific to refining the thematic area of the “Connecting,” in that the participants preferred to contact-communicate with friends online (i.e., to use text-SMS and/or social media-messaging to hangout, to converse, and/or to arrange face-to-face meetings) in all 12 instances.

None of the 12 participants in this study preferred to “use phone calls” with friends (i.e., to hangout, to converse, and/or to arrange face-to-face meetings). There was significant preponderance preference for “Connecting” regularly and often in the digital environments available to the participants. This preference was consistent for all three cohorts of participants in this study.

Texting (SMS) and emailing. Participants’ responses in the thematic area of “Texting (SMS) and/or Messaging as opposed to Emailing” are presented in Tables H16 to H18 in Appendix H. Participants were asked what terms they use and what they believe they do. This information was collected prior to the exercise, which requested they keep exact numbers of contacts specific to the types of communication over several days.

According to actual send and receive data collected in the order and manner described, all 12 participants used text and/or messaging, as described above, more than email. They also all replied significantly more often to text- and/or messaging contacts. Tables H19 to H21 in Appendix H present participants’ data relating to sending and receiving data.

All 12 participants sent and received more actual text (SMS) than email contacts with friends. For the six participants who used social media messages with friends as well, they also messaged in those apps more often than emailed. Participants also considered email to be primarily for more formal-official communication in 11 of 12 instances, with one participant providing no response.

In summation, the youngest Cohort 1 consistently favoured instant/text messaging, while the other older two cohorts varied in this preference. This suggests a difference in perceived preference for the cohorts born before 1997 and those born after 1997. Those born after 1997 (a) preferred, persistently, shorter intervals between being connected, and, therefore, supported the Bullen et al. (2011) analysis for potential digital natives and (b) preferred receiving texts/messages to email. The data gathered, therefore, in part supports Bullen et al.'s analysis for potential digital native preference for instant results.

Members of Cohort 2, born after December 1996 but before January 2000, produced minor variations, but predominantly were congruent to the Cohort 1 results in both of the above categories. The preponderance of these two cohorts, therefore, support the Bullen et al.'s (2011) analysis that digital natives prefer being connected and to some degree confirmed the preference for receiving instant results. These results seem to adhere to the proposition presented by Prensky (2001a, 2001b) and the research of Linne (2014) and, more recently Teo (2013, 2016).

Visual and textual organizers. Participant data in the thematic area of “Visual and Textual” preference are presented in Table H22 in Appendix H. This suggests a difference in perceived preference for the cohorts born before 1997 and those born after 1997. Those born after 1997 preferred visual (photo or graphic) organizers, while three of the four participants

born before 1997 preferred textual (word-only) organizers. The preponderance, nine of 12 total participants, therefore, supported the Bullen et al.'s (2011) analysis that the "older" Generation Y trend is toward "Working with Images rather than Text." However, a potential anomaly does seem to exist in that a significant portion of the population, and those closest to the age of cohort researched by Bullen et al. (2011), Linne (2014), and Teo (2013, 2016), did not confirm this thematic area (see Tables H22 and H23 in Appendix H).

Instant results. Participants' responses in the thematic area of the "Length of Video (preferred)" are presented in Table H24 in Appendix H. This suggests a confirmed significant difference in perceived preference for the cohorts born before 1997 and those born after 1997 (see Tables H24 and H25 in Appendix H).

The data gathered suggests a difference in perceived preference for the cohorts born before 1997 and those born after 1997. Those born after 1997 preferred, persistently, shorter intervals between communication and/or between the onset and completion of communications. As such, participants, therefore, in part seem to support the Bullen et al.'s (2011) analysis for potential digital native preference for instant results.

Cohort 2, born after December 1996, but before January 2000, produced minor variations; however, these were predominantly congruent to Cohort 1 results in both of the above categories. The preponderance of these two cohorts, therefore, supported Bullen et al.'s (2011) analysis that digital natives prefer receiving instant results. These results seemingly adhere to the proposition presented by Prensky (2001a, 2001b) and the more recent research of Linne (2014) and Teo (2013, 2016).

Data Not Supporting Anticipated Themes

Data applied inductively to the effect of calling into question Bullen et al.'s (2011) and Bullen and Qayyum's (2014) analysis list of digital native traits. The results strongly foreshadow a potential refined understanding of the current generational cohort of learners.

Computers and hardcopy books. Participant data in the thematic area of the “Computers over Hardcopy Books” in the specific field of “Computer-Online and Hardcopy (course) Textual Materials” are presented in Tables H26 and H27 in Appendix H. This suggests a notable difference in perceived preference for the cohorts born before 1997 and those born after 1997, while the preponderance overall favoured computer-online course – textual materials.

Participant data in the thematic area of the “Computers over Hardcopy books” in the specific field of “Computer-Online and Hardcopy Story (Book) Materials” are presented in Tables H28 and H29 in Appendix H. This suggests no significant difference in perceived preference for the cohorts born before 1997 and those born after 1997. These results indicated the “Computer over Hardcopy books” preference, evidently prevalent in the older Generation Y data, was not consistent with the story (book) preference expressed in the younger Generation Z participants of this study.

Multitasking: Play and work. Data from this study provided information in a variety of topics specific to the thematic area of the “Play and Work.” The participants in this study defined “Play and Work” (in their own words), as discussed in the paragraphs that follow.

Cohort 3. For Question 7a, participants were asked, “How do you know you’re working online?” Participants in Cohort 3 (three interviewees born prior to December 1996)

responded with the following statements: “If I am learning something new or furthering my goal” (C3M1), “there would be no chatting app . . . only assignments and documents open to work on” (C3M2), and “Learning or working will often involve further research and more ‘brain power.’ I often feel more focused, and am unable to multitask as effectively” (C3F1).

For Question 7b, participants were asked, “How do you know you’re playing online?” Participants from Cohort 3 shared the following responses:

- “If I am just having fun” (C3M1).
- “Music . . . videos . . . whatever I want but no assignments or homework” (C3M2).
- “Much less focus required. More relaxed, no extensive research, multitasking is easy, and it feels, often, more time consuming” (C3F1).

Cohort 2. For Question 7a, participants were asked, “How do you know you’re working online?” Participants Cohort 2 (three interviewees born after December 1996 and prior to December 1999) provided the following responses:

- “When I am doing homework, I’ll have a number of tabs open about different topics I’m working on and usually a word document too” (C2M1).
- “When I sit down with a task to complete and the objective of completing it” (C2F1).
- “Well, work and learning are normally not as mind numbing, and requires you to think” (C2F2).

For Question 7b, “How do you know you’re playing online?” Participants from Cohort 2 shared the following responses:

- “I’ll have more social media type websites open like YouTube, Twitter or Reddit. Maybe some news sites. I’ll have Steam (gaming service) open and maybe a game running in the background or downloading” (C2M1).
- “When what I’m doing is fun and doesn’t serve any real purpose” (C2F1).
- “You can tell when you are playing a game because of the repeated actions, and no real thought put into it” (C2F2).

Cohort 1. For Question 7a, “How do you know you’re working online?” participants from Cohort 1 replied, “When I get some information while I’m working” (C1M1), “When you are thinking,” (C1M2) and “I have what I’m working on open” (C1F1).

For Question 7b, participants were asked, “How do you know you’re playing online?” Participants from Cohort 1 replied, “When it’s really simple and addicting” (C1M1), “You are not really [*sic*] thinking” (C1M2), and “I have what I’m playing open” (C1F1).

Additional data from this study provided further information in topics specific to the thematic area of the “Multitasking: Play and Work.” This information is presented in Tables H30 to H32 in Appendix H.

There was consistent preference for “Games and/or Social Media” as the predominant forms of play. Only two of 12 participants (both females) played no games, while games predominated at the youngest ages and social media predominated at the oldest ages. In summation, the data suggest all three cohorts had a clear understanding of the differences between online work and online play.

Multitasking: Play. Data from this study provided further information on topics specific to the thematic area of “Multitasking Play.” The participants in this study perceived

play as multitasking (i.e., as in, having more than one device and software platform open and in use simultaneously), as shown in Tables H33 to H35 in Appendix H.

Some participants connected play to multitasking to issues and/or potential issues resultant from these forms of play and/or multitasking. From Cohort 1 (those born after December 1999), three participants, all male, strictly limited multitasking and/or abstained from multitasking at all because it is “hard” and/or exhausting and/or potentially addictive. From Cohort 2 (those born before January 2000 and after December 1996), two participants, both female, limited the amount of time and restricted the “time of day” when they multitask, citing the potentially addictive qualities and the need to be rested and/or to be able to focus effectively in order to multitask. Participant C3F2, a female from Cohort 3 (those born before December 1996), described work-related multitasking as both less effective and more time consuming.

Working in groups or teams. Data from this study provided further information on topics specific to the thematic area of the “Working in Groups or Teams.” This information is presented in Table H36 in Appendix H.

Summary

The data founded in deductive analysis supported the anticipated proclivities-preferences in the thematic areas of being connected, texting (SMS) and emailing, visual and textual organizers, and instant results. In contrast, data founded in inductive analysis did not support the anticipated proclivities-preferences in the thematic areas of computers and hardcopy books, multitasking, and working in groups and teams.

Data founded in inductive analysis suggest unanticipated proclivities-preferences and, therefore, new future research agenda items in the thematic areas of defining work and play,

technology-mediated environments, tools versus toys, connecting with friends-peers, and respect-role models. Chapter 6 will focus on the analysis and interpretation of the study results.

Chapter 6: Discussion of Results

The purpose of this qualitative case study was to explore the perceptions, beliefs, and proclivities of the participating adolescent cohort of learners (i.e., with dates of birth of ranging from before December 1996 to after December 1999 in three discrete age-distinguished, yet contiguous cohorts) with respect to digital media applications and their day-to-day usage of digital media.

This chapter begins with a recap of the research questions, a discussion of the major themes that surfaced in the literature, as well as a review of the participants. The inquiry results are then discussed in three primary sections, each presenting results unique to the categories of (a) data supporting anticipated themes, (b) data not supporting anticipated themes, and (c) data proposing unanticipated themes. The data that drove the construction of these three categories include both the first-phase data gathered from the focus groups and the second-phase data gathered from the semi-structured interviews.

It is important to note that the empirical evidence in this study was based (a) on preponderance, or significant proportion, of the aggregate cohort (i.e., the critical mass of the age grouping of the participants) and (b) on textured data collected during both focus groups and interview processes, as outlined in Chapter 4 of this paper. This chapter concludes with a summary of the key findings.

Research Questions

The primary research questions for this qualitative case study investigation were the following: (1) What characteristics, preferences, and/or proclivities make Generation Z different from earlier generations? And (2) What changes to the education systems should be considered, given the technology proclivities of this “Generation” Z? The focus of this

study was to explore the hypothesis that a new generational group of learners now does exist for whom early access and use of digital media technology has created a paradigm, as defined by Kuhn (1962), that is, in effect, digitally native.

The rationale for this study was that the development of learning experiences to use the technological proclivity of Generation Z should encourage enhanced learning for this age cohort. Within this context, a sub-question was derived from the inquiry into the research problem and the related literature:

1. What characteristics, preferences and/or proclivities make Generation Z different from earlier generations?

In elaborating on the potential of the construct of digital natives (Prensky, 2001a, 2001b), it seemed reasonable to employ as a starting point the context of the seven thematic areas applied in Chapter 5.

As noted earlier in the report, the study included the following three cohorts:

- Cohort 1 – those born after December 1999,
- Cohort 2 – those born before January, 2000, and after December 1996, and
- Cohort 3 – those born before December 1996.

The established literature set the watershed year for the Internet, in terms of growth and establishment as a reasonably accessible entity, at or around the market penetration designation of 1997 (Abbate, 1999; Zakon, 2010). The year 1997 also is the approximate midpoint for births for those participating in this study.

In the area of Connecting, as outlined in more detail previously in Chapter 5, the three cohorts displayed quite distinct levels of patience-impatience with being offline. Cohort 1 demonstrated the least patience, extending to 1.5 days during holidays, and 3 hours during

school days. Aside from the lack of REM sleep this latter tendency indicates, which needs to be researched in more detail, there are clear indications here of addict-like behaviours.

Cohort 2 demonstrated more patience, to a point, extending to 5 days, and 6.5 hours, during holidays. Cohort 3 demonstrated still more patience, extending to 10.3 days, and 10 hours, during holidays. These variations are consistent with expectations and recognized traits-proclivities for the age cohorts as defined: Cohort 1: Generation Z – digitally native; Cohort 2: Onset Generation Z; Cohort 3: Cusp of Generation Y-Generation Z (i.e., see Appendix I).

