Adult Learning in the Transformational Environments of the Digital Revolution: Connecting Theory and Practice

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Abstract

The purpose of this study was to investigate the learning preferences and the postsecondary educational experiences of a group of Net-Gen adult learners, aged between 18 and 35, currently working in the knowledge economy workplace, and their assessment of how adequately they were prepared to meet the requirements of the knowledge economy workplace. This study utilized an explanatory mixed-method research design. Participants completed a questionnaire providing information on their self-reported learning style preferences, their use of digital tools for formal and informal learning, their use of digital technologies in postsecondary educational experiences, and their use of digital technologies in their workplace. Four volunteers from the questionnaire respondents were selected to participate in interviews based on the diversity of their experiences in higher education, including digital environments, and the diversity of their knowledge economy workplaces. Data collected from the questionnaire were analyzed for descriptive and demographic statistics, and categorized so that common patterns could be identified from information gathered from the online questionnaire and interviews. Findings based on this study indicated that these Net-Gen adult learners were fluent with all types of digital technologies in collaborative environments, expecting their educational experiences to provide a similar experience. Participants clearly expressed an understanding that digital/collaborative aptitudes are essential to successful employment in the knowledge economy workplace. The findings of this study indicated that the majority of participants felt that their postsecondary educational experiences did not adequately prepare them to meet the expectations of this type of working environment.

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CHAPTER ONE: INTRODUCTION TO THE STUDY

There is a new generation of adult learners—the *Net-Generation,* which Tapscott (1988) describes as "the first generation to come of age in the digital age" (p. 2), or, as they will be referred to in this paper, Net-Gen adult learners. This generation is unique because their learning preferences have been molded by digital technologies, making these technologies a major influence in their formal and informal learning preferences (Coleman, 2012; Prince, 2011). This research study explored these preferences and the postsecondary learning experiences of a group of Net-Gen adult learners who are currently working in the knowledge economy workplace, a job where knowledge is the product being produced or service being rendered (Drucker, 1968; Fenwick, 2008), to see if their actual higher educational experience is relevant in preparing them for this employment.

Globalization, coupled with the digital revolution, has created the increasingly complex, competitive workplace in which "industries produce and distribute ideas and information rather than goods and services" (Drucker, 1968, p. 263). By the late '70s, over 50% of the total national product was "earned by producing and distributing ideas and information" (p. 263), and "the center of the American workforce [has become] the knowledge worker, the man or woman who applies to productive ideas, concepts, and information rather than manual skill or brawn" (p. 264). Knowledge has become "the central 'factor of production' in an advanced, developed economy" (p. 264). Workers in the knowledge economy must be capable of creative application of rapidly evolving knowledge along with the ability to collaborate with others (Prince, 2011). Is higher education changing to meet the challenge of providing Net-Gen adult learners with the knowledge and skills the

average employee is required to use in the modern knowledge economy workplace by making education relevant?

Today, these Net-Gen adult learners are between the ages of 18 and 35. As Tapscott (2009) suggests, this population of adult learners may be actually *wired* differently than previous generations and entering a radically changing workplace. Changes in information and communication technologies (ICTs) are reshaping the world around us at ever increasing rates, profoundly altering the learning preferences of students (Dede, 2005). In order to understand the question of educational relevancy, one must understand the learning preferences of Net-Gen adult learners as well as the knowledge and skills needed for the modern knowledge economy workplace. Of specific additional interest to this researcher is the use of digital technology tools used in the knowledge economy workplace and how that relates to students' educational experiences. Learning and teaching practices in institutes of higher learning may need to adjust to stay relevant. Dylan says it best:

> Gather 'round people
> Wherever you roam
> And admit the waters
> Around you have grown
> And accept it that soon
> You'll be drenched to the bone
> If your time to you
> Is worth savin'
> Then you better start swimmin'
> Or you'll sink like a stone

For the times they are a-changin. (Dylan, 1964)

Research Focus

This research study explored Net-Gen adult learners' perceptions about any gaps between the use of digital technologies in their higher education classroom experiences and the digital technology tools used in the knowledge economy. As well, the study examined how the Net-Gen adult learner uses digital technologies to learn, both formally and informally, and work in our continuously transforming workplaces, in the hope that this may elicit practical suggestions for teaching and learning environments at the college or university level that support learning in this digital age.

Based on my experience as an instructor with over 9 years in college classrooms, and a professional corporate (global) trainer for over 25 years, it is my opinion that each student generation changes, and continues to change, in the skills and knowledge they bring to their educational experiences. I find it unfortunate that adult learners enrolled in a higher education learning experience today will be taught in the same way their parents and grandparents were taught in university—they will be required to sit in a lecture hall and take notes while a professor delivers a 2 - 3 hour lecture, and be ready to regurgitate it on a quiz. With the ubiquitous use of many digital tools by this generation, I see so many differences in classroom environments. Not long ago, students balled up notepapers and passed them around the room. Now they instant message three friends at once. *Sports Illustrated* is no longer hidden under their textbooks but can be accessed on a website. Students moan when it takes the professor 20 minutes to set up the PowerPoint projector. They have smart phone apps that transcribe the text on a whiteboard or on an overhead projector into PDF text

through built-in cameras and apps. Notes are distributed via Facebook, blogs, or email anywhere in seconds. I have seen learning preferences being transformed through the use of these digital devices.

As well, students in higher education have indicated that their postsecondary educational experiences often lack inclusion of the digital tools they prefer to use for their own formal and informal learning (Tapscott, 2009). Some of the comments from Tapscott's (2009) study, made by students, were the following:

- "I will read eight books this year, 2,300 Web pages and 1,281 Face Book profiles."
- "I will write 42 pages for class this semester and over 500 pages of e-mails."
- "When I graduate, I probably will have a job that doesn't exist today" holding up a multiple choice test form along with a sign: "Filling this out won't get me there" (p. 121).

However, it is not just the students, but also the workplace, which is rapidly changing. Most sources agree that in order to compete with the cheap labour forces in newly industrialized countries like Brazil, Korea, Taiwan, or China and others, traditional *first world* economies must have a very highly educated and adaptable workforce in order to create sophisticated, cutting-edge products and provide services that general labour with standardized capabilities cannot competitively supply (Rumberger & Levin, 1967).

Workers needed for today's workforce are those "who acquire, manipulate, interpret and apply information in order to perform multidisciplinary, complex and unpredictable work. They analyze information and apply expertise in a variety of

areas to solve problems, generate ideas, or create new products and services" (Prince, 2011, p.3). Prince (2011) also suggests that continual adaptability, creativity, and collaboration are the key due to the complete nature of knowledge work, and adds that this nature means that those who perform it require certain skills and abilities as well as familiarity with actual and theoretical knowledge. The non repetitive nature of knowledge workers' jobs makes crucial the ability to apply information to new situations. Knowledge workers possess communications skills that enable them to collaborate with one another for goal-setting, decision-making, and idea-generating purposes (Prince, 2011).

Therefore, there is a need on the part of the educational community to continuously analyze and intelligently respond to knowledge economy workplace change in order to adequately prepare their students.

Rationale of the Study

As an instructor in higher education, I see my job as preparing students to become fully functional and competent people in the knowledge economy workplace (Knowles, 1980). Even 30 years ago, Knowles was arguing that teaching was moving "from a focus on teaching to a focus on learning … by focusing on what happens inside the learner rather than on what the teacher does" (Knowles, 1980, p. 19). "We now know also, that the way to produce competent people is to have them acquire their knowledge (and skills, understandings, attitudes, values, and interests) in the context of its application" (p. 19). According to Knowles (1980), the educator is "helper, guide, encourager, consultant, and resource—not that of transmitter, disciplinarian, judge and authority" (p. 37). Knowles

asserted that in order to understand our part as the resource persons and consultants, it is essential that we as instructors understand our learners and use teaching strategies that support their learning needs.

Net-Gen adult learners must be prepared for the modern workplace (Drucker, 1999; Friedman, 2006; Houle, 2012; McNeil, 2012; Rumberger, 1987). Prince (2011) and Tapscott, (2009) have described today's workplace as an environment in which the worker has an awareness of what colleagues are doing, shares expertise, and performs multi project problem solving tasks using project management techniques in interactive technological environments. Drucker (1968) also added, "Knowledge without skill is unproductive. Only when knowledge is used as a foundation for skill does it become productive" (p. 268).

My personal experience supports this view of the workplace. During the last 8 years of over 35 years of full-time employment, I worked as a virtual employee—from my home office. My home office workplace had two computers capable of connecting to my corporate networks worldwide. I had three screens, one telephone with a wireless headset, all connected through the Internet with conference calling capabilities. My computers connected to any of our 172 data centres and offices worldwide. My Information and Communication Technologies system included global email, enabling me to connect to any one of over 130,000 employees. I could oversee changes to call center tracking systems serving hundreds of thousands of clients. I used *Instant Messaging* services connected to other employees and executives. Relevant communications to global customers were carried out through corporate satellite networks. At any one time, I had at least three screens with multiple windows open on each screen plus a conference call in progress. I had never met any of my five or six managers face-to-face over the last 10 years. My workday averaged 12 - 14 hours. I had to

instruct end-users and other instructors on an average of two or three new systems per year. A few years ago, systems engineers (developers) had to learn a brand new programming language within 3 months. At the end of the training period, they had to pass an exam with a minimum of 80%. If they didn't get the 80%, they lost their jobs. That was my work reality and is the modern workplace reality for many Net-Gen adult learners. I believe that this is the workplace reality I must prepare my Net-Gen adult learners to meet.

My personal experience also developed my view of the modern workplace as a *flat* organization (Friedman, 2006) in which there is less hierarchy and decisions are made more quickly because each person is closer to the ultimate decision-makers (Joo-Seng, n.d.). Decision-making involves fewer levels of management, and workers are empowered to make decisions (Brinkley, 2006). Therefore, my students need to be able to work successfully in this type of environment, and I approach my teaching and this research study with a view similar to Drucker (1968), who suggested that preparing students for their place in the *knowledge economy* should be the central concern of education.

I see the results of this research as being important in developing new models/set of guidelines for instruction in higher education that constitute effective learning environments for Net-Gen adult learners.

Theoretical Framework

This study was grounded in the theoretical understanding of how Net-Gen adult learners learn (Knowles, 1980; Fenwick, 2008; Martinez, 2010). According to Knowles (1980), optimum learning outcomes are achieved for these learners through peer-oriented and collaborative engagement with both fellow students and with instructors. As well,

Net-Gen adult learners have been transformed by the ubiquitous nature of mobile devices and digital technologies for formal and informal learning, which has resulted in an evolution of how these students organize their own thoughts, communicate, and learn new material. Sivan (2008) and Downes (2006) describe these adult learners as *connected,* or learners who have developed a learning process in which they use digital technologies and multiple online sources in "ever-evolving creative ways" (The Digital Media & Learning Research Hub, n.d., para. 5) to access knowledge. Pontefract (2011) further promotes the idea that *connected learning* is viewed as a learning process which is "part formal, part informal and part social." (para. 4).

The learner *connects* one's self to people, content, systems, and networks during the learning process itself, and it often occurs through several mediums (para 4). Hence, the term *connected learning* is used to describe how learners use a set of tools to augment learners' abilities to interact with each other through social media (Sivan, 2008, para 4).

Along with Sivan (2008), Downes (2006) also describes connectivism as learning situated in communities, where "the practice of learning is the participation in the community" (para. 2). In other words, "learning occurs precisely because it is a part of community activity" (Downes, 2006, para. 121). This is greatly facilitated by digital tools now available to learners. Downes argues that to learn is to "immerse oneself in the network" (para. 119) and that this constitutes "robust pedagogy" (para. #119).

Pontefract also suggests that connected learning is a "knowledge ecosystem" (para.1) utilizing three modalities: informal, formal, and social. Pontefract describes informal learning, the process of the learner using tools such as webcasts, podcasts,

websites, books, videos, and workshops, whereas the formal connected learning process may involve online experiences, such as virtual workshops, conferences, instructor-led classes, eLearning, professional videos, and institutional and corporate roadshows. Socially connected learning includes blogging, YouTube, social networking, Wikis and discussion forums. Pontefract further states that

> Based on our learning requirements (individual, team, organizational, etc.) we continuously 'connect' the need that has to be filled to the learning modality, be it formal, informal or social. We have to question which modality provides the appropriate amount of depth juxtaposed with the time on which we need the information or new knowledge (Pontefract, 2011, para. 14).

The notion of connectivity being based on a network structure is very clearly expressed by Sivan (2008) when he explains that, "instead of hierarchy, we create networks. Instead of static spaces of information exchange, we foster ecologies" (para. 13). Network structures may be the neural network inside your brain, a social network of like-minded peers, your organization's communication and documentation management tools, and the Internet (Sivan, 2008).

According to the Digital Media & Learning Research Hub (n.d.), educational institutions should harness the natural interests students have in digital technologies, peer relations, and academic ambitions (para. 7) to improve learning for the connected learner. If that were done, it would conform to an initial set of three educational values, three learning principles, and three design principles.

The three educational values at the core of connected learning are:

1. Equity. Quality education should be readily accessible to all groups in society.
2. Full participation. All members of society should have both the opportunity and incentive to participate in education, community life, and civic activities.
3. Social connection. Learning becomes meaningful when taken out of isolation and situated within social groups. (The Digital Media & Learning Research Hub, para. 9).

The three learning principles enabling the preceding values are:

1. Interest in content. Interests are both innate and encouraged in educational settings, resulting in superior outcomes.
2. Peer-supported. Peers and mentors, generating enthusiasm and creativity in the collaborative process, energize individual interests.
3. Academically oriented. Academic success translates to economic and political opportunity, and is a pathway to individual advancement in the knowledge economy. (The Digital Media & Learning Research Hub, n.d., para.11).

Educational and learning principles are realized through three design principles:

1. Shared purpose. Shared interests and goals are facilitated by unprecedented digital technologies.
2. Production-centered. Today's globalized knowledge economy demands creative production as never before, and presupposes life-long learning.

3. Openly networked. Connected learning environments depend upon access to the universe of knowledge that is available via the Internet. (The Digital Media & Learning Research Hub, n.d., para 14)

Connected learning in many ways supports the principles asserted by Knowles (1980), that learning is life long, collaborative, and creative. "The principles of connected learning weren't born in the digital age, but they are extraordinarily well-suited to it" (The Digital Media & Learning Research Hub, para. 3). Knowles was, in many ways, prescient in understanding today's learning imperatives.

I acknowledge that, although many researchers are attributing specific characteristics broadly to those we are identifying as the Net-Gen generation, there are individuals within this generation that might not necessarily follow this pattern. However, this study examined the learning preferences and educational experiences of Net-Gen adult learners who were connected learners working in a knowledge economy workplace that valued skills connected learners had developed. This study examined the learning preferences and educational experiences of Net-Gen adult learners through the lens of what it means to be a *connected* learner working in a knowledge economy workplace that values skills connected learners have developed.

Research Questions

In order to address the question of how higher education is currently meeting the learning needs of Net-Gen adult learners as they prepare to enter the knowledge economy workplace, the following questions were investigated:

- How do Net-Gen adult learners currently use digital technology to meet their learning needs?
- Which digital technologies were used for learning in their postsecondary classrooms?
- What digital skills and knowledge are required in their knowledge economy workplaces?
- Which postsecondary tech-enhanced learning experiences did the Net-Gen adult learners perceive were most relevant to their learning preferences and most helpful in preparing them for their workplace?

Remainder of the Document Outline

This thesis looks at the rapidly changing landscape of digital learners and the workplace experience, what constitutes current classroom reality at the university level, any gap highlighted between those experiences, and instructional strategies, techniques, and activities that most effectively support knowledge building needed for the workplace. In order to analyze this environment, I consulted relevant studies, including current articles in journals and newspapers. In this chapter, I introduced my personal interest in this topic and the need for an investigation into this topic.

Chapter Two presents a literature review with three topics describing relevant adult education models applicable to: a) adult learners of the Net-Generation and their personal preferences for learning, and effective teaching methods for these students, b) current description of the modern workplace and the needs of the knowledge economy,

and c) the Net-Gen adult learners' perceptions of the relevance of their education to meet their workplace demands.