In the area of Multitasking, all three cohorts displayed a firm grasp of the concept and its relationship to their lives, demonstrating clarity in distinguishing multitasking during play from multitasking during work processes. They further demonstrated caution when multitasking for any length of time, to the point of limiting the amount of multitasking and even the time of day when they engage in activities rooted in this area of function (i.e., Cohort 3: cusp of Generation Y-Generation Z).

In the area of Working with Images rather than Text, Cohorts 1 and 2 displayed congruent alignment, while Cohort 3 (i.e., cusp of Generation Y- Generation Z) was uncertain and less focused. This congruence within Cohort 1 and Cohort 2, in part, may well explain the growth market amongst the younger demographic in graphic novels and television-movie productions founded in this format of literature.

In the area of Receiving Instant Results, Cohorts 1 and 2 were consistently aligned while Cohort 3 was divided in opinion. This pattern repeated, as logic would dictate, in the area of Text Messaging versus Email.

Discussion of Findings in Relation to the Literature

The most significant incongruence between the research and the literature was the thematic area of “Working in Groups or Teams,” as all 12 participants expressed preference for working-studying on their own. Despite the seeming accuracy, therefore, across a spectrum of traits and/or proclivities in the writings of Carr (2001), Nellen (1999), Oblinger and Oblinger (2005), Posnick-Goodwin (2010), Rosen (2010a), Tapscott (2008), and Wendover (2010), this research found that generalizations with respect to working in groups or teams and Generation Z are not supported.

A second major incongruence was the preference for Computers over Hardcopy books, with computers preferred by all three cohort for studies, but hardcopy books preferred by all three cohorts for stories.

Deslauriers, McCarty, Miller, Callaghan, and Kestin (2019), in a 2018 study, found their data confirmed this preference. In their study, 540 first-year undergraduate physics students, split into two equal groups, clearly indicated a proclivity for individual (lecture style) learning as opposed to active (team) style learning (Deslauriers et al., 2019, p. 19251). This proclivity was clear even though students from both groups in fact learned significantly more from team-based learning challenges than from lectures (Deslauriers et al., 2019, p. 19251)—another example of proclivities as opposed to learned skills and applications. The Deslauriers et al. study (2019), unlike so many studies earlier in this decade, was conducted with age-appropriate participants, from Onset Generation Z and Generation Z cohorts (i.e., see Figure 11 in Chapter 6 and Table II in Appendix I) of this doctoral study.

Data Proposing: Unanticipated Themes

Data, when applied, called into question Bullen et al.'s (2011) and Bullen and Qayyum's (2014) list of digital native traits. The results strongly foreshadow a potential refined understanding of the current generational cohort of learners.

Defining work versus play. Data from this study provided further information on topics specific to the thematic area of the "Defining Descriptions for Play and Work." Table H7 in Appendix H presents participants' perceptions relating to play as multitasking (i.e., having more than one device and software platform open and in use simultaneously). Consistency was evident also in 'being comfortable offline': with 50% of participants born 1996 or earlier, indicating comfort; 25% of participants born 1966-1999 indicating comfort; 25% of participants born post-1999 indicating comfort. This consistency pattern held through many facets of the data gathered, as can be seen in the Appendices indicating data collected.

Participants perceived that play as multitasking is neither unduly tiring nor addictive nor potentially addictive. From Cohort 1 (those born after December 1999), one participant, a female, expressed no concerns with respect to multitasking play. From Cohort 2, two participants, both males, expressed no concerns with respect to multitasking play. From Cohort 3 (those born before December 1996), all four participants expressed no concerns with respect to multitasking play. However, one participant, a female (C3F1), did express concerns with respect to multitasking work. The data suggest, while opinions are divided nearly in half amongst the participants, patterns of perception do emerge within age cohorts and, perhaps, to some minimal extent, according to gender.

Technology-mediated environments: Tools versus toys. Data from this study provided further information in topics specific to the thematic area of the "Selection of Tools

and Software and/or apps.” Participants’ responses related to these themes are presented in Tables H38 to H39 in Appendix H.

Participants consistently preferred and had an equally consistent tendency to select digital media with intention. These proclivities are demonstrated clearly by a majority (50% or more) proportion of participants in all three cohort groupings.

Connecting with friends-peers. Data from this study provided further information in topics specific to refining the thematic area of the “Connecting with Friends-Peers.” Participants’ responses are presented in Tables H40 and H41 in Appendix H.

There was a significant preponderance of preference for “hanging out” regularly and often in the face-to-face environment. This preference was consistent for all three cohorts of participants in this study.

Data from this study provided further information in topics specific to refining the thematic area of the “Connecting with Friends-Peers.” The participants in this study defined “their preference for extended online versus extended face-to-face time with friends” (in their own words), as discussed in the paragraphs that follow.

Cohort 3. For Question 8, participants were asked, “Do you [prefer online] or [prefer face-to face communication] and why?” Participants in Cohort 3 shared the following responses:

- “Online... because it’s easier” (C3M1).
- “Face-to-face... it’s more hangout when possible” (C3M2).
- “Face-to-face... I enjoy human connection, and face-to-face interaction. It’s easier for me to communicate that way, and you are able to bond in different ways

as well as, in my opinion, have more personal and in-depth conversations”
(C3F1).

Cohort 2. For Question 8, participants were asked, “Do you [prefer online] or [prefer face-to face] and why?” Participants from Cohort 2 offered the following responses:

- “Face to face . . . I don't really like the way social media affects conversation and relationships. I also don't have a Facebook account, and many of my friends mainly use Facebook for online conversations. . . . I'm proud of keeping face-to-face energy” (C2M1).
- “Face-to-face...This is because when I am online I tend to say everything as fast as I can, but in person I take time to spend time with them” (C2F1).
- “Online...I have more friends online then I do offline, and they generally aren't busy” (C2F2).

Cohort 1. For Question 8, participants were asked, “Do you [prefer online] or [prefer face-to face] and why?” Participants from Cohort 1 provided the following responses:

- “Face-to-face . . . because online you won't be able to hear very good (or if texting you won't easily understand what your friend is trying to say)” (C1M1).
- “Face-to-face . . . because I like to see them” (C1M2).
- “About equal . . . I don't go to school so I don't see my friends there but I see them after & at school” (C1F1).

Despite a significant preponderance of participants who preferred to connect online with friends, at least initially, a significant number expressed a preference for “hanging out” regularly and often with friends in the face-to-face environment. These preferences were consistent for all three cohorts of participants in this study.

Respect – role models. Data from this study provided further information in topics specific to refining the thematic area of respect-role models. All interviewees in this study (i.e., the nine individuals who took part in the interviews only) were asked who they respected the most, and all nine participants stated that they admire their parents. In contrast, none of the interviewees expressed a preference to admire their siblings. With respect to celebrities, none of the nine interviewees indicated they admired “celebrities” (i.e., any celebrity of her-his choice).

There was a significant preponderance expressing Respect for their parents as opposed to either their siblings and/or public celebrities. This preference is consistent for all three cohorts of participants in this study.

Summary Discussion

In summary, this study provided findings, as outlined above, that speak to the paucity of recognizable, early decade research into Generation Z and the proclivities of this age cohort. Some publications (e.g., Thompson, 2012) persist in this pattern, whereas Linne’s (2014) work represented a transition in thought, culminating in Teo’s (2016) research, with their profound relevance to this doctoral study.

The main purpose of this study was to investigate the possibility that a generation does exist for whom early access to and use of digital media technology has created a paradigm, as defined by Kuhn (1962) that is, in effect, digitally native. The hypothetical framework was (a) increased insight into this generation (i.e., Generation Z) should assist educators in developing appropriate learning experiences and that (b) developing learning experiences to use the technological proclivity of Generation Z better should encourage

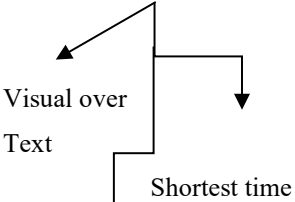
enhanced learning for this age cohort. Within this context, research questions had been derived from the inquiry into the research problem and the related literature.

The data collected during this doctoral study can be summarized as follows. Data supported the anticipated proclivities-preferences, from the literature, in the thematic areas of being connected, texting (SMS) and emailing, visual and textual organizers, and instant results. Data did not support the anticipated proclivities-preferences in the thematic areas of computers and hardcopy books as well as multitasking and working in groups and teams.

Data suggested unanticipated proclivities-preferences, that is, information not found in the literature, suggesting new future research agenda items in the thematic areas of defining work and play, technology-mediated environments, tools versus toys, connecting with friends-peers, and respect-role models. These data also form a rationale that suggests support for the original overall constructs of Prensky (2001a, 2001b) across a preponderance spectrum of the thematic areas, while the participant cohorts, with their preponderance congruence in terminology and beliefs, met the criteria of “age location” (Howe & Strauss, 2007, p. 45) as a generation-age cohort grouping.

Study Participants Generation Z Framework

The data collected during this doctoral study is summarized in Figure 11.

Cohort (Birth Years)	Thematic Factors (Proclivities-Preferences)*	Digital Media Access	Generation Z Variance
Cohort 1 Born post 1999	Connected (with) 	Probable Full Access-Exposure to Digital Media – Internet during ‘Early Learning’ Development Phases as established by	Generation Z

	<p>Comfortable Offline</p> <p>Computer 'Online' Text-Study Materials</p>	Piaget (1952) and Kolb and Fantie (2011)	
<p>Cohort 2</p> <p>Born 1997 - 1999</p>	<p>Connected (with)</p> <p>Visual over Text</p> <p>Moderate time Comfortable Offline</p> <p>Computer 'Online' Text-Study Materials</p>	<p>Possible-Potential Full Access-Exposure to Digital Media – Internet during 'Early Learning' Development Phases as established by Piaget (1952) and Kolb and Fantie (2011)</p>	<p>Onset Generation Z</p>
<p>Cohort 3</p> <p>Born 1994-1996</p>	<p>Connected (with)</p> <p>Text over Visual</p> <p>Longest time Comfortable Offline</p> <p>Traditional Hardcopy Text-Study Materials</p>	<p>Possible Limited Access-Exposure to Digital Media – Internet during 'Early Learning' Development Phases as established by Piaget (1952) and Kolb and Fantie (2011)</p>	<p>Cusp of Generation Y – Generation Z</p>

Figure 11. Graphic representation of the study data by cohort, thematic factors, digital media access, and Generation Z variance.

The results outlined and discussed during this chapter indicate by a clear preponderance of evidence that the responses from the participants of the study, all of whom Mitchell (2008) described as Generation Z (i.e., given their dates of birth between 1993 and 1999), exhibit elements of the paradigm expected of the first digitally native cohort.

This strongly suggested trend will need to be examined in a more rigorous and focused research agenda. There is a paucity of research publications in the area generally and more study will be required to substantiate (a) whether or not this seeming proclivity exists and, most certainly, (b) how to nurture, develop, and utilize this proclivity (or these proclivities) in fostering the learning potential for a generational grouping who are the majority of learners for school (i.e., K-12) and postsecondary coursework, plus employment training, for the foreseeable future.

The analysis of the responses also yielded a number of recommendations, including this pressing need for more research, which will be addressed in the final chapter of this study. Chapter 7 will emphasize the conclusions from the discussion of the results, the practical implications of the results, and the recommendations supported by the data in the study.

Chapter 7: Conclusions and Implications

The purpose of this chapter is to present the researcher's conclusions and discuss the implications of the research. The chapter is structured to provide outlines of the (a) discussion of the results of the research, (b) data summary by thematic area, (c) significance of the study, (d) conclusions from the discussion of the results, (e) practical implications, and (f) limitations of the study.

Recommendations supported by the data in this recent decade study will be refined and published following further (post-doctoral) research

Study Results

Prensky (2001a) coined the phrase digital natives, providing North American culture with a construct demanding of our attention because of the implications. Arguably, he was too early in 'history,' working with an inappropriate generation (i.e., an age cohort too old to have been exposed to digital media early enough in their personal learning development to qualify, under his own construct) to be digital natives.

The critique of Prensky's (2001a) error, and the resultant ongoing debate, may have led other researchers to be reluctant to pursue studies in this area. Regardless of the reason, there is a paucity of recognizable, early 21st century appropriate evidence-driven research in the area of Generation Z generally and in the thematic areas of potential digital preferences or proclivities in particular. This circumstance, created and nurtured by arguably poor scholarship, by a succession of researchers making the same error as Prensky (2001a)—focusing on cohorts of individuals who were too old and, therefore, exposed too late in their intellectual development to digital media. This created a void of understanding at a time when it was needed most.

The core literature that drove this study provided a set of tendencies and preferences to be examined. By sampling cohorts that were too old, (See Figure 11; pp 143-144, above), in fact their own students at the times of study, with the attendant issues outlined, (Bullen et al., 2011; Bullen & Qayyum, 2014) and (Carr, 2001; Nellen, 1999; Oblinger & Oblinger, 2005; Prensky, 2001a, 2001b; Wendover, 2010), along with other researchers failed to establish a literature base amenable to use. While in some instances, by treating research results as proprietary and not making the data available (Prensky, 2001; Rosen, 2010a; Tapscott, 2008), the researchers advocating the construct established credibility concerns exploitable by those skeptical to Prensky's (2001a, 2001b) construct.

Nevertheless, this core research did supply a potentially anticipated set of proclivities, preferences, and traits for a cohort of digitally native learners. This set of proclivities, preferences, and traits have most recently been explored by Linne (2014) and Teo (2013, 2016), and the empirical fNIRS research of Chojak (2019) supported by several other researchers (Cipora et al., 2014; Gogolak, 2013; Kostyrka-Allchorne et al., 2017; Masataka et al., 2015; Takeuchi et al., 2015, 2016; Wobe, 2013), as well the findings of this doctoral study.

Treating these proclivities, preferences, and traits as thematic areas, in an exploration of the current adolescent-age cohort, at the time of this study (e.g., conforming to the parameters of Generation Z), the results of this study suggest digitally native learners are connected via digital media, prefer text messaging over email and talking, would rather work with images than text, and prefer instant results. These are discussed in the subsections that follow to help establish new baseline recommendations from which educators, teachers, and researchers might work.

Connected. With an overwhelming consensus, participants of this study discussed being connected (i.e., interacting online via the Internet) as a positive facet in their respective lives. Substantiating this perception is the consensus of preference for online activities across a range of times, circumstances, and opportunities. This result suggests the core literature was accurate, if anticipatory, in projecting potential proclivities of a generation (i.e., age cohort) of learners.

With a similar degree of consensus, participants acknowledged a discomfort attendant to not being connected (i.e., to not checking in or interacting online) for quite remarkably short periods of time (i.e., for intervals less than 10 hours on average).

Although the youngest cohorts, those born around and after the watershed year of 1997, demonstrated this discomfort after short intervals of not being connected (e.g., “a few hours” for Cohort 1; “3 weeks” for Cohort 3), sometimes considerably shorter intervals as the sample responses above indicate, the group as a whole (i.e., all three cohorts) showed similar responses to not being connected and, invariably, sought out interaction online almost every time the opportunity arises. This study suggests, therefore, that the current age cohort of adolescents and secondary school students are, as predicted by earlier researchers in this field (Carr, 2001; Nellen, 1999; Oblinger & Oblinger, 2005; Prensky, 2001a; Rosen, 2010a; Tapscott, 2008; Wendover, 2010), connected by preference and proclivity to digital media devices; this is now supported by Linne (2014), Teo (2013, 2016), and the empirical fNIRS study results (Chojak, 2019).

Text messaging over email and/or talk. None of the study participants preferred to talk on the phone, whether that be to interact for prolonged periods (i.e., to hangout) or to arrange for prolonged interaction. The literature was accurate in that voice contact over the

phone is not the preferred method for this age cohort (Bullen et al., 2011; Linne, 2014; Teo, 2013, 2016).

The participants in this study texted (i.e., SMS) with friends and peers. They also used social media messaging, with the older participants in this study usually being the more comfortable in this latter format than the younger participants. Regardless of age, however, as predicted in the literature (Posnick-Goodwin, 2005; Prensky, 2001a; Rosen, 2010b; Tapscott, 2008; Wendover, 2010), and now supported by Linne (2014), and Teo (2013, 2016), the participants in this study used text (i.e., SMS) more frequently than any other medium.

The participants do, with significant preponderance, prefer prolonged interaction to be face to face—after using text (i.e., SMS) to arrange these interactions—and this does suggest that talk, as applied by some observers (Bullen et al, 2011; Bullen & Qayyum, 2014), may need more careful construction of parameters for the sake of future research. However, while talk via phone is no longer the proclivity of adolescents, talk continues to flourish amongst those participants stating the preference ‘to hangout’ face to face.

The participants in this study also perceived email in a particular manner. Email is for formal communication. While useful in specific situations, it is not a medium of choice for communicating most messages, and certainly not for communicating with friends and peers.

One item to note, potentially of some significance, the researcher of the current study used email to invite the prospective participants to join the inquiry, with many of the prospective participants not responding. Anecdotally, the representatives from the host institution indicated email response rates from students were low overall.

Therefore, while the concept of talk needs greater care in application, it would seem that the recent decade's age cohort of adolescents and secondary school students have, as predicted by researchers (Bullen et al., 2011; Carr, 2001; Linne, 2014; Nellen, 1999; Oblinger & Oblinger, 2005; Prensky, 2001; Rosen, 2010b; Tapscott, 2008; Teo, 2013, 2016; Wendover, 2010), a preference and proclivity to text message rather than email and/or talk.

Working with images rather than text. The significant majority of participants in this study were in favour of working with images rather than text. Although two thirds of the oldest participant cohort (i.e., Cohort 1: participants born before December 1996) selected text (i.e., word-only) options, the remainder of the participants and, therefore, the significant preponderance of overall participants, chose visual (i.e., photographic or graphic images) in preference to text. Therefore, the recent decade's age cohort adolescents and secondary school students are, as researchers predicted (Bullen et al., 2011, Carr, 2001; Nellen, 1999; Oblinger & Oblinger, 2005; Rosen, 2010a; Tapscott, 2008; Wendover, 2010) and now supported by Linne (2014), and Teo (2013, 2016), working with images rather than text by preference and proclivity on their digital media devices.

Prensky (2001a) argued specifically that digital natives “prefer their graphics before text rather than the opposite” (p. 2). The results of this study indicate Prensky's (2001a) prediction of this context adaptation was accurate. The semi-structured interview sessions of this study, at the closing, offered participants the opportunity to send along an email with any additional thoughts they were comfortable sharing (see Appendix E). In response to this, one study participant (a member from Cohort 1, the born post-1999 age group) sent one extra email that included a link to a short video, with no textual or spoken component on the video or in the body of the email itself. It now is common practice amongst the digitally native to

do this (i.e., in the form of memes and related activity), in a deliberate attempt to promote conversation, based solely on the video content, or graphic-image content, with no other cues to establish the frame for the conversation. While these were outlier data, they may be considered indicators that at least some of the most consistently ‘digitally native’ cohort (i.e., Cohort 1), as outlined in this study, are actively pursuing the creation of more sophisticated virtual content-responses.

In their work, van den Beemt et al. (2011) discussed a platform that opposed Prensky’s (2001a) construct. Their results demonstrated “radically different patterns of knowledge creation and sharing for (students in) a wide range of educational levels” (van den Beemt et al., 2011, p. 113).

The findings of this doctoral study, supported by Linne (2014), Teo (2013, 2016), and Chojak (2019), strongly suggest that while van den Beemt et al.’s (2011) statement re learning proclivities may be accurate for older cohorts, it is not true for the Generation Z digitally native learners. This confusion results, perhaps, from van den Beemt et al.’s using their own students, of a ‘too old’ age cohort, for their study. Data gathered during the recent study may not be substantial, but other sources now clearly indicate the pattern that is evolving. An example is the work of a group of early recent decade secondary school students, who in response to a series of suicides amongst their peers, produced and shared their own video on the topic of suicide (Koyczan, 2012) and the outcome was that the incidents of suicide stopped (Koyczan, 2012). In 2011, a series of suicides amongst secondary school students in the Comox Valley, BC, came to a conclusion (“Cluster of B.C. Teen Suicides,” 2011), when the local secondary school students had developed a video and visual presentation campaign, which they toured through the schools in community (“Cluster

of B.C. Teen Suicides,” 2011). These are but a few of the instances of knowledge creation and sharing in graphic-visual format developed and shared by this early recent decade’s secondary school students.

Receiving instant results. Prensky (2001a) argued the Internet, cell phones, and instant messaging are integral to the lifestyle of digital natives. The preponderance of participants in this study demonstrated these predicted preferences and proclivities. They unanimously subscribe to the use of the Internet and cell phones, while the majority of the older cohorts also use instant messaging or social media a significant amount of the time.

Text messaging is another unanimous preference, supported by substantial activity records from the participants, as several researchers predicted (Bullen et al, 2011; Carr, 2001; Nellen, 1999; Oblinger & Oblinger, 2005; Rosen, 2010a; Tapscott, 2008; Wendover, 2010), and now supported by Linne (2014), Teo (2013, 2016), and Chojak (2019), which substantiates this preference for receiving instant results because texting or SMS is quicker (i.e., seemingly instantaneous) to send and to receive than email.

In addition, in related data, the preponderance of participants preferred videos of 1 minute or less, and all participants preferred videos of 5 minutes or less to those 7 minutes or longer. As predicted in the literature, therefore, it would seem that the recent decade’s age cohort of adolescents and secondary school students prefer instant results whenever possible.

Generation Z analysis. Mitchell (2008), as outlined in the Literature Review of this study (see Chapter 2), chose the term Generation Z in outlining the proclivities and preferences of the then youngest age cohort in a distinguished medical publication. The suggested onset of Generation Z was further refined in this study, although it should remain a subject of further research to formally establish the precise onset date with more certainty

given the apparent importance of this transformation in learner proclivities, strengths and potential aptitudes.

Generation Z has become a designation of more widespread application in recent years. As has a wide range of other possible designations, developed, as usual in our culture of late, from marketing as opposed to scholarly sources. The criticism for this lies more with scholars than with marketers, however, as the paucity of recognized research literature indicates marketers have done more research into this latest age cohort than have scholars.

Generation Z does seem the logical extension of a sequence based on the broadly accepted Generations X and Y designations for the previous two generational cohorts. Generation Z also accommodated the age (i.e., dates of birth) range for the cohorts of the participants for this study.

This study included the following three cohorts:

- Cohort 1—those born after December 1999,
- Cohort 2—participants born after December 1996 and before January 2000, and
- Cohort 3—those born before December 1996 but after December 1993.

The established literature sets the watershed year for the Internet, in terms of growth and establishment as a reasonably accessible entity, at or around the market penetration designation of 1997. This date also is the approximate midpoint for births for those participating in this study.

Given that the Baby Boomlet, starting, albeit gradually, in 1974, most logically conforms to the onset of Generation Y, the onset of 1993 to 1995 for Generation Z conforms to the traditional anthropological construct of 15–20 years between procreational generations (Harper, 2010). It also conforms to the demographic congruence of a birth rate that crests and

begins to recede across the spectrum of the developed world between 1990 and 1994 (Information Please Database, 2007; Statistics Canada, 2019a).

It further appears to conform to the developmental stages of Piaget (1952), substantiated in apparent brain growth data (Kolb & Fantie, 2009), as connected to the linguistic simile of Prensky's (2001a) prediction, which in turn is supported as a reasonable proposition for learning patterns by Harley (1986, 1998) and later (Chojak, 2019).

The data from this doctoral study suggests the recent decade's age grouping of adolescents and secondary school students also are a coherent, consistent generation as defined by Strauss and Howe (1991). The participants in this study exhibited consistent preferences and proclivities in the thematic areas of being connected, preferring text messaging over email and talk, receiving instant results, and working with images rather than text. The inquiry participants also demonstrated preferences and proclivities, as a group, in a range of other thematic areas consistent with those listed above. They, therefore, share (a) beliefs and behaviours; (b) an age location in history, in that they have experienced the proliferation of the internet; and (c) a proclivity for self-identifying both in and outside of the thematic areas, in terminology, in understanding of concepts and constructs, and in applications of digital media (i.e., email use for older generational groupings, etc.) in the manner described by Strauss and Howe (1991) to be distinguishing traits for particular generations. The inquiry participants further distinguished themselves by drawing direct comparisons in these distinctions, such as identifying that email for them is the equivalent of letters, in formality and even in structure.

Several of the new potential thematic areas that have emerged from this study, all of which need more research to substantiate, also suggested this is a distinctive generation, in

that the participants take a particular approach to (a) defining work and play in digital media environments, (b) organizing and participating in interactions with peers and friends, and (c) identifying suitable subjects or individuals, deserving in their opinion of respect and (being) role models (i.e., their parents as opposed to celebrities). In addition, members of this generation (i.e., Generation Z) prefer to work alone, seemingly in contrast to the previous generation (Bullen et al., 2011; Bullen & Qayyum, 2014) who prefer to work in teams, and they (i.e., Generation Z) are clear and consistent in their applications of digital media devices as tools not toys.

Multitasking is not as consistent a preference or proclivity, certainly not to the degree the early century literature indicated should be anticipated. According to the literature (Bullen et al., 2011; Bullen & Qayyum, 2014; Carr, 2001; Nellen, 1999; Oblinger & Oblinger, 2005; Prensky, 2001a; Rosen, 2010b; Tapscott, 2008), multitasking could be a measurable benchmark for determining members of the digitally native cohort. The participants in this study were divided, to a considerable extent, by age within the overall generational grouping. However, there was only minimal congruence to the predictive literature for this thematic area. Further research to refine these apparent results is indicated strongly.