Chapter Three describes the mixed research methods that were used in this study. This chapter includes: research design, descriptions of the participants, definition of data and its collection, analysis of the data, limitations of the study and ethical considerations.

Chapter Four contains findings of the study along with appropriate tables that present the data in a structured format and the resulting analyses of the data to the reader. The objective is to make data manageable and provide a representation of the data, interviews, and personal observations so that conclusions and common themes emerge.

Chapter Five provides a summary of the conclusions reached in the investigation as well as a discussion of how the findings contribute to an understanding of the gap between teaching and personal learning preferences of adult learners. I make connections between the findings from the study to improve best practices in my own classroom and summarize the numerous theories that currently discuss learning by Net-Gen adult learners. The chapter concludes with recommendations for teaching practice in higher education and possible future research undertakings.

CHAPTER TWO: LITERATURE REVIEW

This chapter outlines a research study that investigated the learning preferences and the postsecondary educational experiences of a group of Net-Gen adult learners who are currently working in the knowledge economy workplace (Drucker, 1968; Fenwick, 2008) to see how their actual higher educational experience is relevant in preparing them for this employment.

The areas of relevant literature that informed the design of this study were: a) current workplace conditions and the needs of the knowledge economy, b) Net-Gen adult learners and their personal preferences for learning, and c) how Net-Gen adult learners are being taught and what the Net-Gen adult learners' educational expectations are as they prepare for the workplace.

The Workplace of the Knowledge Economy

Fenwick (2008) defines the core concept of working in the modern workplace as a convergence of "knowledge, phenomena, events and actors" that are "mutually constitutive, and actually emerge together" and describes modern work as a "continuous and dynamic invention within these relationships that enable a complex system to flourish in changing environments" (p. 21). High levels of education alone, as traditionally defined, are no longer enough (Rumberger & Levin, 1967.; MacPherson, 1962).

> Workers continuously experiment and invent new processes, as necessary, in order to fulfill their work requirements. Nothing in

> today's work environment is predictable, with the whole being greater than its parts, creating a synergy, which is 'not predictable from examining the parts of the relationships.' (Rumberger & Levin, 1967, p. 21)

Rumberger and Levin also describe the workplace as shifting from the traditional views of work with detailed division of labour to one that has less hierarchy and more worker participation in decision-making in order to increase productivity (Rumberger & Levin, 1967).

Instead of just following a repetitive routine, the information technology workplace of today requires workers to make decisions about product quality, scheduling of production, training, and job rotation and to address problems that arise in production. This type of shift tends to increase the skill and education requirements even in the absence of technological change, but it has particularly important implications in conjunction with the application of new technologies that facilitate the use of information to address production needs (Joo-Seng, n.d.; Levin, 1987; Zuboff, 1988).

The knowledge economy of the 21st century is driven in large measure by unprecedented advances in transportation and in computing, information, and communications technologies (Drucker, 1968). "Knowledge is fast becoming the foundation of skill" (p. 268). We teach knowledge but perhaps, not necessarily the application of knowledge.

To be competitive, industrialized and developing nations alike are driven by needs such as greater use of science and new technologies by average citizens; more

> interdisciplinary work; greater understanding of highly complex, interacting systems; new and renewed efforts at building communities and solving local challenges in the face of globalization; and a substantial rethinking of retailing, services, and business in general as a result of changing tools, physical possibilities, and financial opportunities" (Moore, 2007, p. 45).

Teachers today are facing an educational dilemma. Education that served well for a mass production economy with comparatively little global competition does not deliver for the challenges of the globalized digital economy (Tapscott, 2009). The world in which teachers learned and learned to teach is also rapidly evolving. Merely installing computers in schools is insufficient to ensure equal opportunity of sharing in the *digital revolution* (Tapscott, 2009).

Knowledge and Workplace Skills

Knowledge, skills, and competencies required by workers in the knowledge economy workplace have been identified, and fluency in information technology (FIT) is included in the list of literacies required to be successful in this economy (National Research Council [NRC], 1999). The NRC report further suggests that literacy is a long-term process of self-expression, reformulation, and synthesis of knowledge in three realms. The three realms are:

- *Contemporary skills* are described as the ability to use today's computer applications and enable people to apply information technology immediately. It is

an essential component of job readiness, providing practical experience on which to build new competence.

- *Foundational concepts* are essential for understanding and using the principles and ideas of computers, networks, and information that underpin and use this technology. Understanding how and why information technology works, gives insight into its limitations and opportunities. Basic comprehension of the foundational concepts of technology is the raw material for understanding and using new information technology as it evolves.
- *Intellectual capabilities* are necessary to apply information technology in complex and sustained situations, encapsulating higher level thinking in the context of information technology. Understanding information technology empowers people to manipulate media to their advantage and to handle unintended and unexpected problems when they arise. The application and the understanding of this technology fosters more abstract thinking about information and its manipulation (NRC, 1999).

The National Research Council report further states that students preparing for the information economy workplace should:

> Be able to engage in sustained reasoning; manage complexity; test a solution; manage problems in faulty solutions; organize and navigate information structures and evaluate information; collaborate; communicate to other audiences; expect the unexpected; anticipate changing technologies; and think about information technology abstractly (National Research Council, 1999, pp.# 21-27).

Fenwick (2008) suggests that, to work in this new workplace, education is essential "to be creative and entrepreneurial as a way to stay competitive" (p. #18) and will continue throughout the worker's career.

Collaborative Nature of the Knowledge Workplace

Working in the knowledge economy workplace requires the formation of workgroups as necessary for projects (Davis, 2001). People inherently collaborate. Working also involves learning. Working is a "continuous and dynamic invention within these relationships that enables a complex system to flourish in changing environments" (Fenwick, 2008, p. 21). Workers continuously experiment and invent new processes as necessary in order to fulfill the requirements of the task. Nothing in today's work environment is predictable, the whole being greater than its parts, creating a synergy which is "not predictable from examining the parts of the relationships" (p. 21).

Drucker (1968) stresses that knowledge workers must have a number of characteristics; they must possess factual and theoretical knowledge, be able to find and access information, have the ability to apply information, have a high level of communication skills, be motivated, and have the intellectual capabilities to understand the value of acquiring and maintaining new knowledge and skills to accomplish their work. Preparation for the knowledge workplace can be most effectively accomplished through education. Central to this philosophical view is that people are the most valuable resource.

The *Globe and Mail* (2012) reported on what the CEOs of some of our top employers value most in employees. Employers stated the most important skill sought was the ability to work in a team structure. Other essential skills (in a descending order of importance) were the abilities to communicate, solve problems, obtain and process information, and analyze quantitative data (McNeil, 2012).

Net-Gen Adult Learners of the Digital Age

There are a number of views about how to teach Net-Gen adult learners, but it has been suggested that Net-Gen adult learners *learn differently* (Barnes, Marateo, & Ferris, n.d.; Tapscott, 1998).

Personal learning preferences

Net-Gen adult learners appear to be more assertive information seekers, and this shapes how they approach learning in the classroom. These students make conscious choices about what learning techniques work best for them, which may include reading lecture notes online, viewing interactive media such as PowerPoint presentations, iTunes movies, YouTube web-sharing videos, Google digital images, or working in groups. According to Brown (2002), the web is a transformative learning technology that will continue to be a transformative medium as important as electricity. Furthermore, Net-Gen adult learners "tend toward independence and autonomy in their learning preferences, which impacts a broad range of educational choices and behaviours, from "what kind of education they buy to 'what, where, and how they learn'" (p. 4). Brown (2002) asserts the web is a new "learning ecology" that may change how the Net-Gen adult learners learn

(p. 3). It is a two-way, push, and, pull proposition for information exchange, and is a medium that requires multiple forms of intelligence—abstract, textural, visual, musical, social, and kinaesthetic (Brown, 2002).

Martinez (2010) explains:

> For this generation, the Internet is not a tool simply to find information but a tool to share information, collaborate on projects of shared interest, organize and socialize. They do this through social network sites such as Facebook and MySpace, live chats, blog posts, participation in multiple-player online games and virtual worlds, remixing content such as songs, art clips, stories, photos, and video clips and uploading them to YouTube, Flickr, or other specific interest sites; and instant polling or rating systems on songs, movies and games . . . . Information age technologies are now as natural to the Net-Generation as breathing. (p. 52)

In recent studies by Rosen (2010), Net-Gen adult learners, and younger, are reported to be doing six things at once. These tasks appear to be complementary and actually provide a deeper understanding of the topic rather than being a distraction. "Certain tasks can be done together without hindering performance" (Rosen, 2010, p. 82). In fact, Brown (2002), studying employees in top high performance organizations, noted that the attention span of his study group of Net-Gen adult learners varied between 30 seconds and 5 minutes—paralleling that of the top managers at the Xerox research centre. Top managers generally operate in a world of fast context switching. In other words, *multitasking* among young people may actually be fast context switching, concentrating on one task at a time rather than tracking several tasks simultaneously.

Formal and Informal Learning

Learning, according to many current educators, can be formal or informal, or *unbundled,* as Sefton-Green (n.d.) describes this process of learning being freed from the boundaries of the educational institution. Coleman (2011) claims that there is considerable overlap between informal learning at home with digital technologies and formal learning at school, and that increasingly the lines between these types of learning blur. Therefore, educators need to think seriously about "contexts such as home, where learning increasingly takes place" (p. 2), and acknowledge that:

> Development is bi-directional, not unidirectional …. human growth and change has been enhanced and influenced by the environment in which he or she grows up….the individual is an agent in his or her own development….digital technologies have special salience for the adolescent period of development (pp. 3 - 4).

People are becoming increasingly responsible for their own learning (Knowles, 2008). "The topic of learning lives is an important one …. away from the constraints of educational institutions, and encourages us to consider young people themselves and their experiences of ICTs as tools for learning" (Coleman, 2011, p. 8). Coleman (2011) further explains that the key priority of education must include a commitment to recognize a developmental perspective when considering the ways in which young people are engaging with digital technologies, and a belief that a cross-disciplinary approach would enhance any attempt at understanding the place of new technologies in the lives of young people (p. 8). Although this study focuses on Net-Gen adult learners ranging in age

between the years 18 and 35, Coleman doesn't specifically identify the ages of the group he refers to as *young* people however, he does refer to adolescents and "adolescent period of development" (p. 4) using technology in his article a number of times. It is generally accepted that adolescents are the group between childhood and legal adulthood (Armino, n.d.). Baker (1997) echoes Coleman's comments on how young people as students learn:

> Compared with students enrolled in conventionally taught courses, students who use well-crafted computer-mediated instruction (CMI) materials generally achieve higher scores on summary examinations, learn their lessons in less time, like their classes more, and develop more positive attitudes toward the subject matter they're learning (p. 1).
>
> CMI is emerging as a preferable way for young people to learn because of increased engagement and enthusiasm.

Effective Teaching Methods for Net-Gen Adult Learners

A new learning style is emerging where lecture is giving way to allow for more individual expression. Individual expression includes individual interaction with other students. Net-Gen adult learning is often characterized as *learning by doing* (McNeely, 2005). According to McNeely (2005), learning characteristics include consistent multitasking, instant gratification, a need for independence, and involvement in the learning process. To include all of these characteristics, it is necessary to formulate a pedagogical strategy that emphasizes the use of technology. The use of the Internet to promote *higher level thinking* and *develop small group skills in the collaborative learning*

has been suggested (Zheng, 2005). The new pedagogical strategy is therefore learner centred. This shift in pedagogy is a result of a natural evolution of the use of technology and ideas of how the Net-Gen adult learners use it in the classroom. Net-Gen adult learners complain that some subject matter seems unnecessary by expressing a lack in interest, not because of subject matter, but a lack of time and attention because the subject matter may not apply to their chosen careers (Barnes, 2007). The Net-Gen adult learner is beginning to drive the shift of attention towards the learner, to a more learner-centred approach (Weimer, 2003).

Brown (2002) also declares that, as educators, we now have a medium that enables our learners to become engaged in their own ideal way to learn. Research about how Net-Gen adult learners learn has evolved over the last 30 years. The evolution of this thought has gone from the *sage on the stage,* with learners working alone, being expected to absorb content delivered by the teacher (Arum & Roksa, 2011), to a focus on learning and the learner (Knowles, 1980), where the teacher capitalizes on content by creating a curriculum that utilizes the digital tools the Net-Gen adult learner takes for granted as natural modes of communication (Beyers, 2009). A number of researchers (Arum and Roksa, 2011; Baker, 1997; Barnes, 2007; Beyers, 2009; Bhattacharya, 2001; Brown, 2002; Bruffe, 1984; Bump, 1990; Cameron, 2005; Carlson, 2005; Carnivale, 2006; Clark, 1999; Coleman, 2011; Dede, 2005; Drucker, 1968; Erlandson, 1993; Fenwick, 2008; Friedman, 2006; Glenn, 2000; Good, 1990; Hartman, Dziuban & Brophy-Ellison, 2007; Hay, 2000; Kurzweill, 2005; Lemke, 2003; Levin, 1987; Livingston, 2008; Lockee, Moore & Burton 2002; Logan, 2006; Mabrito & Medley,

2008; MacKeracher, 2008; McNeely. 2005; Mergel, 1998; Merrill, 1991; Miller, 2000; Moore, 2007; National Research Council, 1999; Noddings, 2007; Tapscott, 1998) argue that the Net-Gen adult learners learn best by using tools that allow multiple voice, data, and video input to receive and transmit communication. According to these researchers, Net-Gen adult learners essentially organize their own learning by using a combination of digital tools such as social networking, videos, and information from diverse electronic resources in collaborative ways. The consequence is that Net-Gen adult learners deeply customize their learning according to their own personal, educational, and professional needs and collaborate with each other and therefore deem educational experiences that incorporate these digital tools and collaborative learning methods as more relevant (Sivan, 2008).

Bar and Tagg (1995) highlight the teaching methods that are characteristic of learner-centred approaches that might be effective for Net-Gen adult learners, and traditional classroom, or teacher-centred approaches that are prevalent in higher education classrooms. See table 1 for details.

Table 1

Comparing teaching-centered and learning-centered approaches (Bar & Tagg, 1995).[1]

Teaching-centered	Learning-centered
Deliver instruction	Produce learning by promoting understanding
Transfer of knowledge from teacher to student	Discovery and construction of knowledge by using relevance
One teaching style	Multiple modularity approach
Curriculum development	Learning technologies development
Quantity and quality of resources	Quantity and quality of outcomes
Time held constraint; learning varies	Learning held constant; time varies
Learning is linear and cumulative	Learning is nesting and networking
Promote recall	Promote understanding
Faculty are lecturers	Faculty are designers of learning environments
Learning is competitive and individualistic	Learning is cooperative and collaborative

[1] Permission to use an adaptation of this comparison table has been submitted.

Educational Environments for the Higher Education Student

Workplaces have changed and are continuing to change because of economic necessity. For example, at my workplace, programmers had to learn an entirely new program language and process within a period of one month. Workplace change is pervasive in Canada over the last 3 years. This change includes changes in job classification and tasks, downsizing, outsourcing, continuous improvement (TQM/ISO) standards, scheduling, and introduction of new technologies (Kumar, Murray, & Schetgne, 2011). In Dylan's (1964) words, the waters have grown, and we had better start swimming or sink like a stone! Schools preparing future workers need to take heed.

Yet, Naomi Baron argues that the move to "incorporate technology, reduce lecture time, and reshape assignments to engage impatient Net-Geners merely caters to a lack of discipline" (Barnes,2007, p. 2). Carlson (2005) proclaims, "at some point, what we are doing is killing higher education" (p. 6).

It seems that many schools adhere to this assessment of the situation, and that institutions of higher education constitute the last bastion of resistance, where many a classroom barely quivers to the digital drumbeat outside (Kay, 2012).

Kurzweil (2005) proposed that the exponential rates of technological change in modern times offer possibilities for gestalt shifts in the way we approach many challenges. For such shifts to occur in today's new economy, time-honoured content and emerging ideas will be joined in innovative ways with old and new technologies to benefit modern society's needs.

> Next come rigorous assessments that demonstrate the manner and degree to which learning takes place. More important, these assessments must evaluate information literacies, technology fluencies, and content competencies together, not as separate remnants of last century's economic and social imperatives (Moore, 2007, p.6).

In the face of so many calls for accountability for learning outcomes, a good portion of which involve appropriately using domain-specific content that resides in digital media and that use digital media as an explanatory tool, higher education will be asked to provide evidence that is more direct than grades or seat time; for example, to demonstrate student achievement. Such measurements include acknowledging the importance of linking questions that relate technology fluency and domain competence as a critical starting point (Moore, 2007). Therefore, fresh approaches to teaching and learning that include deciding what students need to know and how they should be taught in the context of a changing panoply of computing, information and communications technologies is a critical first step (Kurzweil, 2005).

Traditional Higher Education Methods

According to Tapscott (2009), *thinking* in traditional education was/is left to the people in power, and education was simply a sausage factory where individuals were not encouraged to rise above the masses, where conformity was the order of the day. Teachers in such a system are viewed as gatekeepers and the source of all knowledge and where textbooks are regarded as all-important.

> The model of education that still prevails today was designed for the Industrial Age. It revolves around the teacher who delivers a one-size-fits-all, one-way lecture . . . . The student working alone is expected to absorb the content delivered by the teacher (p. 122).

Arum & Roksa (2011) describes student perceptions of the teaching environment and quotes a student as he is commenting on his observations of learning in the higher education classroom, "You know I can get out of here with a 3.5 G.P. average but it doesn't really matter if I don't remember anything…It's one thing to get the grade in a class and it's another to actually take something from it" (pp. 4 - 5).

In a more traditional teacher-centric classroom where information transfer is prevalent, the teacher may be interpreting the meaning of the material for them. Net-Gen adult learners often find themselves immersed in a range of technological devices that provide them with access to information through a broad range of media. The challenge for the teacher is to capitalize on this by engaging in the content of the curriculum through the use of the *tools* of the Net-Gen adult learners (Beyers, 2009).

There are three main theoretical approaches of learning theories according to Beyers (2009). Mergel (1998), quoting Schuman (1996), summarized the three learning models: behaviourism, cognitivism, and constructivism. Behaviourism is based on observable changes in behaviour. Behaviourism focuses on a new behavioural pattern being repeated until it becomes automatic. Cognitivism is based on the thought process behind the behaviour. Changes in behaviour are observed and used as indicators as to what is happening inside the learner's mind. Constructivism is based on the premise that

we all construct our own perspective of the world through individual experiences and schema. Constructivism focuses on preparing the learner to problem solve in ambiguous situations (Schuman, 1996).

Tapscott (1998) used the concepts behind behaviourism as the basis for his description of "broadcast learning" (p. 129). According to Tapscott, "students are *tuned in* to take the information that they are *taught*, or are transmitted to them" (p. 129). The theory suggests that through repetition, rehearsal, and practice, information is committed to long-term memory, which is then integrated to form larger knowledge structures (Tapscott, 1998). Knowledge that is distributed in this way includes lectures, homework assignments, and textbooks. It is one-way and centralized and has a predefined structure that works best for the mass audience. It is a top-down, authoritarian, and teacher-centered process. Reinforcement and punishment were said to enhance learning. In this scenario, the teacher is the transmitter.

Coleman (2012) claims "the introduction of ICTs opens up opportunities for a different curriculum based on a different set of skills" (p. 7). ICTs are not an extension of traditional teaching but require a whole new approach in teaching methodology, which may be one reason that schools have been "slower to integrate ICTs . . . into their lesson plans than they were to locate computers in the classroom" (p. 6). In fact, Coleman explains that even though learners are:

> Deeply immersed in the use of this technology and broadly positive about it, these (University) students also identified a shared set of circumstances associated with its use in school that could be variously stressful, frustrating, threatening or

> devious…[which] raises fundamentally-mediated questions over whether society really desires a transformed, technologically-mediated relation teacher and learner" (p. 7).

Coleman (2011) further explained that "there are important ways in which digital technologies have altered opportunities for learning, or to use Facer's words [no citation] they have provided *augmentation"* (p. 7), including capabilities for learning as "greater freedom for networking with peers, the reach across different media, a widening of the field of enquiry … in the educational field" (p. 8).

However, in spite of effectiveness of digital materials to enhance and deepen learning, "relatively little use is made of technology in mainstream college teaching. Whole-class, lock-step, synchronous teaching continues as the predominant teaching method, particularly in entry-level courses" (Baker, 1997, p. 1).

Relevance Gap

Current teaching methodologies as opposed to Net-Gen adult learners' preferences for acquisition of knowledge constitute a possible *relevance gap*. According to Jerald (2006):

> Integrating technology into learning is central to creating the meaningful learning opportunities that will engage and motivate youth. Half of the students who drop out cite boredom and lack of interest in their classes as the primary reasons for leaving school (p. 52).

Digital technology provides the tools for an individual "to shape and influence his or her own development" (Coleman, 2012, p. 4). The tools used in the classroom are more likely to engage students if they are similar to the tools they use in their daily lives and teaching methods address and respect the inherent individualism of the digitally connected (Coleman, 2012; Jerald, 2006).

It is assumed that *the relevance gap* between Net-Gen adult learners' learning preferences and traditional lesson delivery exists because;

> Those in the university world find it hard to step into the shoes of another generation for whom technology perhaps has a different range of meanings in comparison to those who depend on it day in and day out for their work" (Coleman, 2012, p. 5).

Summary

The issue surrounding technology and its uses in schools still offers much opportunity for debate. If doing database, journal, and literature searches through the Toronto Public Library system, Brock University library, and my college library systems is any indicator, it appears the debate is extremely active and accelerating. Mass media columnists from newspapers, magazines, TV and radio, and even corporate executives, have joined the debate. The trend of the debate seems to support the use of technology in the classroom in order to prepare students for the new workplace (Bruffe, 1984; Coleman, 2012; Drucker, 1968; Fenwick, 2008; Friedman, 2006; Glenn, 2000).

Malcolm Knowles (1980) along with Beckman (1990), Rumberger & Levin, (1967), Davis (2001), Martinez (2010), the National Research Council (1999), Tapscott (1998), Dede (2005), Logan (2006), Moore (2007), Rosen (2010), Houle (2012), and Schuman (1996) and others cited in this thesis have identified the necessity of moving away from the traditional (transmission) method of teaching and suggested teachers employ learner-centred modes of instructional delivery and focus on learning through self-directed enquiry.

Education, in the broadest sense, is a combination of knowledge, experiences, understanding, skills, attitudes, interests, and values. Furthermore, education is ideally increasingly self-directed in order to fulfil new workplace skill requirements and collaboration with fellow workers. The new worker must be not only knowledgeable and have the necessary basic skills but must be able to learn additional skills and adapt those new skills in new ways. Flexibility and creative problem-solving in collaborative teams are normative workplace requirements.

Some of the issues identified by Coleman (2012) and Baker (1997) in various educational institutions have outlined technology gaps in delivering lesson materials to students. Knowles (2008), MacKeracher (2008), Tapscott (1998), and others have urged the need to use current technologies to capture the imaginations and learning capacities of today's students. Houle (2012) writes, "We realized we had to emphasize global learning, encouraging thinking across disciplines, the capacity to work in teams on complex problems and use technology fluently" (p. 207).

Overall conclusions from my readings indicate that today's Net-Gen adult learners (Prensky, 2001; Tapscott, 2009) may be significantly different from previous generations of students, being on the whole more independent and self-motivated as learners, prefer learning by doing, and are more actively involved in the learning process in general. They are also more single-mindedly, career-needs driven (Barnes, 2007; Rosen, 2010). A consequence of these learning preferences is that Net-Gen adult learners best respond to collaborative styles in the classroom (Beyers, 2009; McNeely, 2005).

The knowledge economy workplace desired by Net-Gen adult learners requires continuous technology adaptation, collaborative creative solutions to problems, and rapid assimilation of new information (Davis, 2001; Drucker, 1968; Fenwick, 2008; the National Research Council, 1999). Careers evolve more rapidly in response to the constant evolution of ideas and technology in the knowledge economy workplace, necessitating life-long learning (Barnes, 2007; Knowles, 2008; Kumar, Murray, & Schetgne, 2011).

Houle (2012) observed, that there is a growing interest in highly specialized majors such as computer security, and in interdisciplinary studies such as project management for business professionals, financial managers, engineers, and scientists. These areas of study are now firmly entrenched in a globalized context, incorporating rapidly evolving digital communications. The ever-increasing pace of professional life is reflected in students' desire for faster-paced degree attainment (p. 207).

Adult learners require the talents of an adult educator in order to develop the skills and knowledge they need to understand and fulfill their work requirements and/or personal needs. Adult learners are filling continuing education classrooms and online courses at unprecedented rates. Adult learners are required to adopt new roles and learn new skills at work and at home. Working roles within the information technology workplace have changed. In order to meet those new work demands, schools and instructors must change. The workplace may soon have jobs and professions that have not even been invented yet. It is essential the students have the tools and application knowledge to meet any future, yet to be defined by requirements. It is generally felt from the literature that was reviewed that the adult learner today needs to learn how to ask the right questions and be directed to "find answers for themselves" (Knowles, 1980, p. 37); in other words, to be rapidly adaptive, flexible, and creative in the face of transforming environments.

How much time and effort do instructors expend trying to make students enthusiastic and passionate about learning? Are we delivering education using methods that keep the Net-Gen adult learners interested and appropriately informed with what they need to know in order for them to enter today's workplace? This study attempts to address these crucial issues by investigating the learning preferences of Net-Gen adult learners by exploring their perceptions of personal learning needs, skills requirements of the knowledge economy workplace, and the Net-Gen adult learners' perceived relevance of higher education.

CHAPTER THREE: RESEARCH METHODS

This chapter outlines a research study that investigated the learning preferences and the postsecondary educational experiences of a group of Net-Gen adult learners who are currently working in the knowledge economy workplace (Drucker, 1968; Fenwick, 2008) to see how their actual higher educational experience is relevant in preparing them for this employment. In order to describe the learning preferences of a purposive sample of Net-Gen adult learners and capture their perceptions about learning experiences that are most relevant to their knowledge needs in the workplace, this study employed a mixed-method research design.

Research Design

Creswell (2012) and Erlandson et al.(1993) suggest a systematic approach using a combination of quantitative and qualitative methods, such as a mixture of questionnaires, interviews, field notes, researcher's reflective journal notes, and case study reports constructed collaboratively with participants, as suitable for capturing perceptions of lived experiences of participants. This study used a combination of quantitative and qualitative methods by mixing or integrating two research strategies (qualitative and/or quantitative) to produce a report. This study used a sequential explanatory mixed-method design in which the research is conducted in two phases (Creswell 2012). Creswell (2012) explains that, "In this design, quantitative, numeric, data is collected and analyzed first, while the qualitative, text, data is collected and analyzed second in sequence, and helps explain, or elaborate on the quantitative results obtained in the first phase" (Creswell, 2012, p. 304).

Participants of the Study

A purposive sample of participants was chosen and recruited. A total of 31 participants responded to the questionnaire. The selection process was based on specific criteria in order to ensure maximum diversity of gender, age, and level of secondary education in the sample, in order to gather a variety of responses that will provide rich textual information. In order to capture perceptions of the Net-Gen adult learners about postsecondary digital learning experiences most relevant to their workplace requirements, the criteria for selecting individuals were:

1. Between the ages of 18 and 35, as described by Tapscott (2009) as Net-Gen adult learners;
2. Currently employed in a knowledge economy workplace, as described by Drucker (1968) and Brinkley (2006), in workplaces for business, law, and engineering;
3. Diverse in backgrounds including gender, age, and postsecondary education in order to provide a maximum diversity of perspectives;
4. Recent graduates of, or attending, a postsecondary institute of education such as a college or university in Ontario, specifically students or graduates of business, engineering, science, health sciences, liberal arts and humanities, computers science, or law. The focus was on students that were preparing for the knowledge economy workplace.

Four respondents were chosen from the 31 questionnaire respondents to participate in the interview phase. These volunteers were selected based on their diversity of experiences in higher education, including digital environments, and their diversity of

background in working in the knowledge economy workplace. For this study, two males and two females between the ages of 21 and 35 were selected. Three of the selected participants were recent graduates; one participant is a graduate student. One is a mechanical engineer working for a high-end pump manufacturer based in Europe, the other engineer is a metallurgist (engineer, with a Master's degree) working for a large Canadian gold-mining company, and the third a recently graduated lawyer working for a large Canadian insurance company. The fourth participant is a graduate student working in community and urban planning and working part-time at a country club.

Data Collection

The procedure for conducting this mixed method study began with providing participants with a questionnaire instrument (the quantitative part of the study) that provided descriptive demographic statistics about the study participants (Peterson, 2000). The study participants were selected to meet the specific criteria outlined in the section, *Participants of the Study*, above. The questionnaire was constructed to gather characteristics of the Net-Gen adult learners regarding their self-reported learning preferences, their use of digital tools for formal and informal learning, their use of digital technologies in postsecondary educational experiences, and their use of digital technologies in their workplaces. The questionnaire was then piloted with two individuals recruited from my former students because they had similar backgrounds and employment experiences to the study participants. The questionnaire was revised based on feedback from the pilot. The final questionnaire was completed by 31 participants. Four volunteers from the questionnaire respondents were selected based on their diversity of experiences in higher education, including digital environments and their diversity of

background in working in the knowledge economy workplace, to participate in semi structured interviews. Case reports for each of these interviewees were constructed from a combination of interviews, researcher field notes, researcher reflexive journal notes, and questionnaire data. Case reports presented interviewee perceptions of the relevance of their higher education experiences to requirements needed in their knowledge economy workplaces. Trustworthiness of qualitative data was achieved using a member checking process to saturation.

I chose to use a mixed study design in order to extricate as much information as possible about the use of digital technology from participants. I felt a descriptive quantitative study alone could not provide the type of information required. Quantitative research explains what types of digital technology participants are using. Qualitative research is an attempt to reveal why they are being used. It is understood that this is a complex issue, encompassing as it does a myriad of social factors as well as individual motivations, both conscious and subliminal.

Data collection was conducted according to the following timeline:

1. An on-line questionnaire was constructed based on study objectives and the literature review.
2. The initial questionnaire was piloted with individuals of similar backgrounds to participants of the study.
3. The final questionnaire was revised for feedback. See Appendix A for the questionnaire.

4. Request for ethics approval was submitted through and received through the Brock University REB process. Approval was received under file #12-288-FIGG.
5. Following the recommendations, terms, and conditions of the Brock University REB process, participants were recruited via email and sent a letter of invitation and an informed consent form.
6. The link to the on-line questionnaire was distributed via email to those who had agreed to participate and had returned the completed informed consent letter.
7. Results from the 31 questionnaires were analyzed.
8. Interviewees chosen, with four participants meeting the criteria based on returned questionnaires.
9. Four participants were selected for interviews from the questionnaire respondents and interview times were set up.
10. Interviews were conducted via telephone and transcribed as interviews were completed.
11. Case reports of each participant's perceptions were constructed from interview summaries and other data such as the researcher reflexive journal, researcher field notes, and questionnaire comments.
12. Case reports were distributed to the four interview participants for member checking, a process were participants continued case reports until no new ideas emerged.

Quantitative Data Collection Instruments

Data collection began with participants completing an online questionnaire (Peterson, 2000). Quantitative data were collected first and "used to produce results to assess the frequency and magnitude of trends" (Creswell, 2012, p. 535). This questionnaire was specifically designed to collect descriptive statistics regarding participants' digital learning style preferences, informal and formal learning using digital technologies, the use of digital tools in postsecondary instructional settings, and the use of digital tools in their workplace.

The questionnaire

The questionnaire contained 24 questions. As per Peterson (2000), the questions were grouped by theme divided into four categories. The first category covered basic demographics—age, gender, education level, major or focus of study, and employment status. The second category looked at their personal use of technology—what ICT devices are used, what environments were being used to share information (if any) with friends, and technology usage preferences. The third category included the uses of technology in the classrooms at their universities and colleges, the uses of digital tools used by instructors for lesson distribution and information sharing with fellow students (in and out of the classroom). This category in the questionnaire asked survey respondents to rate lesson delivery with a satisfaction rating. A scale of 1 to 5 was used, with 1 being *low*. The fourth and final category on the questionnaire concentrated on the use of technology at work. Respondents were asked to identify tools that were used at university and at work. Participants were also asked to rate how well they felt their education prepared them for the knowledge economy workplace, how they felt the

importance was for their work, the relevance of their education, and their general satisfaction with their education. See Appendix A for questions used in the questionnaire.