Another thematic area that may well prove to be generational, after further research, is that of computers over hardcopy books. Also proposed as a generational measure for digital natives (Bullen et al., 2011), the participants in this study demonstrated incongruence in both the type of reading involved and the specific age cohort preferences and proclivities. Further research into this cohort, and the cohorts following the participants of this study, in these thematic areas, may clarify the recent results.

Overall, however, this study explores an age cohort meeting the criteria of Strauss and Howe (1991) to be identified as a separate generation—in this instance, Generation Z. The participants supplied the data for the study. Clear preponderance preferences, proclivities, and activity patterns emerged, repeatedly, and withstood persistent analysis. The pattern that emerged, pending further research for clarity, and given the 3- to 5-year possible variance (Kick, 2005) in the onset of any generation as defined by Strauss and Howe (1991), might well see a framework of the type outlined below.

Data Summary by Thematic Area

This study explored the possibility that a generation of digitally native learners exists now in the education (i.e., K–12 and post-secondary) system and considered how best to delimit, define, and describe this generation for the purpose of improved support in their learning. Table I1 in Appendix I presents the thematic factors arising from this inquiry by Generation Z variance.

In preparation for the recommendations, the received data from the three cohorts of this study are summarized in the context of the thematic areas (see Table I2 in Appendix I). The data are then further summarized, founded in the comparison to the literature (see Table I3 in Appendix I) in order to better refine the overall thematic areas from this research.

Study Conclusions

Two main research questions drove this study. To wit: (1) What characteristics, preferences, and/or proclivities make Generation Z different from earlier generations? And (2) What changes to the education systems should be considered, given the technology proclivities of this “Generation” Z?

Both of these questions were derived from available literature and the main purpose of this study was to begin to explore the possibility that a generation does exist, and is progressing through formalized structures of education, for whom early access and use of digital media technology has created a ‘paradigm,’ as defined by Kuhn (1962), that is digitally native. The rationale was that (a) increased insight into this generation (i.e., Generation Z) should assist educators in developing appropriate learning experiences and (b) developing learning experiences to use the technological proclivity of Generation Z better should encourage enhanced learning for this age cohort.

With these questions and this rationale in mind, founded in the data, the results of this study suggest the following:

- Generation Z exists and there are indicators this particular age grouping might be the first digitally native cohort (See Appendix I, p 220, for data supporting the descriptors expected of these students, i.e., *Digital Natives*, by Prensky and others).
- Generation Z appears to have a structure of characteristics, preferences, and/or proclivities distinct from previous generations.
- Increased insight into Generation Z should assist educators in developing appropriate (technology-mediated) learning experiences and, therefore, enhance learning outcomes for both Generation Z and ensuing generations.

Leading to the conclusion that the literature on this topic area is potentially accurate (ie., Linne (2014) and Teo (2013, 2016), and the empirical fNIRS research of Chojak (2019), strongly indicating further research is recommended to more clearly define this age cohort,

clarify the characteristics, preferences, and proclivities of the cohort, and explore parameters for the optimum (technology-mediated) learning structures and experiences.

Practical Implications Supported by the Data in the Study

There is an ordinary green door in an ordinary hallway of an ordinary secondary school in an ordinary BC community. The door has no window. The sign on the door reads simply “Powered By XYZ.”¹ Opening the door, for observation research purposes, revealed a dimly lit space approximately 30 feet by 60 feet with two tiny windows along one end wall and four desks—two, spaced out along each sidewall. The desks are oversized in that each is fronted by an opaque plastic-like façade, rising about 18 inches above the usual front height of the desk to make dimensions of roughly 60 inches wide by 48 inches high. Any student entering this room cannot see through the opaque screen, so they have to approach a desk, and, because of the height of the façade, many students, especially those in Grades 8 and 9, must actually rise on tiptoe to find out if anyone is occupying the desk and then remain at full stretch to engage the occupant.

The sign on the door is meant to tell us—in a marketing, rather than in an educational, modality—that this is the school-based headquarters of the local digital media/virtual/online distance education organization. This is the interface space between traditional bricks-and-mortar education and digital media environment education, both of which are sanctioned and operated by the local school district.

¹ The exact wording of the sign in question.

It is an environment strongly in contradiction to the evolving reality for effective learning derived from the results suggested by this study, and the literature, in that these new generation (Z) learners should not be treated in an education setting, as an ‘afterthought’: an argument supported by other recent studies by Linne (2014) and Teo (2013, 2016), and the empirical fNIRS research of Chojak (2019), which was supported by prior research (Cipora et al., 2014; Gogolak, 2013; Kostyrka-Allchorne et al., 2017; Masataka et al., 2015; Takeuchi et al., 2015, 2016; Wobe, 2013). In that current learners in the system prefer simple surroundings, in order to focus on the online materials-content they are undertaking on their learning journeys.

Repeatedly, over the past decade, this school district in this ordinary BC community has used its official website to argue that the results of the distance education school (i.e., the digital media environment) should be excluded from the overall school district completion rates. This relates to, and demonstrates, that they were happy to accept the per pupil financial allotment for the courses offered but they wanted no responsibility for the results: thus distinguishing their online learners, in potential capability, from those in more traditional learning modalities.

Potentially addressing this seeming imbalance with the reality of current learners is a possible true significance of this doctoral study. The learners of this early recent decade’s age cohort at secondary school (i.e., Generation Z) are connected (i.e., active online), visual (i.e., prefer images to text), and intuitive-impatient (i.e., used to and looking for quick responses that create fewer, rather than more, impediments to their progress). All traits established as potential distinguishing characteristics in early literature on the topic broached by Prensky (2001a, 2001b).

This study explored the proclivities of the early onset of this cohort of learners (i.e., Generation Z), and the fact this sort of interface space exists as their primary link between what ‘was’ and what ‘now is’ reinforces the overall significance of this study. As predicted by Ambient Insight Research (2010), Carbol (2009), the Government of BC, Premier's Technology Council (2010), and the OECD (2010, 2019), resources are now being diverted from the traditional system of schools into technology mediated learning environments in a trend projected to grow. What could be said, as of the formal outset of this study, is that the oldest members of Generation Z were potentially between 14 and 18 years of age. This age range placed the possible eldest members of Generation Z in secondary school and starting to enrol in undergraduate classes over the ensuing few years as the transition to technology-mediated experiences was projected to increase, as it did, later in this current decade. According to Ambient Insight Research (2015), these predicted growth trends from early in the decade have been met, and in some instances exceeded. Moreover, continuing, increasing growth, was projected by 2020 (Ambient Insight Research, 2015) to reach an estimated \$24 billion transferred from traditional to technology mediated learning environments (Government of BC, n.d.-b).

More and more students, therefore, were entering that dark, hidden, and difficult-to-access interface space in order to blend their education.. Amongst the results of this situation are rooms like the one described previously, and, more fundamentally, completion rates in Canada for K–12 digital media learning environments that were frequently too low (Barbour, 2012, 2013; Barbour & Labonte, 2019): a statistical statement masking the reality of lost learning opportunities for students.

The findings of this study might be used by leaders who are in preliminary stages of exploring online-digital education for their organization. Additionally, the study could be useful for leaders of organizations who have implemented online–digital education with limited or little success. Data from this study also could prove useful for the modification of failed or marginally successful attempts at implementing online–digital education in organizations that embarked on such a project several years ago. This study might, and, hopefully will, help to create an environment in which research into the digitally native knowledge, skills, and aptitudes of age cohorts born around and after the watershed year of 1997 can be undertaken with support. Especially now, with COVID 19 precautions mandating virtual education where possible –making study of the phenomenon of the Digitally Native more of a priority than ever before.

Paradigm Shift

The paradigm has shifted. Kuhn (1962) coined the term and made popular the construct of paradigm shift. Articles as early as the *Report of the British Columbia Royal Commission on Education* (Sullivan, 1988) and other similar reports in every jurisdiction in the developed world have hinted at this expected paradigm shift, implying the shift would involve technology-computers, as is now occurring, and anticipating the potential affects and effects of the paradigm shift for education. Report after report failed to gain traction, and with each successive effort, the construct of a paradigm shift applying to education eventually became an increasing source of disillusionment. In part, it appears, this was because the generational-technology confluence needed did not yet exist.

That paradigm shift now appears to have occurred. The data from this study, and others (Teo, 2013, 2016), and more recently in the emerging area of Neuropedagogy

(Chojak, 2019, 2020) indicate the presence of a generational age cohort for whom digital media exposure, early digital media exposure, has occurred at the correct age for maximum integration into brain function-patterns (Kolb & Fantie, 2009; Piaget, 1952), creating a digitally native cohort of learners: who are also future educators, and the general population.

The implications are more emphatic and culture altering, directly affecting fields beyond education. It is culture altering, and the manifestations are becoming evident as digital media usage has grown ubiquitous. This study, however, was focused on (a) exploring the prospect of such a generation existing, as time passes and digital media affects-effects on earlier age groups becomes more prevalent and (b) examining, if needed, the appropriate parameters for the systemic transition of education. A much needed transition, which, arguably, should have been available to an entire generation that has moved through the education system in BC (and elsewhere) since Prensky first argued the existence of this generation in 2001.

The practical implication for this study, therefore, because there does appear now to be digitally native generations *in situ*, within the education system, as learners, and now as teachers, is that the shift to exploring appropriate parameters for systemic change is required. This is one, but by no means the only, manifestation implicit in accepting the new paradigm.

Limitations of the Study

The following limitations underlie this doctoral study:

1. The literature that served as background for the key topic of this study was itself limited.
2. The literature since this study was conducted continues to flourish (i.e., Chojak, 2019, et al., with their application of *Nfirs* studies leading to the explorations in

the new field of Neuropedagogy) creating substantive core value into an ongoing state of flux that is difficult to accommodate in one report.

3. Digital media and, in particular, digital media learning environment tools are in a constant state of flux.
4. The study focused on one institution in one Canadian province; therefore, the findings cannot easily be generalized.
5. As the participants were students enrolled in an online program at the time of the study, they may be more engaged with technology and more likely to use digital media-technology than their age peers in the general population; an element that should now, arguably, be redundant.

Recommendations Supported by the Data in the Study

Two main recommendations surfaced through this research. Each is discussed in the sections that follow.

Research. This study suggested more research is needed to further explore the following topics:

1. How can educators properly use Generation Z's digitally native proclivities in facilitating their learning?
2. What criteria should be applied in designing and implementing technology-mediated education environments for K–12 and post-secondary, students (i.e., Generation Z digitally native cohorts of learners)?
3. What criteria should be applied in establishing and assessing appropriate leadership in implementing effective technology-mediated learning environments

for K–12 and post-secondary students (i.e., Generation Z digitally native cohorts of learners)?

4. What criteria should be in place to accommodate this cohort of learners as they enter postsecondary education and/or employment training and/or become teachers and/or trainers?
5. What safety in online environments do educators need to be in place to accommodate this cohort of learners?

The evidence gathered through this study, and supported by recent literature (Chojak, 2019; Teo, 2013, 2016) and by de facto digital media usage by the current generation of learners, makes debate on this topic redundant. A transition is needed. Leaders and practicing teachers need information from reliable, tested sources regarding digitally native learners, as these students deserve the opportunity to utilize their knowledge, skills, and aptitudes in appropriate ways at appropriate intervals in their respective learning journeys.

Train and retrain educators and leaders. Anecdotal information and published studies demonstrated that the too common practice for the current system of education is to (a) create interface spaces like the one described in this chapter, (b) assume that digital media application knowledge should be innate, and (c) assume that the best possible resource for learners with a demonstrated digital media proclivity is a teacher of younger age cohort (herself or himself).

The interface space of the type described is inappropriate., as data from this study strongly suggested learners in the Generation Z cohort prefer, overall, less not more complexity in their surroundings. It is only one example of the actual practice-based paradigm shift required for the learning capacities of this cohort of adolescents and

secondary school students to be nurtured and enhanced through appropriate learning environments and experiences.

Oblinger and Oblinger (2005) suggested it is necessary to teach appropriate applications of digital media, just as there is a need to teach the appropriate uses of the traditional lead pencil, or any other tool. Assuming early access to digital media should automatically produce a viable digital product of an appropriate and positive nature is like assuming early access to multiple languages should result in written successes in those languages without teaching writing skills. The logical fallacy here, committed by early researchers in this field (e.g., van den Beemt et al., 2011), is not sustainable in any context. Growing up with a tool might lead to preference-proclivity, but only education, whatever the form, leads to full proficiency of use of the tool in question.