Questionnaire Pilot

Two strategies were used to ensure content validity, which ensures that "items measure the content they were intended to measure" (Creswell, 2009, p.149). First, an expert on the topic, a technology professor at a local university, reviewed the questions on the questionnaire to determine if the questions "measure the content they were intended to measure" (Creswell, 2012, p. 210). Second, two individuals with similar backgrounds to the study participants also reviewed the questionnaire to ensure clarity of the wording of the questions. The two student reviewers were two of my former students. The process was:

1. The questionnaire was emailed to these individuals, allowing time for them to review the questions individually;
2. I contacted the first individual via telephone. I had the first individual complete the questionnaire orally and explain why the questions were answered the way they were;
3. We discussed and recorded the participant's comments for each question;
4. Question/s were edited as per their feedback;
5. The process was repeated with the other individual.
6. After all edits were completed, the questionnaire was sent back to the reviewers for final approval.

This review process resulted in a total of five major edits to question content phrasing and three minor grammatical edits. The resulting questionnaire was used for the research in this study.

Qualitative Data Collection Instruments

Qualitative instruments (interviews, written case reports from interviews of participants, researcher field and reflexive journal notes, and qualitative comments from questionnaire) were used to describe, understand, and interpret learning experiences. Qualitative data collection began with the first participant contact (Erlandson, et al. 1993; Patton, 1990). All interactions with participants were documented through transcripts, researcher's field notes, and researcher's reflexive journal. The specific qualitative data collection methods used for this study were the following:

The interview

The interview was considered to be "a conversation with a purpose" (Erlandson, et al., 1993, p. 85). The conversation between the interviewer and the participant was a back and forth exchange of ideas moving from interpreting the past, discussing the present, and projecting the future—in this case—of the use of digital in their personal lives, at work, and their experiences with digital technologies in their higher education institutions. This exchange helped the interviewer put the participants' views about using digital technologies and their higher education experiences into a context that helped the interviewer, and eventually the reader, understand these views on possible gaps in how technology is used in the classroom (Erlandson, et al., 1993).

In order to extricate underlying feelings of the participants about digital technologies, using these technologies at work, and their experiences using this

technology in their higher education experiences, individual semi structured interviews with four of the questionnaire respondents were conducted. An interview protocol was used (See Appendix B). These participants were selected from the questionnaire respondents who had agreed to be interviewed, based on their diversity of experiences in higher education, including digital environments, and their diversity of background in working in the knowledge economy workplace. Interview time allotment was 30 - 40 minutes. All interviews were conducted via telephone and recorded on a digital data-recorder. Recorder notes were textually transcribed for analysis procedures. The objective was to document phenomena as they emerged, procedures and analysis consistent with the principles of qualitative research (Erlandson et al. 1993). The following procedures for interviews were followed:

- Interview subjects were selected based on the criteria stated above.
- Contact through email was made with interviewees in order to arrange a mutually agreeable time for interviews to be held.
- A "person as instrument" along with a Letter of Consent and Informed Consent statements were developed and sent to interviewees via email.
- The Informed Consent statements signed by the interviewees were received via return email.
- Interviews were conducted.
- A researcher's reflexive journal was developed.
- Case reports were prepared.

- Perceptions represented in case reports were member checked with individual participants for accuracy; this process was repeated until participants were satisfied with accuracy of the report.
- Data were triangulated (Erlandson, et al., 1993; Glaser, 2004) by using quantitative and qualitative data collected from questionnaires and the interviews.

Researcher's field notes

The researcher recorded field notes during interviews with participants. After the interviews, field notes about observations the researcher made during the interview, reflexive notes about the interview and what was learned, or other notes about the conversation were made. These were to accompany the transcripts and were items that would not show up in the literal transcripts of the conversation (Creswell, 2012; Glaser, 2003; Seidel, 1998).

Researcher's reflexive journal

Per suggestions from Erlandson et al. (1993), a reflexive journal was kept to serve as a record of the progress and interviewer thoughts or reflections about the events that occurred during the research study. The reflexive document was used to record decisions and ideas that occurred regarding the research as it progressed, reflections upon new information or reading that served to influence interpretation of data, or thinking about the research process. As such, this document formed a chronology of the research study and may be useful as an audit trail for the research (Creswell, 2012). Notes were also added to the researcher journal that record serendipitous conversations or emails that

occurred outside of the formal interview situation which provided insight into the perceptions of the participants—if applicable. See Appendix C for the reflexive journal.

Case Reports

Erlandson et al. (1993) explained that within a study investigating the perspectives and lived experiences of individuals within the phenomenon, the "principal task of the researcher is to communicate a setting with its complex interrelationships and multiple realities to the intended audience in a way that enables and requires that audiences interact cognitively and emotionally with the setting" (p. 163). Case reports are normally used by the qualitative researcher as one of the tools to present the reader with a description of interrelationships within the phenomena under study, providing a "rich and comprehensive picture" (Creswell, 2012, p. 536), or, in this case, a picture of use of technology by the study participants personally in their learning environments and in their the knowledge economy workplace. The use of case reports in this study provided a thick description of the context in which the phenomena occurred, allowing the reader to judge the information held within the case report and make decisions whether or not the themes that emerged can be transferred to their own situations.

Erlandson et al., (1993) also suggest that one of the primary reasons for constructing a case report is to maximize the researcher's ability to identify emerging themes that may be common to other cases. In order to accomplish this objective, case reports were constructed for each of the four participants interviewed, using a "thematic approach" (Creswell, 2012, p. 274). The objective was to highlight for the reader the themes that emerged from the data analysis of each participant. A cross-case analysis was then performed to highlight the emerging themes that were common across the four cases.

Khan and VanWynberghe (2008) suggest that the use of the cross-case analysis produces "new knowledge" (p. 2) by extending the researcher's ability to see beyond a single case and delineate a combination of factors affecting the study phenomenon. New dimensions of understanding are then revealed by comparing participant perceptions in one or more settings, which, in this case, are the views of the consequences of using technologies in different classrooms in different courses. A cross-case analysis was conducted by comparing, categorizing, and grouping data into common themes. The resulting themes were then coded and used to compare the four case reports to find similarities and differences. The goal of the cross-case analysis was to find cases containing both common and unique issues to try to facilitate a better understanding of issues using digital technologies in higher education environments (Khan & VanWynberghe, 2008).

Member checking of summarized reports of interviews

Member checking in this study refers to the researcher soliciting feedback from respondents on the inquirer's findings through the process of reviewing case reports created by the researcher that summarize participants' perspectives expressed in interviews, questionnaires, and any other data collected. The member checking process, which allowed participants to elaborate on, review and change, or edit their responses to more completely reflect their opinions and beliefs, ensured accuracy (Creswell, 2012) and confirmed that summarized statements were primarily reflections of the participants' perspectives, rather than the researcher's expectations (Erlandson et al., 1993).

The member checking process that was used was as follows:

1. A copy of the case report that was constructed by the researcher from all data (as described above) was sent to the participant for review.

2. Participants were asked to provide feedback or comments such as: “Am I on the right track?” , “Did I capture your thoughts on this correctly?” or “Did I understand this is what you meant?”

3. The copy of the case report with corrections or revisions was returned to the researcher via email.

4. A new revised copy of the case with corrections was returned to the participant for further feedback, clarifications, and comments.

5. Steps 2 - 4 were repeated until the participants no longer added information, ideas, perceptions, or corrections (Creswell, 2012).

The member checking process was continued until saturation was reached, which in this study occurred when no new information was added or new substantive comments were forthcoming from interviewees based on the feedback processes, thereby indicating that there was nothing to be gained by continuing the process (Creswell, 2012).

However, in this study, three out of four cases were returned approved with no additional edits, even though the researcher revised and requested feedback. One case required two minor edits before final approval was received.

Person as instrument statement

Qualitative inquiry demands the use of a *human as the instrument* document (Erlandson et al., 1993). It was therefore essential that a statement of researcher beliefs, biases, values, experiences, and personal perceptions that might influence the interpretation of data or decisions made during the research process be noted. The statement served two purposes: to inform the reader of any personal biases or perceptions that could influence the interpretation of data and as a reminder to the researcher that he

or she holds these beliefs during the research (Erlandson et al., 1993). (See Appendix D for my *Person as Instrument* statement.) The *Person as Instrument* statement informed the reader of my personal values, perceptions, and experiences regarding this study. The statement describes my 35 years on the factory floor, including over 20 years of experience as a corporate trainer and over 8 years as a higher level education instructor.

The statement also recorded my belief that technology and the Internet contribute to a communications revolution rapidly underway, akin to and surpassing the communications revolution started by the printing press. An increasingly diverse student cohort functions in a revolutionary environment: an unstable knowledge economy in technological/communications flux, under increasing pressure to perform in constantly innovative ways. My experiences on the factory floor, corporate training rooms, and in classrooms have had an enormous impact on my beliefs about the power of technology and the computer as a communications tool. It has the power to stimulate learning and promote critical thinking at various levels. I fervently believe the computer empowers students to achieve types of learning never seen before. Learning takes place at the kitchen table, the local store, café, library, or car, in wired environments. Work can be a website, an organization, public or private sectors, in an airplane, or the farm. Work itself can be paid or unpaid, based on reflection, material or virtual, in or out of the home. Workplace learning is not only formal training but increasingly on-the-fly and informal on an as-needed basis. The emphasis of globalization has made learning a lightning rod for survival. The emphasis on the knowledge economy has created big demand for innovation—people learning to be creative and entrepreneurial as a way of staying competitive. New technologies are continuing to fundamentally change how people learn

(Fenwick, 2008). The *Person as Instrument* statement highlights my passionate belief that technology is rapidly transforming our world and, concomitantly, our students' requirements for surviving and thriving in that world. Because the student is changing in how she or he learns, how we teach must also change.

Data Analysis

Quantitative analysis used in this study generated descriptive statistics to summarize data from the aggregation of results from the online questionnaire. General tendencies in the data were identified through the use of percentages that are derived from frequencies or counts of common response from participant surveys to provide context and trends (Lind, 2009).

The qualitative data analysis process helped develop a "more in-depth understanding" (p. 535) and a more "rich and comprehensive" (p. 536) picture of this phenomenon (Creswell, 2012). Qualitative data were collected as they were gathered from each interview and transcribed into text. The qualitative data analysis was based on a combination of textural data from transcriptions of interview conversations, serendipitous conversations, and general comments, as well as recorded field and researcher journal notes, and using an iterative and recursive coding process to categorize and group data into themes that identify similarities or patterns (Erlandson et al., 1993). See Appendix E for details.

A peer debriefing process was used to help establish trustworthiness during the coding, categorization, and theme construction phases of qualitative data analysis. (Guba, 1998) explain that peer debriefers are *knowledgeable others,* or peers, outside of the context, but who have a general understanding of the research methods being used in the

study and a familiarity with the topic being investigated. For this study, my thesis supervisor was recruited to serve as the peer debriefer. As a professor of technology education, she provided feedback regarding the accuracy of interpretation of data for coding, categorization, and theme generation as well as appropriateness for case reporting.

The themes emerging from the coding process were used to create case reports that represented the perceptions of the participants. Participants were asked to member check (as described above) the reports or review the case reports and make any changes or clarifications needed to more accurately express their viewpoints (Morse, Barrette, Mayan, Olson, & Spiers, 2001). A cross-case analysis (Creswell, 2012) was conducted to illuminate common themes and ideas that might emerge from across cases. A generic sample of this process is shown in Table 2. Please note that each unitized piece of data, or smallest thought about a topic, is provided with a coding label that describes the topic. Each topic is then chunked into relevant themes. See full results in Appendix E.

Limitations

This study had several limitations that should be acknowledged. First, qualitative methods of collecting and interpreting data in social or education studies are often preferable due to the fact that depth and understanding of the phenomenon can be gathered. However, qualitative data inherently do not have empirical data containing numerical precision, clarity, and systematization of measurement (Creswell, 2003); therefore, rigor in this qualitative study was gained through strict adherence to strategies and procedures to ensure trustworthiness (Creswell, 2012; Erlandson et al., 1993, Guba & Lincoln, 1998).

Table 2

Coding Excerpt

Themes	General Coding Categories	Key Descriptors	Examples of Data
Digital tech in class	Formal learning	Learning management tools	"Very few professors, probably less that 5% use the web portal for feedback on assignments"
Digital tech in the workplace	Informal learning	Self-taught	“I use Excel extensively at work and this was hardly touched upon in school”
Personal learning needs	Informal learning	Social-collaborative	“We texted a lot in informal teams in order to get our projects done”
Personal learning needs	Informal learning	Social-collaborative	“We (the students) often studied together sharing on-line notes and documents”

The second limitation is the size of the sample of participants (*n=31* for quantitative questionnaire and *n=4* for qualitative cases) being used in the study. In this study I was not seeking to generalize to other populations, but lived experiences of these specific participants at the time of the study may be useful to others (Creswell, 2012; Erlandson et al., 1993; Guba & Lincoln, 1998). The uses and expectations that emerge from the introduction of newer technologies create a very fluid environment which changes almost on a daily basis. Procedures used in this study were meant to ensure as much detail as possible of lived experiences of the participants in this environment through purposive sampling (to collect perspectives from participants with as broad a range of backgrounds and experiences as possible) and pilot testing of the questionnaire with individuals similar to the study participants before actual data collection began.

Third, the use of self-report data from participants may be problematic; however, triangulation with quantitative data as well as cross-case analysis was conducted (Erlandson, 1993; Guba & Lincoln, 1998).

As well, the sample size used to enrich understanding of the experiences of the population under study is small (n=4) and, may not be sufficient to fully illuminate within group diversity of the population. Individuals within the population of Net-Gen adult learners may not necessarily share the general traits being attributed to Net-Gen adult learners. Even though strategies to enhance trustworthiness and credibility were used, such as the careful selection of participants for the qualitative phase of the study for diversity in educational background, gender, and workplace experiences, findings will only represent the specific population under study and cannot be generalized to a larger population.

Establishing Trustworthiness

Trustworthiness in this study was established using a combination of strategies. The strategies used to enhance academic rigor were a combination of triangulation, peer debriefing, member checking, the use of a (member checked) case report, and the use of a reflexive journal that served as a chronology of the study which could be used as an audit trail (Leitz & Langer., 2006). Specifically, trustworthiness was enhanced by triangulation between the interview, questionnaire data collection, and the opportunity for interview respondents to read case reports constructed from their questionnaire and interview responses, allowing them to edit, verify, and clarify those constructions in order to present the voice of the participant with accuracy (Creswell, 2012; Morse et al., 2001).

The use of peer debriefing was another strategy to enhance trustworthiness. The peer debriefer was used to review and confirm interpretations of data during data analysis, specifically to provide feedback on accuracy of the coding, categorization, and determination of themes that emerged from the data analysis process (Erlandson et al., 1993).

Member checking was used, allowing the interview participants to check accuracy and validity of researchers' interpretation in creating summaries. The ultimate objective of member checking is to keep distortion or bias nonexistent or at least to an absolute minimum (Armino, n.d.).

The researcher's reflexive journal provided a possible audit trail that allowed others to understand the decisions made during the study, any changes to the research process that occurred during conducting the study, any additional data serendipitously collected from participants, and researcher's reflections (Armino, n.d.).

Ethical Considerations

Research studies, especially qualitative research where participant voice is presented as an integral component to the findings, requires a strict compliance to the code of ethics (Creswell, 2012), such as those set out by the Brock Research Ethics Board (REB). For this research, one original and two hard copies of the appropriate required forms were submitted to the Brock REB for review and approval. The application consisted of a submission form for ethics review, a letter of invitation, and an informed consent form. Clearance was received from the Brock Ethics Review board under file #12-288-FIGG.

Considerations such as reviewing *best* ethical practices, designing the study by being mindful of safeguarding data by using encryption, maintaining confidentiality, and using anonymous identifiers for both quantitative and qualitative data have been considered and built into the design of this study. The design of this study included considering and keeping risk at a minimum.