The presumed effectiveness of teachers of a younger age cohort in this context is fallacious. The data gathered through the study revealed that teachers in the system now are not digitally native themselves and, therefore, the assumption that they are in the best position to educate the current cohort of learners is inappropriate. Moreover, published studies, from early years in the past decade, support those decisions to assign teachers based solely on their age is not appropriate (Crichton, Slater, & Pegler, 2010). Although, given the current age parameters of some new teachers fresh into the profession (i.e., 21–22 years old; born post 1999) this may be a valid subject for future research.

The leadership paradigm resulting in these sorts of inappropriate decisions, combined with the constant, persistent change in technology (and therefore in technology-mediated learning environments and applications) is rationale for the necessity to train and continually

retrain leaders and teachers at all levels. It is strongly recommended that this training be based on recognizable research-based evidence and practice.

In summary, this study indicates a de facto paradigm shift has occurred, and steps should be taken to incorporate research into this shift within a framework of the effective retraining of educators to nurture the learning proclivities and preferences of current K–12 and future postsecondary and employment-training learners.

The objective now is to refine the current educational paradigm, in light of the findings of this and other recent studies. This researcher intends to pursue, with these factors in mind, an agenda of (post doctoral) research founded in recent, and future studies, as yet unpublished, with an eye to producing viable, evidence-based, recommendations for practice both current and future.

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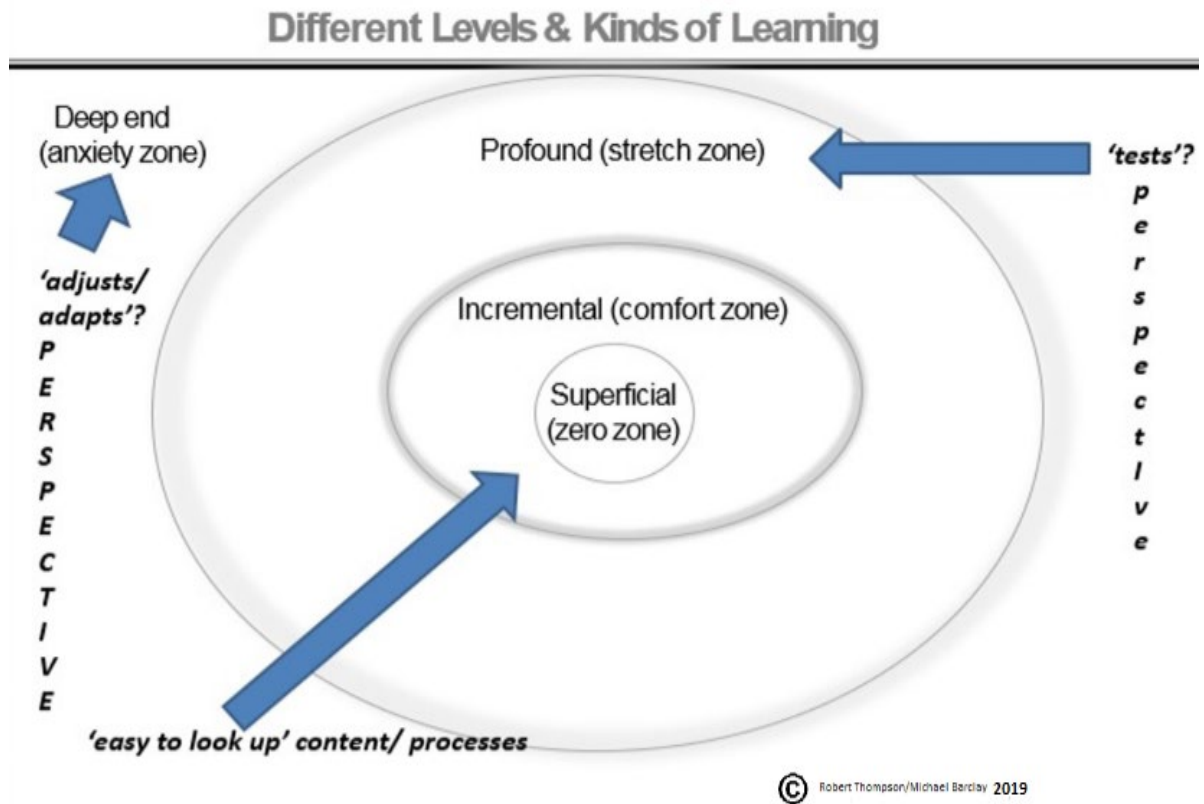
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Appendix A: Bloom 'Basics' – Applied



From *Bloom 'Basics' – Applied* (p. 1), by R. Thompson & M. Barclay, 2019.

Appendix B: Study Participants Generation Z Framework

Literature Type	Prensky Strauss & Howe Construct	Gen Z Construct
Supporting	Bennett and Maton (2010) Chojak (2019, 2020) Cipora et al. (2014) Gogolak (2013); Hargittai (2010) Jones and Healing (2010) Kostyrka-Allchorne et al. (2017) Oblinger and Oblinger (2005) Reeves and Oh (2007) Rosen (2010a, 2010b) Takeuchi et al. (2015, 2016) Tapscott (2008) Thompson (2012) van den Beemt et al. (2010, 2011) Wobe (2013) Wood et al. (2010)	Mitchell (2008) Posnick-Goodwin (2010) Rosen (2010a, 2010b)
Non-Supporting	Jones and Healing (2010) Reeves and Oh (2007) Wood et al. (2010)	
Mixed Results	Barbour (2013) Beetham & Sharpe (2013) Bennett & Maton (2010) Bullen et al. (2011) Liebermann, Bates, and So (2009) van den Beemt et al. (2010, 2011)	

Appendix C: Request for Participants

Research Study

Request for Participants

SIDES is to be the site of a Doctoral study. This study has been approved by Mr Kevin White (Principal of SIDES), and the SD 63 Superintendent and Board of Trustees. Interested students, born between the years 1993 and 1999 (inclusive) should email D_ED_STUDY@sides.ca before July 15, 2013.

This project is fully compliant with Research Ethics Board requirements and therefore guarantees:

1. The anonymity of all participants, and
2. That participants may withdraw from the study at any time; and
3. That participation in this study will in no way effect your ongoing education, and
4. That no participants will be accepted into the study without:
 - a. Full, informed consent of both
 - i. the participants, and
 - ii. their parents/ legal guardians.

The Researcher, Robert Thompson, and both SIDES, and SD 63, guarantee the terms and condition as outlined above and hope you will agree to participate in this interesting and worthwhile study.

Appendix D: Focus Group Questions

Focus Group(s): Question Set 1

Please give the best answer possible to each of the following questions:

1. Do you *think* you text (sms) message more often?...or email more often? (Please answer this question before the questions below)
2. Do you usually *think* this is a ‘text’...this is an ‘email’? or do you always think these are ‘texts’?...or always think these are ‘emails’?
3. Which term do you use when talking to friends?...do you use both terms?...or do you use the term ‘texts’ for both?...or ‘emails’ for both?

Focus Group(s), Question Set 2

1. A. sms I would like an average of how many texts (sms) you send and receive in a day (i.e., 24 hour period). Please don’t delete texts until the end of each 24 hour period and count the text messages at the same time each day (i.e., 8 pm each evening, or any other time convenient for you) I am providing the table (below) for you to use to keep track:

Day 1	Number of Texts (sms) received	Number of Texts (sms) sent
Day 2	Number of Texts (sms) received	Number of Texts (sms) sent
Day 3	Number of Texts (sms) received	Number of Texts (sms) sent

2. B. email I would like an average of how many emails you send and receive in a day. Please use this table as you are using the table (above). Thank you.

Day 1	Number of emails received	Number of emails sent
Day 2	Number of emails received	Number of emails sent
Day 3	Number of emails received	Number of emails sent

3. C.phone I would like an average of how many phone (voice calls) you send and receive in a day. Please use this table as you are using the tables (above). Thank you.

Day 1	Number of emails received	Number of emails sent
Day 2	Number of emails received	Number of emails sent
Day 3	Number of emails received	Number of emails sent

Focus Group(s), Question Set 3

In your own words

1. Tell me about your favourite programs/apps
 - on your phone...
 - on your computer (e.g., desktop/laptop/tablet-ipad)...
 - on your games console, etc.
 - ...(for example, What are these apps-programs? What do they do? Why do you like them?...why do you use them? etc.)
2. Tell me about your favourite programs/apps LAST YEAR...
 - on your phone...
 - on your computer (e.g., desktop/laptop/tablet)...
 - on your games console, etc.
 - (why do you think they were different last year?...if they were)
2. Tell me about a typical multi-tasking session for you...
 - are you mostly on your phone/computer/game console/all three/ usually just two (which two)
 - what else is on at the same time (if anything)?
 - how long might a typical session like this last?
 - Do you find this type of session more tiring?...more enjoyable? When do you find this type of session hard to do?...or more tiring than usual.? When do you find this type of session more enjoyable?...or more fund than usual?
3. What do people say about you and your use of technology? (Apps? Games?)

**** Focus Group(s): Question set 4**

1. Which two (story) characters or (real life) celebrities mean the most to you NOW?

Bella Swan or _____ (another character from Twilight)

Harry Potter or _____ (another character from the Potter series)

Justin Beiber or _____ (another singer)



Person or Character not yet mentioned

2nd Person or Character not yet mentioned

2. Are the celebrities or characters who mean most to you NOW different from those who meant most to you three (3) years ago?
3. If the answer to #2 is yes, who meant the most to you three (3) years ago?

Appendix E: Semi-Structured Interview Questions

	<p><i>Instructions (as Printed) on slide:</i></p> <p><i>Semi-structured Interview Questions</i></p> <p><i>Please type your answer(s) in the chat box</i></p> <p><i>Then feel free to elaborate orally (if you want)</i></p>
<i>Q#</i>	<i>Question</i>
**1a	What is your favourite colour?
**1b	What was your favourite colour last year?
**1c	What was your favourite colour 3 years ago?
2a	Would you prefer to read your textbooks online-on a computer or in the traditional textbook-hardcopy format?
2b	Would you prefer to read your stories online-on a computer or in the traditional book-hardcopy format?
3a	<p>Tell me what is the longest time</p> <ul style="list-style-type: none"> • days • hours • minutes <p>you can recall having gone comfortably without connecting/checking online?</p>
3b	Tell me about your average day?...How much time do you spend online-on a computer?...How much time do you spend away from a computer-being online?
3c	Tell me about your last 'school break'...How much time did you spend online-on a computer during an average day of this break?...How much time did you spend away from a computer-being online during an average day during this break?
4a	How much time can you stay away from being online-on a computer during an average day?
4b	How much time can you stay away from being online – on a computer during an average day of a school break?
4c	How much time can you stay away from being online – on a computer during an average day of a weekend?
5a	Do you prefer longer vids/videos? Or shorter vids/videos?

5b	<p>5B. You are asked to create an original video or <u>vid</u> involving only the 3 icons</p> <p><i>Write Below</i></p>   <p>You can use the 3 icons any way you like as often as you like and you can animate them in any manner you like</p> <p style="text-align: center;"> Will your vid- video be Less than 1 minute in length 3 to 5 minutes in length More than 7 minutes in length </p>
5c	Do you prefer to use the word Video? or the word Vid?
6a	<p>Tell me who you respect most</p> <ul style="list-style-type: none"> • your parents/aunts/uncles • your older siblings/their friends • your younger siblings/their friends • celebrities/personalities
6b	What do you respect most about the people you identified?
7a	How do you know when you are learning-working on the computer -online?
7b	How do you know when you are playing on the computer - online?
8a	Do you spend more time with friends online (on the computer)?
8b	Or do you spend more time with friends in the same place (in the same room, or at the same location)?
8c	Or do you spend more time with friends on the phone (using voice calls)?
8d	Why?

**9a	tell me the title(s) of your favourite book or books
**9b	tell me the title(s) of your favourite movie or movies
**9c	tell me the title(s) of your favourite musical styles
**9d	tell me the title(s) of your favourite musical groups
**9e	tell me the title(s) of your favourite song(s)
**9f	tell me the title(s) of your favourite song(s) last year
**9g	tell me the title(s) of your favourite song(s) 3 years ago
**9h	tell me the name(s) of your favourite athlete(s)
** 10a	tell me about your interests, hobbies and activities not already outlined and not involving digital technology
** 10b	tell me about your interests, hobbies and activities not already outlined that do involve digital technology
11	<p>You are traveling by plane, boat, car, etc., which of the following are you most likely to do to pass the time?</p> <ul style="list-style-type: none"> • Reading? • Playing a game? • Listening to music? • Being online (on a computer-phone)? • Or something else not listed here?
12	Which of the above are you most likely to spend the most time on?
13	<p>Feel free to send me an email telling me anything else you think I should know...</p> <p>This is purely voluntary</p>

Appendix F: Study Participants with Extrapolated Profiles

Cohort No.	Members	Date of Birth	Excerpts from Extrapolated Profiles: from collected/ Member Checked data
1	C1M1	Born after Dec 2000	Male;
1	C1M2	Born after Dec 2000	Male;
1	C1F1	Born after Dec 1999	Female;
1	C1M3 (focus group only)	Born after Dec 1998	Male;
2	C2M1	Born after Dec 1997	Male;
2	C2F1	Born after Dec 1997	Female:
2	C2F2	Born after Dec 1996	Female:
2	C1F3 (Focus group only)	Born after Dec 1996	Female;
3	C3M1	Born before Dec, 1996	Male;
3	C3M2	Born before Dec 1996	Male;
3	C3F1	Born before Dec 1996	Female;
3	C3F2 (Focus group only)	Born before Dec 1996	Female;

Note. Participants in Cohort 1 (those born after December 1999); Participants in Cohort 2 (those born after December 1996 and through December 1999); Participants in Cohort 3 (those born before December 1996).