Risk

Participants were asked to contribute through an online Google Drive Form questionnaire. The questionnaire, created in a Google Drive, was linked to a specific Google Gmail account, which was available only for the study participants and the duration of the study. The tool used upon completion and submission of the form to carry out data tracking and calculations for descriptive statistics and frequencies was a *Form* located on a Google Drive.

The research required the use of a Web 2.0 application, Google Form located on a Google Drive, meaning that the only way for individuals to participate in the research

was through the online Internet tool. Access to the website required a password verification process offering protection from any but invited participants and a designated Gmail account used specifically for this study. This process was designed to limit the risk of outsiders gaining access to private information posted on the Google Drive site. Participants were told in the informed consent letter that precautions taken offered a reasonable expectation of privacy and the risk of outsiders gaining access to private information through Google Drive form was highly improbable. However, all of these interactions occur on an online environment and, as such, regardless of how diligent and powerful the online tool may be, invasion of privacy from outside sources was a remote possibility. Participation in this research exposed them to this risk.

Research Benefits

A possible benefit to participants because of this study was to provide an impartial forum through which they could voice their opinions about their educational experiences. Additionally, this study was designed to provide educators with insight into the types of preferred learning environments used by participants that support the knowledge economy workplace plus informal and formal learning approaches employed by Net-Gen adult learners.

Summary

In this chapter, an explanatory mixed-method design that appropriately answers the research questions for this study was described. The investigation of how higher education is currently meeting the learning needs of Net-Gen adult learners as they prepare to enter the knowledge economy workplace explored the following questions:

- How do Net-Gen adult learners currently use digital technology to meet their learning needs?
- Which digital technologies were used for learning in their postsecondary classrooms?
- What digital skills and knowledge are required in their knowledge economy workplaces?
- Which postsecondary tech-enhanced learning experiences did the Net-Gen adult learners perceive were most relevant to their learning preferences and most helpful in preparing them for their workplaces?

The quantitative method using a questionnaire was used to provide descriptive information about the characteristics of the Net-Gen adult learners, preferences for learning formally and informally, specifically using digital tools, and providing information about the types of educational experiences that effectively served as preparation for their knowledge economy workplace. Data collection and analysis were based on frequencies of responses from the questionnaire as well as content analysis of questions from questionnaires, interview data, interviewer field-notes, and researcher's reflexive journal, case reports, a member checking of notes by participants, and case reports which served as the source of qualitative data that provide insight and understanding of comments expressed. The combination of developing themes across cases and triangulation processes, plus understanding limitations of the study, was used to produce a study with objectivity and within the limitations of the study.

CHAPTER FOUR: FINDINGS

This chapter outlines the research findings of a study that investigated the learning preferences and the postsecondary educational experiences of a group of Net-Gen adult learners currently working in the knowledge economy workplace (Drucker,1968; Fenwick, 2008). In order to describe the learning preferences of a purposive sample of Net-Gen adult learners and capture their perceptions about learning experiences that were most relevant to their knowledge needs in the workplace, this study used an explanatory mixed-method research design. Participants for this study were chosen using specific criteria to complete a questionnaire providing information on their self-reported learning style preferences, their use of digital tools for formal and informal learning, their use of digital technologies in postsecondary educational experiences, and their use of digital technologies in their workplaces. Four volunteers from the questionnaire respondents were selected based on their diversity of experiences in higher education, including digital environments and their diversity of background in working in the knowledge economy workplace, to participate in interviews. Data collected from the questionnaire were analyzed for descriptive and demographic statistics (Peterson, 2000), and textual data collected from the interviews were analyzed using a unitized coding process in which text is broken down to the smallest unit of data that represents an independent thought about the topic, and categorized so that common patterns could be identified. Common themes emerged from the analysis of the stories of the participants (Erlandson et al 1993; Maykut & Moreland, 1994; Miles & Huberman, 1994).

In order to address the question of how higher education is currently meeting the learning needs of Net-Gen adult learners as they prepare to enter the knowledge economy workplace, the following questions were explored:

- How do Net-Gen adult learners currently use digital technology to meet their learning needs?
- Which digital technologies were used for learning in their postsecondary classrooms?
- What digital skills and knowledge are required in their knowledge economy workplaces?
- What tech-enhanced postsecondary tech-enhanced learning experiences did the Net-Gen adult learners perceive were most relevant to their learning style and most helpful in preparing them for their workplaces?

Initial Research Phase: Questionnaire Results

As stated in Chapter Three, the research study began with providing participant volunteers with a questionnaire.

Overview of Net-Gen Adult Learners

Participants self-reported demographic information in the questionnaire to provide an overview of their experiences and present a clearer picture of the characteristics of this specific group of Net-Gen adult learners. These participants were split at 58% and 42%, with females being the larger group. Thirty-five percent of the participants were between 26 and 30, and 48% were in the final grouping of 31 to 35. See Appendix F for details.

At the time of the study, the participants had a diverse range of educational experiences. Nineteen percent of the participants had recently graduated; 81% were currently either part-time or full-time students. Sixty-eight percent of the participants were attending or had attended colleges, while 19% were currently university students. Ten percent listed their institution of higher learning as "other," indicating a private or specialized institute. See Appendix G for details.

As well, the study participants had diverse backgrounds in achieving diplomas and degrees. Thirty-eight percent had college diplomas, 19% had undergraduate degrees, and 45% had advanced degrees from a university. See Appendix H for details.

Participants were also selected because of a diversity of background education that prepared them for knowledge economy workplace fields. Ninety-three percent of the respondents in this study were educated and employed in disciplines of study as described by Prince (2011) and the National Research Council (1999) as fields that directly apply theory learned to tasks in the knowledge economy workplace. For example, business disciplines study taxation—the theories behind taxation, the laws related to taxation—and applying these theories to actual scenarios. Mechanical engineering disciplines study the theories of mechanical movement, applying theory to machine design. The study of law requires the direct application of legislation to legal issues encountered by clients. The respondents in this study were employed in the following fields: business (52%), computer and related technology (13%), engineering (19%), law (6%), and science (3%). The remaining 6% of respondents are employed in fields that do not tend to use knowledge from educational backgrounds that apply directly to workplace tasks. See Appendix I for details.

Demographic information was gathered to verify educational standing, identifying degrees held, educational focus, and educational specialty. Participants in this study represented a broad range of knowledge economy workplace experiences and had a variety of experiences in personal use of digital technologies as well as a variety of different experiences in postsecondary education.

Personal Preferences for Using Digital Technology to Meet Learning Needs

In this study, 100% of the respondents were using digital devices personally for communication purposes. Devices included a variety of smartphone/cell phones and tablets as well as laptops and desktop computers. As well, 84% of the respondents in this study reported using their communication devices to meet learning needs outside of the classroom. They were interacting with others about classwork using email (48%), texting (19%), online chat (6%), synchronous communications or cloud tools (6%), and finally social networking (3%). See Table 3 for additional details.

Table 3

Personal Communication Tools and Methods Used to Interact With Others About Classwork Outside of the Classroom.

	Count	%
Email	15	48
Online chats	2	6
Synchronous communications or Cloud tools	2	6
Social networking	1	3
Texting	6	19

Digital Technologies Used for Learning in the Classroom

Respondents were asked to report all types of lesson delivery modes they had used, and in order to describe all types of modes being experienced were able to select more than one option. They reported more classroom instructional experiences in their postsecondary education in which the delivery of lessons was through non-digital modes rather than digital modes. The lessons delivered using non digital modes were described as consisting of printed notes (10%) and notes written on the board (32%). However, the respondents also indicated experiences in their postsecondary class instruction that included the use of digital tools to deliver the lesson, specifically in which the instructor used a presentation and LCD projector (26%) and made use of the learning management system portal (26%). Very few respondents had experiences with their instructor providing podcasts (3%) and a class or lesson website (3%).

See Table 4 for the details of digital technology usage to deliver lesson materials in the classroom.

Table 4

Digital Delivery Methods Versus Non Digital Delivery Methods

Digital Tools Used		
Lesson delivery method	**Count**	**%**
Class or lesson website	1	3
Podcast	1	3
Presentation & projector	8	26
School web portal	8	26
Non-digital instruction tools		
Printed notes	3	10
Notes written on board	10	32

Digital Technology Used in the Workplace

In the workplace, 61% of the respondents reported using email and mobile devices to conduct workplace tasks. Those tasks generally involved communication related duties, which included using email (45%), mobile devices (13%), and blogs (3%). Cloud computing functions were used by 10% of the respondents. Nineteen percent of the respondents reported using digital technology for various document management applications such as Word, Excel, PowerPoint, and databases. See Table 5 for details.

Table 5

Digital Tool Usage in the Knowledge Economy Workplace

Tasks involving communications		
	Count	**%**
email	14	45
blogging	1	3
Mobile devices	4	13
Tasks involving Public or Private Cloud Computing		
Cloud environment computing	3	10
Document Management		
Word, Excel, PowerPoint, Databases	6	19

As well, respondents perceived that knowledge about digital tools and how to use them for various purposes influenced their ability to do the job (29%), ability to plan work (26%), ability to communicate (16%), and the ability to analyze data (6%). See table 6 for a breakdown.

Table 6

How Digital Technologies Support Job Performance in the Knowledge Economy Workplace

	Count	%
Ability to do the job	9	29
Ability to plan work	8	26
Ability to communicate	5	16
Ability to work on a team	3	10
Ability to analyze data	2	6

Higher Education Preparation for the Knowledge Economy Workplace

Participants perceived that those learning experiences in postsecondary education that were enhanced by digital technologies were helpful in preparing them for the digital economy workplace. Ninety percent felt it was very important, moderately important, or important to learn with digital technology during their education. See Table 7 for a breakdown of the details of the importance of learning to use digital technologies in their education in order to be prepared to use digital technologies in the workplace.

Table 7

The Importance of Learning to Use Digital Technologies in Education in Preparation for the Workplace

	Count	%
Very important	17	55
Moderately important	10	32
Important	1	3
Not very important	2	6
Not important	1	3

Specifically, respondents highlighted three types of technology enhanced teaching that were beneficial:

- Classroom experiences in which the presentation or delivery of content by their instructor used digital technology (48%)
- Using digital communication and collaborative teamwork (32%)
- Exploring for information or inspiration using digital technology (19%)

Respondents also ranked their satisfaction of learning to the actual use of teacher-directed activities within their higher education experiences that incorporated digital tools. Although the majority of respondents (68%) were satisfied with their experiences, a total of 32% of all respondents were either dissatisfied or very dissatisfied with their classroom experiences to prepare them for the workplace. See Table 8 for details of their satisfaction ratings and how respondents rated their preparation for using digital technologies in the knowledge economy workplace.

Table 8

Satisfaction Ratings of Actual Classroom Preparation for the Knowledge Economy Workplace

	Count	%
Very satisfied	1	3
Moderately satisfied	12	39
Satisfied	8	26
Dissatisfied	6	19
Very dissatisfied	4	13

Summary of Questionnaire

Findings from the quantitative analysis indicated that many students' classroom experiences did not include the use of digital technologies. For example, 26% had experienced an instructor using presentations, 26% had experienced an instructor using the school web portal, and 3% had experienced an instructor using a website or podcast within a lesson. However, 10% of the students had experienced an instructor using printed notes and 32% of the students experienced notes written on the board during instructional delivery. It is also important to note that 100% of participants used digital technologies in their personal activities and were fluent users of mobile digital devices including cell/smartphones, tablets, as well as laptop and other PCs for their personal learning needs (84%).

In their workplaces, 90% of participants used digital technologies. Digital technologies used most often were: email, document management, mobile communications devices, Cloud environment computing, and blogging.

The quantitative analysis indicated that there was a gap between the digital experiences that students experienced in their higher education classroom and the digital knowledge and skills needed to prepare them for the knowledge economy workplace. Overall, 90% of respondents felt it was important to learn with digital technology during their education. As well, 80% indicated that the use of digital technologies in the classroom, including tech-enhanced presentation of materials, digitally enhanced communication, and collaborative teamwork, and activities that required exploring online for resources and inspiration would have better prepared them for the workplace. Respondents indicated that digitally enhanced learning activities would support

workplace knowledge and skills, such as ability to do the job, plan work, communicate, work on a team, and analyze data.

Although the majority of respondents were satisfied with their overall educational experiences in higher education, the findings indicate that 32% were dissatisfied with how their educational experiences prepared them to work in the knowledge economy workplace. However, to provide a richer description of the factors that led to this rate of dissatisfaction among participants, qualitative interviews were conducted.

Qualitative Research Phase: Voices From the Field

Follow-up interviews were conducted with a select group of participants to further illuminate the phenomenon under study: Net-Gen adults working in the knowledge economy workplace and the educational experiences that prepared them to do that work.

Although all but one questionnaire participant volunteered to participate in follow-up individual interviews, four participants were selected because they were available during the time frame of this study. Although I recognize that recruiting more participants for interviews would have added more depth and richness to the qualitative data, it was not possible during the study. To enhance trustworthiness of this study, the four participants selected did meet the criteria for diversity in experiences in higher education, including digital environments, and their diversity in background work experiences. The case reports that follow were constructed with the help of the participants, and they are meant to depict the notions that the four participants held at the time the study was conducted regarding their perceptions as to the relevance of their educational experiences in preparing them for their work lives in the knowledge economy workplace.

Three common themes, personal preferences for using digital technology to meet learning needs, digital technologies used for learning in the classroom, and digital technology used in the workplace, emerged from a cross-case analysis of the coding of all qualitative data (including interviews, field notes of the researcher, reflexive journal notes, and open-ended questions from the questionnaire). Table 2 shows a sample from the full results shown in Appendix E.

The common themes that emerge from a cross-case analysis of such diverse experiences may provide insight and lessons learned that would be of interest to educational institutions that prepare Net-Gen adults for working in the knowledge economy. The themes are not meant to be generalizable to other situations but to provide direction "for the investigation of others" (Erlandson et al., 1993, p. 45).

The voices of these participants and the descriptions of their working lives in the knowledge economy workplace are presented below. Pseudonyms have been used for these interview participants. Permission to use ideas and quotes in this document have been granted by each participant.

Participant #1: Ken

"Universities do not necessarily teach specific skills, but they teach you how to learn."

Ken graduated with a Master's degree in Engineering Metallurgy 3 years ago at a university, which included participating in an 8-month co-op placement in a mining company and, after graduation, retained permanent employment in that sector. He works as a project metallurgist in northern Ontario, Quebec and other parts of Arctic Canada and at the head office in Toronto. Ken has been out of school working for 3 years.

Personal preferences for using digital technology to meet learning needs. Ken was a serious gamer since childhood and in that respect was very used to a digital environment. He used Word extensively throughout high school and in both undergraduate and graduate work. It was during graduate work that he discovered that his Excel knowledge was more limited than was required for his course work. He acquired considerable advanced skills (developing macros, inputting formulas) by himself and with the help of friends. He did not acquire any of this knowledge through formal education. It was during his co-op placement that he was exposed to specialized digital technologies used in the mining industry and which constituted a considerable part in "landing that first job."

Digital technologies used for learning in the classroom. During his university schooling, Ken was exposed to very few digital technology tools, either as presentation methodology or as tools he would require on the job. Ken explained, "I remember very few things I'd learned using digital technologies in school. Only two professors used digital tools for presentations and were the only instructors that used the school web portal for distribution." In Ken's experiences, only "one computer class was presented through all of [his] undergraduate and graduate school." Ken made it clear that he did not expect his professors to train him on office tools such as Excel but rather to give examples in class about where and how these tools would be used in a likely work scenario.

Digital technology used in the workplace. Excel—specifically programming macros and inputting formulas—is a crucial work tool which Ken depends upon to get his job done. He learned the tool and programming skills on his own.

Although traditionally "mining is old school and very slow to adopt digital technologies," Ken noted that the mining sector is now rapidly adapting a variety of digital technologies. For communication, email and Skype are used; for work activities, MS Office products are utilized extensively. For mining activities, products such as "whip ware" (a particle analyzer) and process controllers and simulators have been used for a number of years. "This tool takes online pictures of materials on the conveyer, providing important information to the operators. No technologies like this were taught or even introduced in school."