Appendix G: Request for Study Participation

Parental Letter of Informed Consent

Student Computer Use In Learning Study

Dear Parent-Guardian:

I am currently studying student computer use in online formats. Results of this research will provide direction for future online course delivery that meets the needs of students. I am asking for your (daughter-son's) participation in this study: to be able to view their course activities (including forum and blog postings), and should you consent, possibly for them to be involved in a short focus group online conversation and/or a short online interview before the end of ?Date?. (None of these activities should take more than 15-20 minutes of her-his time and will be arranged at a time convenient to your daughter-son.)

The data collected through this study will be used to provide SIDES with a report on the computer use of students enrolled at the school. As well I (Robert Thompson) will use it for the research that is being conducted as part of my requirements for a Doctorate in Distance Education degree at Athabasca University. Data will be only reported in aggregate (collective) form and you will not be identified personally in the reporting of the study findings.

The primary goal of this study is to explore what factors might create the best possible online learning for students currently enrolled in grades K-12. The specific research questions that guide the study are:

- What computer usage factors (if any) distinguish this cohort of K-12 students from previous 'generations' of students?
- What overall factors (if any) distinguish the current K-12 cohort as a grouping distinct from previous cohorts?
- What factors (i.e., computer use aptitudes, strengths, etc.) (if any) might be useful in developing appropriate learning opportunities for the current cohort of K-12 students?

If you consent (and give consent for your daughter-son) to participate in the study, the researcher will be able to view course postings (forums and group blog, etc.). Your daughter-son may also be invited to participate in an online focus group and/or an online interview.

If you are willing (and give consent for your daughter-son) to participate in the second part of the study (either the focus group and/or the short interview), I would contact her-him to arrange a time to meet and conduct these activities online. These activities should not take more than 15-20 minutes and will be arranged NOT to interfere with her-his coursework at SIDES.

You have the right to refuse (and to refuse your daughter-son permission) to participate and to withdraw at any time during this research, without prejudice. Please note (1) that I am not,

and will not be, teaching your son-daughter and (2) that a decision to participate or not to participate will not in any way effect your daughter-son's education at SIDES. If you are willing to have your daughter-son participate in the interviews, her-his email address will be used as a contact method. This email address is held in the strictest confidentiality and under no circumstances will be released to other parties.

All information collected will be stored in a secure electronic location that can be accessed by myself and, potentially, by my research supervisors -- and all information will be kept confidential. I will replace the names of all participants with pseudonyms-aliases-codings before being reported in any form. On completion of analysis, a summary of the results of this research will be made available to SIDES and to all other interested participants upon request to me.

If you have any questions about this study or would like additional information to assist you in reaching a decision about participation, please feel free to contact

1. Robert Thompson; Principal Researcher: [email address]
2. Mr Kevin White; Principal of South Island Distance Education School;
[email address]; [telephone number]
3. Research Supervisor (s): Dr. Tom Jones; Associate Professor, Centre for Distance Education, Athabasca University;
[email address]; [telephone number]

Dr. Martha Cleveland-Innes; Professor & Chair, Centre for Distance Education Athabasca University; [email address]; [telephone number]

I will also ask you to supply your email address for contact. Upon completion of the research, I will notify you via your e-mail address where the results of the study can be found.

The Athabasca University Research Ethics Board has reviewed this research study and may be reached by e-mailing [email address] or calling [telephone number] if you have questions or comments about your treatment as a participant in this study.

Thank you for your time and consideration,

Robert Thompson, MA

Email: [email address]

Please note that in order to confirm your acceptance of the research participation on behalf of your daughter-son, you will need to reply to this email. In your replying please indicate your consent to participate in this study by replying with the following statement:

Subject Line: Consent For My Daughter-Son to Participate

Body of email: I, <your first & last name>, volunteer my daughter-son <first & last name> to be a participant in the SIDES computer use in learning research project described in this email and provide my consent for:

- A) Researcher viewing of course forum and group blog postings, and
- B) participation in an online focus group, and
- C) possibly, participation in an online interview.

*Most people find it convenient to simply copy-paste from this draft and fill in the 'blanks'.

Request for Study Participation

Student Letter of Informed Consent

Student Computer Use In Learning Study

Dear Student:

I am currently studying student computer use in online formats. Results of this research will provide direction for future online course delivery that meets the needs of students. I am asking for your participation in this study: to be able to view your course activities (including forum and blog postings), and should you consent, possibly for you to be involved in a short focus group online conversation and/or a short online interview before the end of May 2014. (None of these activities should take more than 15-20 minutes of your time and will be arranged at a time convenient to your daughter-son.)

The data collected through this study will be used to provide SIDES with a report on the computer use of students enrolled at the school. As well I (Robert Thompson) will use it for the research that is being conducted as part of my requirements for a Doctorate in Distance Education degree at Athabasca University. Data will be only reported in aggregate (collective) form and you will not be identified personally in the reporting of the study findings.

The primary goal of this study is to explore what factors might create the best possible online learning for students currently enrolled in grades K-12. The specific research questions that guide the study are:

- What computer usage factors (if any) distinguish this cohort of K-12 students from previous 'generational cohorts' of students?
- What overall factors (if any) distinguish the current K-12 cohort as a grouping distinct from previous cohorts?
- What factors (i.e., computer use aptitudes, strengths, etc.) (if any) might be useful in developing appropriate learning opportunities for the current cohort of K-12 students?

If you consent to participate in the study, the researcher will be able to view course postings (forums and group blog, etc.). You may also be invited to participate in an online focus group and/or an online interview.

If you are willing to participate in the second part of the study, I would contact you to arrange a time to meet and conduct these activities online. These activities should not take more than 15-20 minutes and will be arranged NOT to interfere with your coursework at SIDES.

You have the right to refuse to participate and to withdraw at any time during this research, without prejudice. Please note (1) that I am not, and will not be, teaching you and (2) that a

decision to participate or not to participate will not in any way effect your education at the distance education school. If you are willing to participate in the interviews, your email address will be used as a contact method. This email address is held in the strictest confidentiality and under no circumstances will be released to other parties.

All information collected will be stored in a secure electronic location that can be accessed by myself and, potentially, by my research supervisors -- and all information will be kept confidential. I will replace the names of all participants with pseudonyms-aliases-codings before being reported in any form. On completion of analysis, a summary of the results of this research will be made available to the distance education school. and to all other interested participants upon request to me.

If you have any questions about this study or would like additional information to assist you in reaching a decision about participation, please feel free to contact

1. [information deleted to protect confidentiality of persons involved]
2. [information deleted to protect confidentiality of persons involved]
3. [information deleted to protect confidentiality of persons involved]

Supervisor: [information deleted to protect confidentiality of persons involved]

I will also ask you to supply your email address for contact. Upon completion of the research, I will notify you via your e-mail address where the results of the study can be found.

The Athabasca University Research Ethics Board has reviewed this research study and may be reached by e-mailing [email address] or calling [telephone number] if you have questions or comments about your treatment as a participant in this study.

Thank you for your time and consideration,

Robert Thompson, MA
Email: [email address]

Please note that in order to confirm your acceptance of the research participation on behalf of your daughter-son, you will need to reply to this email. In your reply, please indicate your consent to participate in this study with the following statement:

Subject Line: Consent to Participate

Body of email: I, [your first & last name], volunteer to be a participant in the SIDES computer use in learning research project described in this email and provide my consent for:

- A) Researcher viewing of course forum and group blog postings, and
- B) participation in an online focus group, and
- C) possibly, participation in an online interview.

*Most people find it convenient to simply copy-paste from this draft and fill in the 'blanks'.

Appendix H: Data Presented By Specific Thematic Areas

Table H1

Participant Time Online – Participants Spend Significant Time Online

Group	No. Replying Positive	Percentage
Cohort 3	4	100%
Cohort 2	4	100%
Cohort 1	4	100%
Total	12	100%

Note. Significant time is defined as several hours in a session more than once each day. Members of Cohort 1 were born after December 1999 ($N = 4$); members of Cohort 2 were born between December 1996 and December 1999 ($N = 4$); members of Cohort 3 were born before December 1996 ($N = 4$).

Table H2

Participant Time Online – Participants Spend Significant Time Online but do not Perceive Time Allotments Accurately

Group	No. of Participants	Percentage
Cohort 2	1	25%
Cohort 1	3	75%
Total	4	33%

Note. Significant time is defined as several hours in a session more than once each day. Participants' inability to perceive time allotments accurately was assessed as occurring when they provided different time allotments to similar questions. Members of Cohort 1 were born after December 1999 ($N = 4$); members of Cohort 2 were born between December 1996 and December 1999 ($N = 4$).

Table H3

Participant Time Online – The participants in the study Spend Significant Time Online and do Perceive Time Allotments Accurately

Group	No. Replying Positive	Percentage
Cohort 3	4	100%
Cohort 2	3	75%
Cohort 1	1	25%
Total	8	66%

Note. Significant time is defined as several hours in a session more than once each day. Participants' ability to perceive time allotments accurately was assessed as occurring when they provided consistent time allotments to similar questions. Members of Cohort 1 were born after December 1999 ($N = 4$); members of Cohort 2 were born between December 1996 and December 1999 ($N = 4$); members of Cohort 3 were born before December 1996 ($N = 4$).

Table H4

Participants' Verbatim Description of Patience Being Offline by Cohort

Group	Participants' Responses		
Cohort 1	"Hours"	"1 day"	"A few days"
Cohort 2	"Maybe a day"	"5 days"	"About 9 days"
Cohort 3	"3 days"	"1 week"	"3 full weeks"

Note. This table reflects participants' duration of comfort while offline ($N = 9$). Members of Cohort 1 were born after December 1999; members of Cohort 2 were born between December 1996 and December 1999; members of Cohort 3 were born before December 1996.

Table H5

Participants' Comfort Level While Offline for Substantial Periods of Time During an Average School Day

Group	No. Replying Positive	Percentage
Cohort 3	2	50%
Cohort 2	2	50%
Cohort 1	1	25%
Total	5	42%

Note. Substantial periods of time were deemed to be more than 10 successive hours at a time on such a day. Members of Cohort 1 were born after December 1999 ($N = 4$); members of Cohort 2 were born between December 1996 and December 1999 ($N = 4$); members of Cohort 3 were born before December 1996 ($N = 4$).

Table H6

Participants' Inability to Stay Offline for Substantial Periods of Time During an Average School Day

Group	No. Replying Positive	Percentage
Cohort 3	2	50%
Cohort 2	2	50%
Cohort 1	3	75%
Total	7	58%

Note. Substantial periods of time were deemed to be more than 10 successive hours at a time on such a day. Members of Cohort 1 were born after December 1999 ($N = 4$); members of Cohort 2 were born between December 1996 and December 1999 ($N = 4$); members of Cohort 3 were born before December 1996 ($N = 4$).

Table H7

Participants' Comfort at Staying Offline for Substantial Periods of Time During an Average School Day

Group	No. Replying Positive	Percentage
Cohort 3	2	50%
Cohort 2	1	25%
Cohort 1	1	25%
Total	4	33%

Note. Staying offline more than 10 successive hours at a time on such a day. Members of Cohort 1 were born after December 1999 ($N = 4$); members of Cohort 2 were born between December 1996 and December 1999 ($N = 4$); members of Cohort 3 were born before December 1996 ($N = 4$).

Table H8

Participants' Absence of Comfort at Staying Offline for Substantial Periods of Time During an Average School Day

Group	No. Replying Positive	Percentage
Cohort 3	2	50%
Cohort 2	3	75%
Cohort 1	3	75%
Total	8	67%

Note. Staying offline more than 10 successive hours at a time on such a day. Members of Cohort 1 were born after December 1999 ($N = 4$); members of Cohort 2 were born between December 1996 and December 1999 ($N = 4$); members of Cohort 3 were born before December 1996 ($N = 4$).

Table H9

Participants' Ability to Stay Offline for Substantial Periods of Time During a Day of a Break from School

Group	No. Replying Positive	Percentage
Cohort 3	2	50%
Cohort 2	0	0%
Cohort 1	1	25%
Total	3	25%

Note. Staying offline more than 10 successive hours at a time during a holiday break. Members of Cohort 1 were born after December 1999 ($N = 4$); members of Cohort 2 were born between December 1996 and December 1999 ($N = 4$); members of Cohort 3 were born before December 1996 ($N = 4$).

Table H10

Participants' Inability to Stay Offline for Substantial Periods of Time During a Day of a Break from School

Group	No. Replying Positive	Percentage
Cohort 3	2	50%
Cohort 2	2	50%
Cohort 1	3	75%
Total	7	58%

Note. Staying offline more than 10 successive hours at a time during a holiday break. Members of Cohort 1 were born after December 1999 ($N = 4$); members of Cohort 2 were born between December 1996 and December 1999 ($N = 4$); members of Cohort 3 were born before December 1996 ($N = 4$).

Table H11

Participants' Comfort at Staying Offline for Substantial Periods of Time During a Day of a Break from School

Group	No. Replying Positive	Percentage
Cohort 3	2	50%
Cohort 2	1	25%
Cohort 1	0	0%
Total	3	25%

Note. Staying offline more than 10 successive hours at a time during a holiday break. Members of Cohort 1 were born after December 1999 ($N = 4$); members of Cohort 2 were born between December 1996 and December 1999 ($N = 4$); members of Cohort 3 were born before December 1996 ($N = 4$).

Table H12

Participants' Absence of Comfort at Staying Offline for Substantial Periods of Time During a Day of a Break from School

Group	No. Replying Positive	Percentage
Cohort 3	2	50%
Cohort 2	3	75%
Cohort 1	4	100%
Total	9	75%

Note. Staying offline more than 10 successive hours at a time during a holiday break. Members of Cohort 1 were born after December 1999 ($N = 4$); members of Cohort 2 were born between December 1996 and December 1999 ($N = 4$); members of Cohort 3 were born before December 1996 ($N = 4$).

Table H13

Participants' Ability to Stay Offline for Substantial Periods of Time During a Day of an Average Weekend

Group	No. Replying Positive	Percentage
Cohort 3	3	75%
Cohort 2	1	25%
Cohort 1	1	25%
Total	5	42%

Note. Staying offline more than 10 successive hours at a time during an average weekend. Members of Cohort 1 were born after December 1999 ($N = 4$); members of Cohort 2 were born between December 1996 and December 1999 ($N = 4$); members of Cohort 3 were born before December 1996 ($N = 4$).

Table H14

Participants' Inability to Stay Offline for Substantial Periods of Time During a Day of an Average Weekend

Group	No. Replying Positive	Percentage
Cohort 3	1	25%
Cohort 2	3	75%
Cohort 1	3	75%
Total	7	58%

Note. Staying offline more than 10 successive hours at a time during an average weekend. Members of Cohort 1 were born after December 1999 ($N = 4$); members of Cohort 2 were born between December 1996 and December 1999 ($N = 4$); members of Cohort 3 were born before December 1996 ($N = 4$).

Table H15

Participants' Preferred Activities while Travelling

Group	No. Replying Positive	Percentage
Cohort 3	1	25%
Cohort 2	3	75%
Cohort 1	3	75%
Total	7	58%

Note. Staying offline more than 10 successive hours at a time during an average weekend. Members of Cohort 1 were born after December 1999 ($N = 4$); members of Cohort 2 were born between December 1996 and December 1999 ($N = 4$); members of Cohort 3 were born before December 1996 ($N = 4$).

Table H16

Participants Believe They Use the Term Text (or SMS) More Often Than The Term Email

Group	No. Replying Positive	Percentage
Cohort 3	4	100%
Cohort 2	4	100%
Cohort 1	3	75%
Total	11	92%

Note. Members of Cohort 1 were born after December 1999 ($N = 4$); members of Cohort 2 were born between December 1996 and December 1999 ($N = 4$); members of Cohort 3 were born before December 1996 ($N = 4$).

Table H17

Participants Believe They Actually do Text More Often Than Email

Group	No. Replying Positive	Percentage
Cohort 3	4	100%
Cohort 2	4	100%
Cohort 1	3	75%
Total	11	92%

Note. Members of Cohort 1 were born after December 1999 ($N = 4$); members of Cohort 2 were born between December 1996 and December 1999 ($N = 4$); members of Cohort 3 were born before December 1996 ($N = 4$).

Table H18

Participants Actually do Text and/or Message More Often Than Email

Group	No. Replying Positive	Percentage
Cohort 3	4	100%
Cohort 2	4	100%
Cohort 1	8	100%
Total	12	100%

Note. Members of Cohort 1 were born after December 1999 ($N = 4$); members of Cohort 2 were born between December 1996 and December 1999 ($N = 4$); members of Cohort 3 were born before December 1996 ($N = 4$).

Table H19

Participants Mostly do Text Friends More Often Than Email

Group	No. Replying Positive	Percentage
Cohort 3	0	0%
Cohort 2	2	50%
Cohort 1	4	100%
Total	6	50%

Note. Members of Cohort 1 were born after December 1999 ($N = 4$); members of Cohort 2 were born between December 1996 and December 1999 ($N = 4$); members of Cohort 3 were born before December 1996 ($N = 4$).

Table H20

Participants Mostly Text and/or Message Friends (via Social Media) More Often Than Email

Group	No. Replying Positive	Percentage
Cohort 3	4	100%
Cohort 2	2	50%
Cohort 1	0	0%
Total	6	50%

Note. Members of Cohort 1 were born after December 1999 ($N = 4$); members of Cohort 2 were born between December 1996 and December 1999 ($N = 4$); members of Cohort 3 were born before December 1996 ($N = 4$).

Table H21

Participants Who Believe Email is for Formal or Official Communications

Group	No. Replying Positive	Percentage
Cohort 3	4	100%
Cohort 2	3	75%
Cohort 1	4	100%
Total	11	92%

Note. Members of Cohort 1 were born after December 1999 ($N = 4$); members of Cohort 2 were born between December 1996 and December 1999 ($N = 4$); members of Cohort 3 were born before December 1996 ($N = 4$).

Table H22

Participants Prefer for Visual Over Textual Headers or Organizers

Group	No. Replying Positive	Percentage
Cohort 3	1	25%
Cohort 2	4	100%
Cohort 1	4	100%
Total	9	75%

Note. Members of Cohort 1 were born after December 1999 ($N = 4$); members of Cohort 2 were born between December 1996 and December 1999 ($N = 4$); members of Cohort 3 were born before December 1996 ($N = 4$).

Table H23

Participants Prefer for Textual Over Visual Headers or Organizers

Group	No. Replying Positive	Percentage
Cohort 3	3	75%
Cohort 2	0	0%
Cohort 1	0	0%
Total	3	25%

Note. Members of Cohort 1 were born after December 1999 ($N = 4$); members of Cohort 2 were born between December 1996 and December 1999 ($N = 4$); members of Cohort 3 were born before December 1996 ($N = 4$).

Table H24

Participants Prefer Short 1-Minute Videos to 3- to 5-Minute or 7-Minute or Longer Videos

Group	No. Replying Positive	Percentage
Cohort 3	3	75%
Cohort 2	2	50%
Cohort 1	4	100%
Total	9	75%

Note. Members of Cohort 1 were born after December 1999 ($N = 4$); members of Cohort 2 were born between December 1996 and December 1999 ($N = 4$); members of Cohort 3 were born before December 1996 ($N = 4$).

Table H25

Participants Prefer 3- to 5-Minute Videos over 1-Minute or 7-Minute or Longer Videos

Group	No. Replying Positive	Percentage
Cohort 3	0	0%
Cohort 2	2	50%
Cohort 1	0	0%
Total	2	17%

Note. Members of Cohort 1 were born after December 1999 ($N = 4$); members of Cohort 2 were born between December 1996 and December 1999 ($N = 4$); members of Cohort 3 were born before December 1996 ($N = 4$).

Table H26

Participants Prefer Computer-Online Textbooks and Study Materials to (Traditional) Hardcopy Textbooks and Study Materials

Group	No. Replying Positive	Percentage
Cohort 3	0	0%
Cohort 2	4	100%
Cohort 1	4	100%
Total	8	67%

Note. Members of Cohort 1 were born after December 1999 ($N = 4$); members of Cohort 2 were born between December 1996 and December 1999 ($N = 4$); members of Cohort 3 were born before December 1996 ($N = 4$).

Table H27

Participants Prefer (Traditional) Hardcopy Textbooks and Study Materials to Computer-Online Textbooks

Group	No. Replying Positive	Percentage
Cohort 3	4	100%
Cohort 2	0	0%
Cohort 1	0	0%
Total	4	33%

Note. Members of Cohort 1 were born after December 1999 ($N = 4$); members of Cohort 2 were born between December 1996 and December 1999 ($N = 4$); members of Cohort 3 were born before December 1996 ($N = 4$).

Table H28

Participants Prefer (Traditional) Hardcopy to Computer-Online Storybooks

Group	No. Replying Positive	Percentage
Cohort 3	4	100%
Cohort 2	3	75%
Cohort 1	3	75%
Total	10	83%

Note. Members of Cohort 1 were born after December 1999 ($N = 4$); members of Cohort 2 were born between December 1996 and December 1999 ($N = 4$); members of Cohort 3 were born before December 1996 ($N = 4$).

Table H29

Participants Computer-Online to (Traditional) Hardcopy Storybooks

Group	No. Replying Positive	Percentage
Cohort 3	0	0%
Cohort 2	1	25%
Cohort 1	0	0%
Total	4	8%

Note. Members of Cohort 1 were born after December 1999 ($N = 4$); members of Cohort 2 were born between December 1996 and December 1999 ($N = 4$); members of Cohort 3 were born before December 1996 ($N = 4$).

Table H30

Participants in the Study Perceive Online Play as Primarily Games

Group	No. Replying Positive	Percentage
Cohort 1	3	75%
Total	3	25%

Note. Members of Cohort 1 were born after December 1999 ($N = 4$), with a total of 12 members in all cohorts.

Table H31

Participants in the Study Perceive Online Play as Primarily Games with Some Social Media

Group	No. Replying Positive	Percentage
Cohort 2	2	50%
Total	2	17%

Note. Members of Cohort 2 were born between December 1996 and December 1999 ($N = 4$), with a total of 12 members in all cohorts.

Table H32

Participants Perceive Online Play as Primarily Social Media with Some Games

Group	No. Replying Positive	Percentage
Cohort 3	4	100%
Cohort 2	1	25%
Cohort 1	1	26%
Total	6	50%

Note. Members of Cohort 1 were born after December 1999 ($N = 4$); members of Cohort 2 were born between December 1996 and December 1999 ($N = 4$); members of Cohort 3 were born before December 1996 ($N = 4$).

Table H33

Participants Perceive Online Play as Multitasking

Group	No. Replying Positive	Percentage
Cohort 3	4	100%
Cohort 2	4	100%
Cohort 1	4	100%
Total	12	100%

Note. Members of Cohort 1 were born after December 1999 ($N = 4$); members of Cohort 2 were born between December 1996 and December 1999 ($N = 4$); members of Cohort 3 were born before December 1996 ($N = 4$).

Table H34

Participants Perceive Online Play and Multitasking as Exhausting and/or Tiring

Group	No. Replying Positive	Percentage
Cohort 2	2	50%
Cohort 1	3	75%
Total	5	42%

Note. Members of Cohort 1 were born after December 1999 ($N = 4$); members of Cohort 2 were born between December 1996 and December 1999 ($N = 4$).

Table H35

Participants Perceive Online Play and Multitasking as Addictive or Potentially Addictive

Group	No. Replying Positive	Percentage
Cohort 2	2	50%
Cohort 1	2	50%
Total	4	33%

Note. Members of Cohort 1 were born after December 1999 ($N = 4$); members of Cohort 2 were born between December 1996 and December 1999 ($N = 4$).

Table H36

Participants Preference to Work in Groups or Teams (Not on Their Own)

Group	No. Replying Positive	Percentage
Cohort 3	0	0%
Cohort 2	0	0%
Cohort 1	0	0%
Total	0	0%

Note. Members of Cohort 1 were born after December 1999 ($N = 4$); members of Cohort 2 were born between December 1996 and December 1999 ($N = 4$); members of Cohort 3 were born before December 1996 ($N = 4$).

Table H37

Participants Perceive Online Play is Neither Exhausting nor Addictive (or Potentially Addictive)

Group	No. Replying Positive	Percentage
Cohort 3	4	100%
Cohort 2	2	50%
Cohort 1	1	25%
Total	7	58%

Note. Members of Cohort 1 were born after December 1999 ($N = 4$); members of Cohort 2 were born between December 1996 and December 1999 ($N = 4$); members of Cohort 3 were born before December 1996 ($N = 4$).