Ken stated that collaborative teamwork with other engineers and field technicians is essential, requiring speedy and shared communications technologies and shared document platforms in order to consult on solutions across distances. In general, digital mechanization, remote controllers, and simulators are being introduced for a number of operations, as it is more difficult to attract employees to very remote locations but "we had very little information of systems or tools like this in school."

Higher education preparation for the knowledge economy workplace. Ken stated emphatically that he would have greatly appreciated "a heads up" on the possible uses of digital technology tools, especially advanced expertise in Excel, so that he could take additional classes or spend time on self-instruction with the tool. Ken specifically stated that he felt that his formal education lacked relevance in this particular instance in preparing him for his workplace. He also stated that other types of digital technologies in metallurgy were not mentioned in class and that his professors were not acquainted with "what was happening out there."

In school, Ken was exposed to very few digital technologies required on the job. Ken learned to program sophisticated Excel macros by himself. He remembers very little discussion of digital technology applications in metallurgical engineering. There was very little collaborative teamwork using digital technologies in his classes. Ken appreciated the scientific and technical content of his learning experiences but felt that the practical application of a number of digital technologies and teaching methodologies—lecture hall as opposed to collaborative teamwork—did not adequately prepare him for the realities of what he had to accomplish on the job. Ken emphasized that the one truly relevant experience in university was his practicum.

Participant # 2: Alena

"*Digital information tools gave me my most precious commodity: time."*

Alena is a recently graduated lawyer working in the insurance industry, often putting in 60—80 hour work weeks. As a "junior" lawyer—less that 2 years working—the workload varies as cases come up, but for the present "it's mostly an 8:00 to 8:00 job." Alena also stated that the work is essentially "24/7" and that digital communications technology makes that possible. "I got married last year, but really feel married to my job. Having babies is just not on the horizon."

Personal preferences for using digital technology to meet learning needs. Alena has always been digital technology inclined: building, installing, and operating a Microsoft NT server when she was 8 or 9 years old. As well, Alena was an early adopter of texting, Blackberry, smart phones, tablets, Facebook, and other social media such as Twitter, in order to communicate about class matters with other students. She used her iPad extensively to share notes and to clarify issues arising from classroom lectures.

Alena has used digital technologies as they have become available for educational purposes since grade school.

Digital technologies used for learning in the classroom. Alena's experiences in university vis-à-vis the use of digital technologies were "disappointing." Alena noted that most of that exposure in the use of digital technologies was instruction of how to conduct document searches through various (legal) journal and documentation databases. No MS Office applications were taught or used during instruction.

Alena noted that "all documents and lesson materials, course notes, and course outlines should be consistently posted online, so students can read materials and discuss important points with teaching assistants in class, making learning more efficient and effective." If course notes, documents, lesson materials, and even course outlines had been posted online or in some electronic form, on either the school portal or any other electronic media, she explained that she felt she could have prepared even better for class, especially to help clarify confusing issues. "If everybody used the school web portal and posted their lessons online before class I could have learned 25% more. Schools underuse technology, even MS Office."

Alena commented that in lecture halls, students would often ignore the professor delivering "his canned lecture" and would collaborate in groups using mobile devices. These law students were "very serious" about preparing for the Bar and therefore devised their own methods of learning within informal collaborative groups, extensively employing digital technologies both to acquire information and to collaboratively learn that content. Alena recalls that one of her classmates' father was a lawyer, who described that, in his student days (early 1970s), his classwork largely consisted of solitary and

competitive “paper chases” or conducting manual searches through printed sources, such as books, documents, and law cases. Alena commented that the experience of the daughter was very different, relying on voluntary teamwork to master the required knowledge.

Digital technology used in the workplace. Alena observed that “some parts of the legal system have been slow to adapt to digital technology. The court system is still largely paper based. The law profession uses little digital technology, relying mostly on FAX and, if email is used, it must be acknowledged as having been received by the recipient which are transmitted and received through computer software as part of their legal status as documents, but increasingly sent and received as PDF files though Blackberries or smart phones.”

On the other hand, lawyers and their administrative staff have fully embraced the latest digital communications technologies. “Communication in the office uses various types of digital technology tools. Instruction to secretaries is often done through dictation software and electronically signed.” In other words, workplace activities not tied directly to formal practices are accomplished collaboratively using ever-increasing sophisticated digital communications technologies. “In such long work weeks, any new technology that saves us time is quickly adopted.”

Higher education preparation for the knowledge economy workplace. Alena observed that the university did not provide workplace relevancy; it was the students improvising their own learning environments that proved “most relevant” to her present workplace. Alena noted that students formed their own informal work groups and often met at either the university library or Starbucks (“Wi-Fi there was great!”) in order to

work on their projects. She emphasized that the idea of working entirely alone without group support was “inconceivable.” She lamented, “How did students ever survive working like that? I was close to nervous collapse as it was!” Alena noted that she took her Blackberry to bed and was often communicating with her fellows late at night on school matters or creating questions about class materials to be asked of the teaching assistant the following day.

Participant # 3: Laurence

"There were missed opportunities for students to understand subject matter, be motivated, and contribute to our collaborative learning."

Laurence is a recently graduated engineer, as of 2012, working as an application engineer, supporting field salespeople and customers with offices and clients throughout North America. His head office is in Europe.

Personal preferences for using digital technology to meet learning needs. Laurence has extensive, largely self-taught knowledge about using digital technology, going back to grade school, where he was producing digital documents on his own and distributing graphics to his classmates. Laurence’s work in high school of pie charts and graphs illustrating environmental and astronomy subjects are still displayed in the school’s hallway. Laurence currently uses numerous emails and social media accounts, MS office applications such as Word, Excel, Access, and PowerPoint, and is self-taught on all Adobe creative suite applications such as Dreamweaver, Fireworks, Illustrator, In-design, and Photoshop.

Digital technologies used for learning in the classroom. In university, Laurence noted that the use of the web portal for downloading lesson materials, problem solving,

and discussions was mainly used by teaching assistants. Laurence estimated that fewer than 5% of professors used the web portal at school for feedback on assignments, which was only partially explained by the fact that the school's web portal "was old and not very useful for collaborative learning or work." Laurence stated that "most" of his professors were not "digitally savvy."

Old versions of AutoCAD were used in his classes, which Laurence explained were "not in the least relevant—ancient technology!" Laurence cited the need for instruction on parametric (solid) modeling for CAD systems, but never received any instruction on these newer digital technologies.

However, students were digitally collaborating inside and outside the classroom. "We were using Google cloud to share docs on our own to learn collaboratively, working on assignments and group problem-solving" on a regular basis. This happened both in the lecture hall and more intensively outside the classroom, mainly in library spaces. Laurence noted "at times we succumbed to sending each other happy faces to relieve boredom" or just browsed the Internet. Laurence had an opportunity to look at his mother's lecture notes from the mid-1970s and was amused to see them covered in elaborative doodling and drawings. "I guess she didn't have the opportunity of deploying digital toys."

Digital technology used in the workplace. As an application engineer, Laurence uses many digital tools including Google Drive, Microsoft Office suite applications, Adobe, and corporate LANs in his daily activities. "My communication with clients and sales personnel is almost entirely through digital tools." Collaborative work is done with clients, sales personnel, and field technical support personnel entirely through digital

communications and shared documents tools, while communication with a global head office is entirely conducted through digital tools.

Higher education preparation for the knowledge economy workplace. Laurence noted that virtually none of the tools being used at work were utilized or taught in school. He also noted that he was entirely self-taught regarding digital technology, as were his fellow students. Laurence stated that he was inadequately prepared for the knowledge economy workplace and was disappointed that his professors "didn't take more effort to be up on things. They seem to be so protected from the outside world. I have to be out there and compete!"

Participant # 4: Kate

"Using the school web portal system for lesson notes and files is at times more of a hassle than it is of use. Few professors use the course management system, and those that do, often have disorganized information, wrong files, and poor naming conventions."

Kate is a recent graduate student of urban planning, being a straight A student throughout high school and university. Kate was planning to complete her Master's in the fall of 2013.

Personal preferences for using digital technology to meet learning needs. Kate uses social media such as Facebook, email, twitter, smart phone, and texting effortlessly and has a busy social life online.

> My father describes me as "ebullient." I love to socialize and be with friends. Using social media like twitter and instant messaging is a natural part of my life. My parents don't get it [being in constant contact], but I just couldn't live without it.

Kate noted that using digital communications tools to collaborate in school projects was a natural extension of her personal uses of those tools.

Digital technologies used for learning in the classroom. Kate experienced little digital technology in her undergraduate degree, rather learning it from friends and informally online. “Graduate work is mostly done in small groups working collaboratively and informally outside the classroom, sharing files and applications, holding online meetings and editing papers through Google document sharing, using VPN connections for communication and version control.” All of this collaborative schoolwork was initiated and organized among the students themselves. They worked in libraries or more informal settings such as friends’ homes or coffee shops. This schoolwork was not a part of her formal classroom experience or assignments.

Additionally, Kate also noted that it often “took the professor 20 minutes to set up a simple PowerPoint” presentation and that it was a relief to have the teaching assistant substituting because all the digital tools were up and running at the start of class. Kate seeks a classroom experience where content is king and its delivery effortless.

Digital technology used in the workplace. Kate works at two part-time jobs and uses a number of “point-of-sale” devices in one of them, including messaging with other staff. The other part-time job requires her to do quantitative analysis and use various software packages like SPSS. Kate stated that there had been no preparation in using analysis packages and very little introduction to MS Office at school. “University felt like a strange alternative universe, trapped in some kind of time-warp.” Kate noted that while a lot of the content was relevant, its delivery was “archaic.” However, “that being said,” digital technologies taken for granted in both personal and professional use (specifically

Office applications and digital communications tools of all kinds) were just not deployed in the classroom.

Higher education preparation for the knowledge economy workplace. Kate describes herself as a "digital native" but not one who is terribly intrigued or obsessed by it. She uses it more for communication with friends and colleagues rather than "sitting in front of a computer screen all day." She is there to learn in both a knowledge-based and realistic way and is concerned about "being adequately prepared to use digital technology in her workplace." Kate noted that most of that digital learning was not forthcoming from her formal education. Office applications, communications formats, and document sharing on the Internet were all employed extensively throughout Kate's course work but organized by the students themselves.

Summary of Findings

Overall, these Net-Gen adult learners are very adept with using all kinds of digital technology, including social networking devices, a variety of computers, document management systems, and applications. Communication tools and methods are an essential part of their social and work lives, which they take for granted. Adapting to new technologies swiftly and with ease is a hallmark of their day-to-day activities. Collaborative learning using digital technologies on an informal basis was a crucial part of their educational experience for all four participants.

Specifically, all of the participants interviewed expected to have coursework lesson information and assignments posted on school web portals in order for them to be able to prepare for classwork ahead of time, and they also expected online feedback from professors to help in their learning. Collaborative learning using digital technologies did

not occur as part of their formal education. All participants organized their own informal groups, communicated using various digital technologies, including sharing documents on the Cloud, and meeting informally at libraries or other locations with Wi-Fi access. The participants felt that this was a very important part of preparing for their successful participation in the knowledge economy workplace. The significance of the ability to collaboratively learn led to these participants making the effort to come up with their own collaborative groups and activities.

All of these Net-Gen adult learners expressed the desire to have had appropriate digital technology tools incorporated in their classroom instructional experiences, for lesson delivery, learning how these tools are actually employed in the workplace, collaborative activity within and outside the classroom, and experience in using digital tools in course work (primarily Office applications, but also other products, such as Adobe and more specialized tools, as in Ken's situation, as well) in preparation for their workplaces.

In other words, students expected that the university experience would not only teach them about subject matter but also help them to become adept in using digital technologies in a holistic sense to better prepare them for "the real world." These Net-Gen adult learners definitely felt that there was a large difference between their learning needs that were supported by digital tools and the instructional strategies and activities used by their teachers. These learners told stories of how they often had to resort to their own ingenuity to work collaboratively with fellow students for successful educational outcomes.

These Net-Gen adult learners also describe their knowledge economy workplace as one that is rapidly evolving, highly competitive, and one where the employee has to continuously learn, upgrade, adapt, and reinvent her/himself in order to survive. This is a general experience expressed by the three participants who have been working full-time for the space of 2 to 3 years. New digital tools are quickly being introduced in traditional workplaces such as gold mining, while digital tools already well established (such as Office applications and other specialized products) are constantly undergoing change. Communications technologies such as email and other interoffice communications tools such as iPad's and smart phones employing instant voice messaging, dictation capabilities, and information gathering are being constantly upgraded. Alena put it this way: "My job is so hectic. I also have to keep up with constant change on innumerable devices. I feel like the Red Queen in Alice!" Running faster and faster to stay in one place is emerging as the one constant in the globalized knowledge economy.

CHAPTER FIVE: DISCUSSION AND CONCLUSIONS

This chapter includes a summary, discussions, implications, recommendations, and my final conclusions based on research findings. This study investigated the learning preferences and the postsecondary educational experiences of a group of Net-Gen adult learners currently working in the knowledge economy workplace and their perceptions of how relevant their educational experiences were in meeting these workplace demands. Research questions were answered from two sets of data—the questionnaire and semi structured interviews. Participants for this study were selected to meet specific criteria, such as age group, level of university education, and job placement. They answered a questionnaire, providing information on their self-reported learning style preferences, their use of digital tools for formal and informal learning, their use of digital technologies in postsecondary educational experiences, and their use of digital technologies in their workplaces. Four volunteers from that group were selected for interviews based on their diversity of experiences in both higher education and subsequent knowledge economy workplace employment situations. Data collected from the questionnaire were analyzed for descriptive and demographic statistics, and textual data were collected from the interviews, which were then analyzed using a thematic coding process from which common themes emerged from their responses.

In order to address the question of how higher education is currently meeting the learning needs of Net-Gen adult learners as they prepare to enter the knowledge economy workplace, the following questions were explored:

- How do Net-Gen adult learners currently use digital technologies to meet their learning needs?

- Which digital technologies were used for learning in their postsecondary classrooms?
- What digital skills and knowledge are required in their knowledge economy workplaces?
- What digital technologies utilized in their postsecondary learning experiences did the Net-Gen adult learners perceive were most relevant to their educational requirements and most helpful in preparing them for their workplaces?

Summary

Study findings based on the questionnaire and the interviews that were conducted garnered similar responses, as in the following: All study participants were fluent with the use of many types of digital technologies. Tools used in their personal lives were mobile devices such as smartphones, tablets, and computers. Social networking tools were consistently used for school-related work, including organizing informal groups in order to work collaboratively.

In the workplace, 90% of the participants used digital technologies. Digital tools most commonly used were for communications and document management. Some specialized digital technologies were used for dedicated applications such as parametric modeling for computer-aided design and analysis. Workplace devices such as computer-based dictation tools were used as well as electronic document sharing to communicate with colleagues remotely.

Participants expected to be exposed to technologies that they deemed relevant to their knowledge economy workplaces as part of their postsecondary preparation, including the use of tech-enhanced presentations, communication devices related to

classroom activities such as digital school portals, and interactive digital communications, which would facilitate group study, including participation of teachers. Respondents indicated that digitally enhanced learning activities would have better prepared them for workplace requirements, including basic aptitudes of job content and working collaboratively in problem-solving teams.

Discussion

Findings from the study are organized here in relation to three major themes: how Net-Gen adult learners use digital technologies for learning; the experiences of these Net-Gen adult learners in the workplace of the knowledge economy; and the instructional methods experienced in postsecondary education of these Net-Gen learners.

How Net-Gen adult learners use digital technologies for learning

Net-Gen adult learners have been immersed in digital technologies all their lives. It has been suggested by Barnes et al., (n.d.), as well as Tapscott, (1998), that Net-Gen adult learners actually learn differently. Brown (2002) asserts the web is a new "learning ecology" that may change how the Net-Gen adult learners learn (p. 3). It is a two-way, push-and-pull proposition for information exchange and is a medium that requires multiple forms of intelligence—abstract, textual, visual, musical, social, and kinesthetic (Brown, 2002). In recent studies by Rosen (2010), Net-Gen adult learners are reported to be doing six things at once. These tasks appear to be complementary and actually provide a deeper understanding of the topic rather than being a distraction. "Certain tasks can be done together without hindering performance" (Rosen, 2010, p. 82). Task switching on a very sophisticated level appears to be a part of Net-Gen adult learners' capabilities (Brown 2002). Diverse sources of learning materials are utilized. These students make

conscious choices about what learning techniques and resources work best for them, which may include reading lecture notes online, learning office applications skills and other specialized digital tools such as Adobe, often in shared Cloud environments, viewing interactive media such as PowerPoint presentations, iTunes, movies, YouTube web-sharing videos, and Google digital images, and social networking tools, which are constantly changing, as are the devices of delivery. They quickly adopt new digital technologies, are in constant digital communications with each other, and are comfortable in digital environments.

The learning preferences of these Net-Gen adult learners reflect their personal habits and preferences. The study findings showed that 100% of the participants used digital technology personally. Eighty-four percent of the study participants used their smartphones/cell phones and tablets along with their laptops and desktops for learning activities. Learning activities included meeting other classmates in informal environments to share lessons, problem solving, and gathering information.

These Net-Gen adult learners also clearly understood that these preferences and aptitudes are essential in their employment in the knowledge economy workplace. The uses for digital technology in their workplaces included communication and document management. Corporate (private) cloud services constituted 10% of all usage of digital tools. The major need (55%) for learning digital technology was a need to do the job and plan work. Twenty-six percent of the need to learn digital technologies was to communicate and work on a team in their workplaces.

Personal learning preferences cited in the literature review indicate that Net-Gen adult learners “tend toward independence and autonomy in their learning preferences,

which impacts a broad range of educational choices and behaviours, from ‘what kind of education they buy’ to ‘what, where, and how they learn’" (Brown, 2002, p. 4). “For this generation, the Internet is not a tool simply to find information but a tool to share information, collaborate on projects of shared interest, organize and socialize (Martinez, 2010, p. 52)”.

The consequence for the connected learner is that Net-Gen adult learners deeply customize their learning according to their own personal, educational, and professional needs and collaborate with each other, and therefore deem educational experiences that incorporate these digital tools and collaborative learning methods as more relevant (Martinez, 2010). Coleman (2012) claimed that there is considerable overlap between the formal learning environments at school and the informal learning environments outside of school due largely to the use of digital technologies. Knowles (1980) indicated that students are becoming increasingly responsible for their own learning. This study corroborated literature review findings, finding that participants organized their own informal study groups, meeting in spaces that were equipped with Wi-Fi access such as libraries and coffee shops in order to collaboratively work on their school assignments in order to accomplish successful educational outcomes. According to this study, and similarly described by Coleman (2012), the Net-Gen adult learners in this study learned by doing research, looking up course information, verifying references, and discussing schoolwork with fellow students in informal environments.

All of the participants interviewed expected to have coursework lesson information and assignments posted on school web portals in order for them to be able to prepare for classwork ahead of time, and they also indicated that they would have

preferred online feedback from professors to help in their coursework, whether done individually or in informal collaborative teams.

However, collaborative learning using digital technologies did not occur as part of their formal education. Participants in this study were also concerned with the relevance of their formal educational experience, which in some key aspects of the use of digital technologies, both in content and delivery, turned out to be not particularly satisfactory. The primary concern for the Net-Gen adult learner was to be prepared for the highly competitive, rapidly evolving knowledge economy workplace, and due to a lack of this type of learning environment being a part of their formal instruction in postsecondary experiences, they created educational situations outside of their formal postsecondary instruction to engage in these types of activities, thereby making their learning more relevant. From these findings, it appears that postsecondary experiences with collaborative experiences and instructional methods that utilize digital technologies would enhance the relevance of the educational experience for these learners.

The Workplace of the Knowledge Economy

Fenwick (2008) defines the core concept of working in the modern workplace as a convergence of "knowledge, phenomena, events and actors" that are "mutually constitutive, and actually emerge together" and describes modern work as a "continuous and dynamic invention within these relationships that enable a complex system to flourish in changing environments" (p. 21). High levels of education alone, as traditionally defined, are no longer enough. Education or knowledge must be translated into actual skills. The importance of having skills translated into having the ability to *do the job* and *work on a team* for 87% of the participants of this study (MacPherson, 1962;

Rumberger & Levin, 1967). Ninety percent of the participants in this study felt that learning about and through digital technologies was important to their ability to be successful in the knowledge economy workplace; and 99% of the participants of this study reported the ability to participate in work teams and share information was extremely important to their ability to deliver information content using digital technologies. Although the majority of respondents (68%) were satisfied with their experiences, a total of 32% of all respondents were either dissatisfied or very dissatisfied with their classroom experiences to prepare them for the workplace.

For these learners, the lack of experiences that modeled how to apply knowledge being learned in real world situations made their learning experiences less relevant. Drucker (1968) explains, "The knowledge economy workplace is fast becoming the foundation of skill," and "schools teach knowledge but, not necessarily the application of knowledge" (p. 268). The knowledge economy workplace requires workers not just to follow a routine but to make creative decisions about product quality, scheduling production, training requirements and job rotation (Joo-Seng, n.d.; Levin, 1987; Zuboff, 1988). It is essential that people understand information technologies in order to manipulate information to their advantage (National Research Council, 1999). One of the participants interviewed had only one computer course introducing the bare essentials of MS Office during the entire undergraduate and graduate engineering programs. All of the participants interviewed stated that they had virtually no exposure to digital tools they now use in their workplaces, nor did they receive any information of what to expect in their workplaces. One of the interviewees claimed, "We had very little information of systems or tools like this in school."

Working in the knowledge economy workplace requires the formation of work groups as necessary for projects (Davis & Sumara, 2001). People need to collaborate and constantly upgrade their knowledge. Working is a "continuous and dynamic invention within these relationships that enables a complex system to flourish in changing environments" (Fenwick, 2008, p. 21). Workers continuously experiment and invent new processes as necessary in order to fulfill work requirements. All of the participants in interviews mentioned they work collaboratively in their workplaces, and many participants (32%) in this study noted that the preparation for learning communication and collaborative teamwork was very beneficial. However, postsecondary experiences of the participants in this study were described as traditional: educational experiences that focused on individual work, mostly lectures, using a lecture model, with little or no opportunity for interactivity. These postsecondary education experiences were perceived by the participants in this study as less effective preparation for how these Net-Gen adult learners must work and build knowledge in the knowledge economy workplace. Nearly a third of the respondents (32%) expressed dissatisfaction with their educational experiences to prepare them for the knowledge economy workplace. This is a large number of students, and although the majority were satisfied, this highlights a gap in how educational experiences in higher education may not meet the learning needs for some students who enter the workplace of the knowledge economy.

Instructional methods

Research about how Net-Gen adult learners learn has evolved over the last 30 years. Knowles (1980) focused on learning and the learner, while the *sage on the stage* approach (King, 1993), with students working alone, being expected to absorb content

delivered by the teacher, was encouraged to change to a *guide on the side* approach (King,1993), encouraging teacher-facilitated collaborative learning. This *guide on the side* approach has been accelerated by the digital revolution, where the teacher capitalizes on content by creating a curriculum that utilizes the digital tools the Net-Gen adult learner takes for granted as natural modes of communication (Beyers, 2009). A number of researchers argue that Net-Gen adult learners learn best by using tools that allow multiple voice, data, and video input to receive and transmit communication (Beyers, 2009). Further, Net-Gen adult learners learn best by essentially organizing their own learning by using a combination of digital tools such as social networking, videos, and information from diverse electronic resources in collaborative ways (Beyers, 2009). The result is that Net-Gen adult learners deeply customize their learning according to their own personal, educational, and professional needs and collaborate with each other, and therefore deem an educational experience that incorporates these digital tools and collaborative learning methods as more relevant (Martinez, 2010).

Findings of this study for higher education suggest that current instructional methods are not tapping into Net-Gen adult learners' preferred learning modes. Pedagogy for adult education, especially the adults found in postsecondary classroom today—the *sage on the stage* lecture-based delivery focused on the individual student—appears less optimal than group-focused, *guide on the side* learning wherein the teacher functions as an instructor, coach, and coordinator. However, instruction used for learning in the classroom of participants in this study was often done using non digital modes and traditional lecture instructional methods. Forty-two percent of all instruction was via printed notes handed out or through printed notes on a board. The survey respondents experienced few lesson notes on websites and other school portals. In other words, there were few opportunities

for the Net-Gen adult learners to experience lesson information being distributed using tools they would be seeing and using in their workplaces. This includes incorporating digital technologies best suited for any particular classroom application as well as efficient distribution of classroom materials and general communication using communications technologies. All background reading and participant responses point towards the knowledge economy workplace coveting creative team players, comfortable in performing in rapidly changing digital environments.

Implications and Recommendations

Pedagogy for adult education, especially the adults found in postsecondary classroom today—the *sage on the stage* lecture-based delivery focused on the individual student—appears less optimal than group-focused, *guide on the side* learning wherein the teacher functions as an instructor, coach, and coordinator. Additionally, the connected learning theory implies learners learn best when connected to people, content, systems in a networked ecosystem, using a process of their own making in formal, informal, and social environments using digital technologies by accessing multiple sources and mediums for information. The connected learner must be immersed in a learning ecosystem that "is part of a community activity" (Downes, 2006, para. 121) using digital tools such as webcasts, podcasts, and videos and participating in workshops, all constituting "a robust pedagogy" (para. 119). This learning process must incorporate digital technologies best suited for any particular classroom application as well as efficient distribution of classroom materials and general communication using communications technologies. Participants in this study suggest that, in their experiences, the knowledge economy workplace covets creative team players who are comfortable in

performing in rapidly changing digital environments, and they expect their higher education experiences to prepare them for that type of workplace.

The findings of this study highlight the need for postsecondary instructors to move towards a collaborative classroom environment, which encourages team assignments. This would include employing digital technologies in a variety of ways: communication with students, through school portals and individually, integrating digital technologies into classroom presentations, and examples of how these technologies are used in today's knowledge economy workplace and, where applicable, the introduction of specialized digital tools used in the workplace.

Based on readings, findings, and implications, the following would be recommended learning environments and postsecondary learning experiences for Net-Gen adult learners to help prepare them for the knowledge economy workplace:

- Provide learning environments that focus on the learner, promoting understanding of course material.
- Make connections between theory and application of that theory to knowledge that is relevant to their professions by inviting workplace specialists into the classrooms to demonstrate specialized applications of technologies related to the field of study, and generally provide an environment that allows the learner to experience some aspects of workplace reality, where appropriate.
- Make sure all students have online access to all available course or lesson content.
- Provide an environment where Net-Gen adult learners work in collaborative teams, where appropriate, optimally utilizing digital technologies, within and outside the classroom.

- Create learning environments that promote learner discovery and application of knowledge rather than only a transfer of knowledge from instructor to student.
- Use a multiple learning style approach—textual, visual, and auditory—to enhance Net-Gen adult learners' learning preferences.
- Using a *guide on the side* approach, hold interactive classroom conversations and discussions, providing the opportunity for Net-Gen adult learners to contribute their own experience and knowledge.
- Promote cross-discipline learning of course materials to promote deeper understanding and creative abilities.
- Change the focus or education from simply acquiring a degree to understanding and skills development.

Conclusions

Because I have a strong background in industry training, I brought many of these practical methods into my college classroom. However, it was my studies in the Brock Master of Education program that provided me with the philosophical background, confidence, and theory to confirm and enhance my classroom practice to optimally prepare Net-Gen adult learners to thrive in the knowledge economy workplace.

For example, in my Project Management course, I provided a learning environment that promoted learning discovery and applicability of information. This environment included:

- Classes are held in a computer lab, including PCs for every student with appropriate software, a LCD overhead projector, Internet connection, and Cloud facilities.

- Lessons include a combination of theory, hands-on practice, and information reinforced by real-life examples and techniques from business best practices, making the whole thing relevant.
- Collaborative group research projects are assigned, including class presentations with the purpose of reinforcing learning objectives.
- Group discussions are held, which get published on the school's on-line course management system (Blackboard).
- The dynamics of group behaviour are discussed, which include typical problems such as one member not pulling her or his weight. Suggestions of how to solve such problems are provided, emphasizing the importance of soft skills required in the workplace.
- All lesson materials, assignements, auxiliary documents, and discussions are posted on Blackboard.
- Students are taught sharing group projects on the Cloud.
- Presentation of videos and YouTube selections are included to illustrate lesson topics.
- When training on tool use, highly relevant examples are used, rather than what button to push.

As a direct result of preparation in my class, using the above classroom learning environment, at least six of my students have received promotions or transitions to the position of Project Manager or members of project teams in their workplaces. Several students have reported back to me that PMPs (Project Management Professionals) have come to them to model projects that they are currently working on in the tool. Two

students are using Project Management tools and processes to help develop proposals for clients. I am not conducting a training course on what button to push, but a total learning environment that prepares students for their knowledge economy workplaces.

I feel that we, as postsecondary instructors, are standing by the shores of a vast, largely uncharted ocean. Whether we sink or swim as educational institutions, and whether we let that future generation we hold in our hands sink or swim, is within our power. We are the instructors and coaches.

Come gather ‘round people

Wherever you roam

And admit that the waters

Around you have grown

And accept it that soon

You’ll be drenched to the bone

If your time to you

Is worth savin’

Then you better start swimmin’

Or you’ll sink like a stone

For the times they are a-changin’. (Dylan, 1964)

References

Armino, J. J. (n.d.). *Negotiating the complexities of qualitative research in higher education: Fundamental elements and issues.* Retrieved May 5, 2013 from wikipdia/Member_check: http://en.wikipedia.org/wiki/Member_check

Arum, R., & Roksa, J. (2011). *Academically adrift.* Chicago: The University of Chicago.

Baker W., H. T. (1997, September). *Technology in the classroom. Educom review.* From http://proxy.library.brocku.ca/login?url=http://search.ebscohost.com/login.aspx?direct=true&db=aph&AN=971021182&site=ehost-live&scope=site

Bar, R. B., & Tagg, J. (1995). From teaching to learning: A new paradigm for undergraduate education. *Change , 26* (6), 12-25.

Barnes, K. M. (2007). *Teaching and learning with the net generation.* Retrieved May 1, 2009 from Innovate Journal of Online, 3 (4): http://innovateonline.info/?view=article&id=382.

Barnes, K., Marateo, R. C., & Ferris, S. P. (n.d.). *http://innovateonline.info/pdf/vol3_issue4/Teaching_and_Learning_with_the_Net_Generation.pdf.* Retrieved March 20, 2012 from Innovate: http://www.innovateonline.info/index.php?view=article&id=382

Beyers, R. N. (2009). A five dimensional model for educating the net generation. *Educational Technology & Society, , 12* (4), 218-227.

Bhattacharya, K. &. (2001). *Piaget and cognitive development.* (M. Orey, Ed.) Retrieved May 1, 2009 from Emerging perspectives on learning,: http://projects.coe.uga.edu/epltt/.

Brinkley, I. (2006, July). *Defining the knowledge economy.* Retrieved Feb 9, 2013 from www.theworkfoundation.com/

Brown, J. S. (2002). Growing up digital. *ESDLA Journal , 16* (2).

Bruffe, K. A. (1984). Collaborative learning and the conversation of mankind. *College English , 46* (7), 635-653.

Bump, J. (1990). Radical changes in class discussion using networked computers. *Computers and the classroom, 24*, 49-65.

Cameron, D. (2005, December). The net generation goes to university? *Journalism Education Association Conference* . Surfers Paradise, Queensland, Australia.

Carlson, S. (2005). *The net generation goes to college.* Retrieved March 27, 2007 from The Chronicle of Higher Education: http://chronicle.com/free/v52/i07/07a03401.htm

Carnivale, D. a. (2006, May 26). The challenges and benefits of requiring students to buy laptops. *The Chronical of Higher Education* .

Carnivale, D. (2006, June 2). The fight for classroom attention: Professor vs. laptop. *The Chronicle of Higher Education* .

Clark, A. (1999, August). *Minds, brains, and tools: Comments on dennett for Hugh Clapin's workshop on mental.* Retrieved June 14, 2008 from Archived at http://www.webcitation.org/5Xw2YecaX.