Table H38

Participants Seek Out Technology-Mediated Environments with Multiple Functions (i.e., Games Equipment with Netflix, etc.)

Group	No. Replying Positive	Percentage
Cohort 3	4	100%
Cohort 2	4	100%
Cohort 1	2	50%
Total	10	87%

Note. Members of Cohort 1 were born after December 1999 ($N = 4$); members of Cohort 2 were born between December 1996 and December 1999 ($N = 4$); members of Cohort 3 were born before December 1996 ($N = 4$).

Table H39

Participants Seek Out Technology-Mediated Environments with Specific Functions

Group	No. Replying Positive	Percentage
Cohort 3	4	100%
Cohort 2	3	75%
Cohort 1	4	100%
Total	11	92%

Note. Members of Cohort 1 were born after December 1999 ($N = 4$); members of Cohort 2 were born between December 1996 and December 1999 ($N = 4$); members of Cohort 3 were born before December 1996 ($N = 4$).

Table H40

Participants Prefer to Communicate and/or Hangout-Converse at Length with Friends Online (at Least 50% of the Time)

Group	No. Replying Positive	Percentage
Cohort 3	1	25%
Cohort 2	1	25%
Cohort 1	1	25%
Total	3	25%

Note. Members of Cohort 1 were born after December 1999 ($N = 4$); members of Cohort 2 were born between December 1996 and December 1999 ($N = 4$); members of Cohort 3 were born before December 1996 ($N = 4$).

Table H41

Participants Prefer to Communicate and/or Hangout-Converse at Length with Friends Face to Face (at Least 50% of the Time)

Group	No. Replying Positive	Percentage
Cohort 3	3	75%
Cohort 2	3	75%
Cohort 1	3	75
Total	9	75%

Note. Members of Cohort 1 were born after December 1999 ($N = 4$); members of Cohort 2 were born between December 1996 and December 1999 ($N = 4$); members of Cohort 3 were born before December 1996 ($N = 4$).

Appendix I: Summary of Data by Thematic Area

Table II

Summary of Data Derived from the Study by Potential Thematic Areas and Generation Z Variance

Cohort (Birth Years)	Thematic Factors (Proclivities and Preferences)*	Digital Media Access	Generation Z Variance
Cohort 1 participants born after December 1999	Connected (with) Visual over Text Shortest time Comfortable Offline Computer 'Online' Text-Study Materials	Probable Full Access-Exposure to Digital Media – Internet during 'Early Learning' Development Phases as established by Piaget (1952) and Kolb and Fantie (2011)	Generation Z
Cohort 2 participants born after December 1996 and before January 2000	Connected (with) Visual over Text Moderate time Comfortable Offline Computer 'Online' Text-Study Materials	Possible-Potential Full Access-Exposure to Digital Media – Internet during 'Early Learning' Development Phases as established by Piaget (1952) and Kolb and Fantie (2011)	Onset Generation Z
Cohort 3 participants born before December 1996	Connected (with) Text over Visual Longest time Comfortable Offline Traditional Hardcopy Text-Study Materials	Possible Limited Access-Exposure to Digital Media – Internet during 'Early Learning' Development Phases as established by Piaget (1952) and Kolb and Fantie (2011)	Cusp of Generation Y – Generation Z

Table I2

Summary of Data Derived from the Literature – by Potential Thematic Areas

Thematic Area	Cohort Results	Overall Results
Connected	Cohort 3 – participants born before December 1996 Connected	Study Results Substantiate Thematic Area <input type="checkbox"/> Consistent admission of significant time online across cohort groupings <input type="checkbox"/> Consistent discomfort with time offline expressed across cohort groupings <input type="checkbox"/> Time offline less for cohorts born around and after 1997 (Cohorts 2 and 3)
	Cohort 2 – participants born after December 1996 and before January 2000 Connected	
	Cohort 1 age > participants born after December 1999 Connected	
Text (SMS) messaging over Email and/or Talk	Cohort 3 – participants born before December 1996 Text (SMS) preferred	Study Results Substantiate Thematic Area <input type="checkbox"/> Consistently ‘think’ text as opposed to email or talk across cohort groupings <input type="checkbox"/> Consistently do text as opposed to email or talk across cohort groupings <input type="checkbox"/> Consistently ‘think’ of email as something more formal than ‘normal’ communication across cohort groupings <input type="checkbox"/> Consistently reject telephone-talk in favour of texting-messaging across cohort groupings
	Cohort 2 > participants born after December 1996 and before January 2000 Text (SMS) preferred	
	Cohort 1 age > participants born after December 1999 Text (SMS) preferred	
Receiving Instant Results	Cohort 3 – participants born before December 1996 Prefer Instant Results	Study Results Substantiate Thematic Area <input type="checkbox"/> Consistently prefer the immediacy of text (SMS) to other communication forms across cohort groupings <input type="checkbox"/> 75% of participants prefer videos of 1 minute or less in duration <input type="checkbox"/> 100% of participants prefer videos of 5 minutes or less in duration
	Cohort 2 – participants born after December 1996 and before January 2000 Prefer Instant Results	
	Cohort 1 - participants born after December 1999 Prefer Instant Results	

Thematic Area	Cohort Results	Overall Results
Working with Images Rather than Text	<p>Cohort 3 – participants born before December 1996 (75%) Prefer Text</p> <p>Cohort 2 – participants born after December 1996 and before January 2000 Prefer Images</p> <p>Cohort 1 – participants born after December 1999 Prefer Images</p>	<p>Study Results Substantiate Thematic Area (Especially in Cohorts born around or after 1997)</p> <ul style="list-style-type: none"> <input type="checkbox"/> Consistent understanding of terminology (i.e., text and visual) across cohort groupings <input type="checkbox"/> 75% of participants prefer Images to Text (all participants from Cohort 2 and Cohort 1) <input type="checkbox"/> 25% of participants prefer Text to Images (majority of participants from Cohort 3: participants born before December 1996)
Computers Over Hardcopy Books	<p>Cohort 3 – participants born before December 1996 (75%) Prefer Hardcopy to Computer Online course materials (100%) Prefer Hardcopy to Computer-Online story materials</p> <p>Cohort 2 – participants born after December 1996 and before January 2000 Prefer Computer-Online course materials Prefer Hardcopy to Computer-Online story materials</p> <p>Cohort 1 – participants born after December 1999 Prefer Computer-Online course materials Prefer Hardcopy story books</p>	<p>This study produced mixed results</p> <ul style="list-style-type: none"> <input type="checkbox"/> Substantiates Thematic Area for Course Materials <input type="checkbox"/> Appears to refute Thematic Area for story materials <input type="checkbox"/> Consistent understanding of terminology (i.e., hardcopy and computer-online) across cohort groupings <input type="checkbox"/> Consistent preference for Computer-Online textual materials across Cohorts 1 and 2 <input type="checkbox"/> Consistent preference for Hardcopy story book materials across Cohort 1, 2, and 3 groupings

Thematic Area	Cohort Results	Overall Results
Multitasking	<p>Cohort 3 – participants born before December 1996 Perceive Multitasking as part of play Perceive Multitasking (as part of play) to be relaxing and enjoyable</p> <p>Cohort 2 – participants born after December 1996 and before January 2000 Perceive Multitasking as part of play Majority perceive Multitasking (as part of play) to be exhausting and potentially addictive</p> <p>Cohort 1 – participants born after December 1999 Perceive Multitasking as part of play Majority perceive Multitasking (as part of play) to be exhausting and potentially addictive</p>	<p>This study produced mixed results</p> <ul style="list-style-type: none"> <input type="checkbox"/> Consistent understanding of the term Multitasking exists across the Cohort 1, 2, and 3 groupings <input type="checkbox"/> Consistent perception that Multitasking is part of (online) play exists across the Cohort 1, 2, and 3 groupings <input type="checkbox"/> Majority across the older Cohort 2 and 3 groupings describe Multitasking (in the context of play) as relaxing and enjoyable <input type="checkbox"/> Majority of the younger Cohort 1 and 2 Groupings (those born around or after 1997) describe Multitasking as ‘exhausting’ and potentially ‘addictive’
Working In Groups or Teams	<p>Cohort 3 – participants born before December 1996 Prefer not to Work In Groups or Teams</p> <p>Cohort 2 – participants born after December 1996 and before January 2000 Prefer not to Work In Groups or Teams</p> <p>Cohort 1 – participants born after December 1999 Prefer not to Work In Groups or Teams</p>	<p>This study appears to refute Thematic Area</p> <ul style="list-style-type: none"> <input type="checkbox"/> Consistent preference across the Cohort 1, 2, and 3 Groupings to not Work in Groups or Teams

Table I3

Summary of Data by Thematic Areas from this study – New Possible-Potential Thematic Areas

Thematic Area	Cohort Results	Overall Result
Defining Work and Play (in Online Environment)	Cohort 3 – participants born before December 1996 (100%) See Play as ‘social media with some games, online’	<ul style="list-style-type: none"> <input type="checkbox"/> Consistent understanding demonstrated in defining the concept of Work (in online environments) across Cohort Groupings
	Cohort 2 – participants born after December 1996 and before January 2000 (50%) See Play as ‘games online, with some social media’ 50%) See Play as ‘ social media with some games, online’	<ul style="list-style-type: none"> <input type="checkbox"/> Consistent connection of the concepts of Multitasking and Play (in online environments) across Cohort Groupings <input type="checkbox"/> Consistent descriptions of Multitasking (in online environments) as Unproductive Activity across Cohort Groupings <input type="checkbox"/> Descriptions of what constitutes Play (i.e., games, social media, etc.) vary according to the (age) Cohort Grouping studied
	Cohort 1 – participants born after December 1999 See Play as ‘Games, online’	
Tool Not A Toy	Cohort 3 – participants born before December 1996 Select appropriate TMEs	<p>This study appears to refute generally held beliefs (about age cohorts) of participants</p> <ul style="list-style-type: none"> <input type="checkbox"/> Participants select appropriate hardware-software-apps for specific functions consistently across the Cohort 1, 2, and 3 Groupings
	Cohort 2 – participants born after December 1996 and before January 2000 Select appropriate TMEs	
	Cohort 1 – participants born after December 1999 Select appropriate TMEs	

Thematic Area	Cohort Results	Overall Result
Interactions with Peers and Friends	Cohort 3 – participants born before December 1996 See Overall Results	This study appears to refute generally held beliefs (about age cohorts) of participants
	Cohort 2 – participants born after December 1996 and before January 2000 See Overall Results	<input type="checkbox"/> 75% of each cohort use TMEs to arrange hangout time with Peers and Friends <input type="checkbox"/> 75% of each cohort prefer to actually Hangout Face to Face with Peers and Friends
	Cohort 1 age > participants born after December 1999 See Overall Results	<input type="checkbox"/> (Only) 25% of each cohort prefers to actually Hangout Online
Respect-Role Models	Cohort 3 – participants born before December 1996 See Overall Results	This study appears to refute generally held beliefs (about the age cohorts) of participants
	Cohort 2 – participants born after December 1996 and before January 2000 See Overall Results	Consistent preference, from all three Cohorts/ age groupings, expressed for parents and uncles or aunts as respected role models - as opposed to celebrities
	Cohort 1 – participants born after December 1999 See Overall Results	

Note. SMS = Short Message Service; TME =Technology-Mediated Environment.

*Thematic areas (Proclivities-Preferences) included here are only those unlikely to be influenced solely by the maturity of the participant (learner).

CERTIFICATION OF ETHICAL APPROVAL

The Athabasca University Research Ethics Board (REB) has reviewed and approved the research project noted below. The REB is constituted and operates in accordance with the current version of the Tri-Council Policy Statement: Ethical Conduct for Research Involving Humans (TCPS2) and Athabasca University Policy and Procedures.

Ethics File No.: 20898

Principal Investigator:

Robert Thompson,
Faculty of Humanities & Social Sciences\Doctor of Education (EdD) in Distance Education

Supervisor/Project Team:

Tom Joes (Supervisor)

Project Title:

Mosaic For Generation Z: Exploring the Technology Mediated Learning Environment Potential for Younger Learners

Effective Date: June 02, 2013

Expiry Date: June 02, 2014

Restrictions:

Any modification/amendment to the approved research must be submitted to the AUREB for approval prior to proceeding.

Any adverse event or incidental findings must be reported to the AUREB as soon as possible, for review.

Ethical approval is valid *for a period of one year*. An annual request for renewal must be submitted and approved by the above expiry date if a project is ongoing beyond one year.

An Ethics Final Report must be submitted when the research is complete (*i.e. all participant contact and data collection is concluded, no follow-up with participants is anticipated and findings have been made available/provided to participants (if applicable)*) or the research is terminated.

Approved by:

Date: June 2, 2013

Simon Nuttgens, Chair
Athabasca University Research Ethics Board