Coleman, J. (2012). Introduction: Digital technologies in the lives of young people. *University of Oxford Review of Education , 38* (1), 1 - 8.

Cresswell, J. &. (2011). *Designing and conducting mixed methods research* (2nd. ed.). Thousand Oaks, CA: Sage Publications.

Creswell, J. W. (2012). *Educational research.* Boston: Pearson Education, Inc.

Creswell, J. W. (2003). *Research design: Qualitative, quantitative and mixed methods* (3rd Ed. ed.). Thousand Oaks, CA: Sage Publications.

Davis, B. (2001). Learning communities: Understanding the workplace as a complex System. (T. Fenwick, Ed.) *New Directions in Adult Learning and Continuing Education.* (92).

Dede, C. (2005, November 1). *Planning for neomillennil learning styles.* Retrieved April 23, 2012 from Educase Quarterly: http://www.educause.edu/EDUCAUSE+Quarterly/EDUCAUSEQuarterlyMagazineVolum/PlanningforNeomillennialLearni/157325

Downes, S. (2006, Oct. 16). *Learning networks and connective knowledge.* Retrieved Jan. 29, 2014 from itforum.coe.uga/paper92/paper92.html

Drucker, P. F. (1999). *Management challenges of the 21st century.* New York, NY: Harper Business School Press.

Drucker, P. F. (1968). *The age of discontinuity.* Toronto: Fitzhenry & Whiteside Limited.

Dylan, B. (1964, January). *The times they are a-changin.* (B. Dylan, Performer).

Erlandson, D. A., Harris, E. L., Skipper, B. L., & Allen, S. (1993). *Doing naturalistic inquiry.* Newbury Park, CA: Sage Publications Inc.

Fenwick, T. (2008). Workplace learning: Emerging trends and new perspectives. *New Directions for Adult Education and Continuing Education , 119*, 17-26.

Friedman, T. L. (2006). *The world is flat: A brief history of the twenty-first century.* New York: Farrar, Straus and Giroux.

Glaser, B. G. (2004). Naturalistic inquiry and grounded theory. *Forum: Qualitative Social Research Sozialforschung , 5* (1).

Glenn, J. (2000). Teaching the net generation. *Business Education Forum , 54* (3), 6-14.

Good, T. L. (1990). *Educational psychology: A realistic approach. 4th Ed.* White Plains, NY.: Longman Press.

Guba, E. &. (1998). *Competing paradigms in qualitative research.* (N. &. Denzin, Ed.) Tousand Oaks, CA: Sage publications.

Hartman, J. L., Dziuban, C., & Brophy-Ellison, J. (2007). Faculty 2.0. *EDUCAUSE Review , 42* (5), 62-77.

Hay, L. E. (2000). Educating the net generation. *The Social Administrator 57 , 54*, 6-10.

Houle, D. (2012). *Entering the shift age: The end of the information age and the new era of transformation.* Naperville, Ill.: Sourcebooks Inc.

Kay, J. (2012). AI and Education: Grand Challenges. *IEEE Intelligent Systems* , 66 - 69.

Jerald, C. D. (2006, June). *Identifying potential dropouts: Key lessons for building an early warning data system.* Retrieved March 9, 2012 from Achieve.org: www.achieve.org/files/FINAL-dropouts_1.pdf

Joo-Seng, T. (n.d.). Trends in organizational change. *Encylopedia for Business* .

Khan, S., & VanWynberghe, R. (2008, January). *FQS Forum: Qualitative Social Research.* Retrieved May 5, 2013 from Cultivating the under-mined: Cross-case analysis as knowledge mobilization: http://www.qualitative-research.net/index.php/fqs/article/view/334

King, A. (1993). from Stage on the Stage to Guide on the Side. *College teaching , 41* (1), 30-35.

Knowles, M. S. (1980). *The modern practice of adult education.* Englewood Cliffs, N.J.: Cambridge Adult Education-Prentice Hall Regents.

Kumar, P., Murray, G., & Schetgne, S. (2011). *Workplace change in Canada: Union perceptions of impacts, responses and support systems.* Retrieved Nov 17, 2012 from Industrial Relations Centre: http://qsilver.queensu.ca/irl/qsirc/

Kurzweil, R. (2005). *The Singularity Is Near: When humans transcend biology.* New York: Viking Press.

Leitz, C. A., & L., L. C. (2006, Nov 7). *Establishing trustworthiness in qualitative research in social work.* Retrieved May 3, 2013 from http://academia.edu/FindPapers: http://www.academia.edu/1907846/Establishing_trustworthiness_in_qualitative_research

Lemke, C. (2003). *enGauge 21st Century Skills. literacy in the digital age,.* Retrieved May 29, 2009 from http://www.metiri.com/21/21%20Century%20Skills%20Final.doc.

Levin, H. M. (1987). *Improving productivity through education and technology.* (G. Burke, & R. W. Rumberger, Eds.) London: Falmer Press.

Lind, D. A. (2009). *Basic statistics for business & economics.* Toronto, ON.: McGraw-Hill Ryerson.

Livingston, S. (2008, March). Theorising the benefits of new technology for youth: Seminar 1. *Seminar Introduction; setting the scene* . London, UK.: University of Oxford and the Londo School of Economics.

Lockee, B., Moore, M., & Burton, J. (2002, Volume 25 Number 1). *Measuring success: Evaluation Strategies for Distance Education.* Retrieved March 15, 2012 from EQ: EDUCAUSE QUARTERLY: http://www.educause.edu/EDUCAUSE+Quarterly/EDUCAUSEQuarterlyMagazineVolum/MeasuringSuccessEvaluationStra/157166

Logan, J. (2006). *iGeneration: Shuffling toward the future.* Toronto: Penguin Group (Canada).

Maykut, P. & Moorehouse, R. (1994). *Beginning qualitative research: A philosophical and practical guide.* London: The Falmer Press

Mabrito, M., & Medley, R. (2008). Why professor Johnny can't read: Understanding the Net Generation's Texts. *Innovate: Journal of Online Education , 4* (6), 6.

MacKeracher, D. (2008). *Making sense of adult learning 2nd ed.* Toronto: University of Toronto.

MacPherson, C. (1962). *The political theory of possive individualism: Hobbes to Locke.* London: Oxford University Press.

Martinez, M. S. (2010, Fall). Using technology to engage youth. *New Directions for Youth Development* (127).

McNeely, G. (2005). *Using technology as a learning tool, not just the cool new thing.* (D. G. Oblinger, Ed.) Retrieved March 26, 2007 from Educating the Net Generation: http://www.educause.edu/books/educatingthenetgen/5989

McNeil, A. (2012, Feb. 28). Top employers reveal the skills they value most. *Globe and Mail* .

Mergel, B. (1998). *Instructional design & learning theory.* Retrieved February 26, 2009 from http://www.usask.ca/education/coursework/802papers/mergel/brenda.htm.

Merrill, M. D. (1991, May). Constructivism and instructional design. *Educational Technology* , 45-53.

Miles, M. B. & Huberman, A. M., (1994). *Qualitative data analysis: An expanded sourcebook.* Thousand Oaks: CA. Sage

Miller, A. (2000). *Differences between the 'Traditional' and 'Outcomes Based' Education.* Retrieved August 20, 2008 from Meta Group on Communications,: http://www.metagroup.co.za/difference_sys.htm.

Moore, A. H. (2007, November 3). *The new economy, technology, and learning outcomes assessment.* Retrieved March 15, 2012 from Educause Quarterly: http://www.educause.edu/EDUCAUSE+Quarterly/EDUCAUSEQuarterlyMagazineVolum/TheNewEconomyTechnologyandLear/161826

Morse, J. M., Barrette, M., Mayan, M., Olson, K., & Spiers, J. (2001). Verification strategies for establishing reliability and validity in qualitative research. *Internations Journal of Qualitative Methods , 1* (2).

National Research Council. (1999). *Being fluent with information technology.* Washington: National Academy Press.

Noddings, N. (2007). *Philosophy of education 2nd. ed.* Cambridge, MA.: Westview Press.

Patton, M. (1990). *Qualitative evaluation and research methods.* Beverly Hills, CA: Sage.

Peterson, R. A. (2000). *Constructing effective questionnaires.* Thousand Oaks, CA: Sage Publications Inc.

Pontefract, D. (2011). *Learning 2.0 is dumb: Use 'Connected Learning' instead.* Retrieved Jan. 29, 2014 from www.danpontefract.com/learning-2-0-is dumb-use-connected-learning-instead/

Prensky, M. (2001). Digital natives, digital immigrants. *On the Horizon , 9* (5).

Prince, W. W. (2011). Knowledge workers. *Encylopedia for Business 2nd Ed.*

Ranard, D. A. (1989, Mar). The changing american workplace. *In America: Perspectves on Refugee Resettlement* , 10.

Rosen, L. D. (2010). *Rewired: Understanding the iGeneration and the way they learn.* New York: Palmgrave MacMillan.

Rumberger, R. W. (1987). High school dropouts: A review of issues and evidence. *American Educational Research Journal , 57* (2), 101.

Rumberger, R. W., & Levin, H. M. (1967). *Schooling for the modern workplace Background Paper no.2.* Washington: U.S. Deprtment of Laboor, Commission on Workforce Quality and Labor Market Efficiency.

Schuman, L. (1996). *Perspectives on instruction.* From http://edweb.sdsu.edu/courses/edtec540/Perspectives/Perspectives.html

Sefton-Green, J. (n.d.). Digital literacies; tracing the implications of new technology for youth, Seminar 2. *Implications for policy and practice* , 26-30. London, UK.: University of Oxford and Londo School of Economics.

Seidel, J. V. (1998). *Qualitative data analysis.* Retrieved July 30, 2010 from Qualis Research: www.qualisreasearch.com

Simon, M. (2011). *Pilot--Conducting pilot studies*. Retrieved May 5, 2013 from Dissertation Receipes.com: http://dissertationrecipes.com/wp-content/uploads/2011/04/Conducting-Pilot-Studies.pdf

Sivan, E. (2008, Aug 26). *Defining the connective.* Retrieved Jan 28, 2014 from The Connective: http://theconnective.org/2008/08/26/connectivism-as-learning-theory/

Tapscott, D. (1988). *Growing up digital: The rise of the net generation,.* New York: McGraw Hill.

Tapscott, D. (2009). *Grown up digital: How the net generation is changing your world.* New York: McGraw-Hill.

The Digital Media & Learning Research Hub. (n.d.). *Connected Learning.* Retrieved Jan 23, 2014 from Connected Learning Principles: http://connectedlearning.tv/connected-learning-principles

Weimer, M. (2003). Focus on learning, transform teaching. *35* (5), 48 - 54.

Wood, E. (2009). *Engaging Students with Engaging Tools.* Retrieved March 15, 2012 from Educause Quarterly:

http://www.educause.edu/EDUCAUSE+Quarterly/EDUCAUSEQuarterlyMagazineVolum/EngagingStudentswithEngagingTo/192954

Zheng, R. (2005). From web requests to virtual learning. (S. Ferris S.P. & Godar, Ed.) *Teaching and learning with virtual teams* , 53-82.

Zuboff, S. (1988). *The age of the modern machine.* New York, NY: Basic Books Inc.

Appendix A

Survey Questionnaire

Table 1.0A - Demographics

Number	Question	Response Options
1	Gender	Female Male
2	Age?	15 -20 21-25 26-30 31-35
3	What is your current level of education or program? Check all that apply	College or CEGEP certificate/diploma Undergraduate degree Graduate degree Postgraduate degree Multiple degrees Other
4	Are you currently attending or have attended?	College or CEGEP

	Check all that apply:	University Private or specialized college Other
5	What is your status as student?	Full-time Part-time
6	What type of institute of higher education are you currently attending?	College or CEGEP certificate/diploma Undergraduate degree Graduate degree Postgraduate degree Multiple degrees Other Not a student at this time
7	What is your employment status?	Full-time Part-time
8	What is or was your educational focus?	Business and related Engineering Science Medical sciences Liberal Arts and Humanities Computers and Technology

		Law and related Other

Table 2.0A – Personal Use of Digital Technologies

Number	Question	Response Options
9	What Information Communication Technology (ICT) devices do you now use most at least 3 times a week?	Cell phone Smart phone Tablet (iPad, Android) Personal computer Video game console Cable, Satellite or Internet TV I do not use ICT devices Other - describe
10	How do you currently access the Internet to use the devices listed in the previous question? Check the one you use most often.	Local Wi-Fi Institutional or commercial Wi-Fi Wired connection Cell networks
11	Which of the following devices do you use	Blogs

	on a regular basis to communicate with your friends? Check the one you use most frequently.	Wikis Twitter Facebook Email Mashups Text messaging/notifications Collaboration (Cloud) tools; e.g., Google, iCloud, Drop Box, etc. Synchronous communications tools; e.g., Skype, Google +, etc. Do not share Other:

Table 3.0A School and Technology

Number	Question	Response Options
12	Which tools did/does your institution currently had/have available for general student use? Check the one you use most often.	Blogs Wikis Email Twitter Mashups Video and/or audio broadcasts

		Online courses Social networks e.g., Facebook pages Text messaging/notifications Course management system or through a web portal; e.g., oodl, Blackboard, WebCT, Sakai, etc. Synchronous communications tools; e.g., Skype, Google Chat, etc. Public Cloud computing; e.g., Google docs, drop-box, iCloud, etc. Institution (private) cloud computing; e.g., Sharepoint, Wordpress, Webex, Salesforce, Learnlinc, etc. Mobile apps Do not know N/A Other (please specify)

13	Which tools are/were currently available in your university or college classroom to deliver or use for learning materials? Mark all that apply (It may make it easier for you to answer this question by visualizing one course that you participated in where digital tools were available.):	No technology available Overheads only Video and/or audio only Screen and projector (without external internet or other connectivity) Screen and projector (with external internet or other connectivity) Individual student (school) workstations with external connectivity Available wired connections for student PCs or mobile devices Wireless (WIFI) access for student PCs/mobile devices Other:
14	How is/was lesson content (from one course of your choice) most often distributed?	By notes written on a whiteboard By printed notes; e.g., directed readings, handouts, etc.

		By presentation software and projector: PowerPoint or other By school web portal or collaborative tool: e.g., Moodle, Blackboard, WebCT, Sakai, etc. Class or lesson website Podcast or other download Collaborative site allowing student audio/video discussions; e.g., Skype, conference calling Cloud computing location allowing document sharing and/or collaboration; e.g., Google docs Other:
15	During any of your class experiences, did you interact with other students, either individually for study, in study groups about class lesson materials (using technology	Yes No

	tools) while in the classroom?	
16	Outside of your classroom, what tools/methods do or did you use to interact with others about classwork?	Did not interact with others in my class Personal meeting and talk Blogs Email Twitter Mashups Social networks; e.g., Facebook, LinkedIn, etc. Online chats Text (instant) messaging Collaborative software; e.g., on-line discussion boards Synchronous communications tools; e.g., Skype, Google Chat, etc. Institutional (private) Cloud computing (other than Google, iCloud, etc.) Do not use tools to communicate but used

		nontechnology tools; e.g., written paper notes N/A Other:
17	Were you satisfied with the digital tools that were available at your university/college for instruction? 1 - not satisfied, 5 - very satisfied.	1 2 3 4 5
18	Were you satisfied with use of digital tools that your instructor used to teach (for a course of your choice)? 1- not satisfied, 5 - very satisfied	1 2 3 4 5

Table 4.0b – Technology in the Workplace

Number	Question	Response Options
19	What digital technologies are you using at work? Mark all that apply.	Blogs Wikis Email Twitter

		Mashups Video and/or audio broadcasts Podcasts Social networks; e.g., Facebook or internal corporate systems Corporate text messaging/notifications Team collaboration tools; e.g., Project management, CAD/CAM, Lotus notes, Microsoft Exchange, SharePoint, etc. Documentation management; e.g., Word, Excel, PowerPoint, databases RFID/sensor or POS (Point Of Sale) devices Mobile devices Synchronous communications tools; e.g., Skype, Google Chat, Jabber, etc. Public Cloud computing; e.g., Google docs, Drop Box, iCloud, Company (private) cloud computing services; e.g., Sharepoint, Wordpress, Webex, Salesforce, Learnlinc, etc. Do not use any technology tools

		N/A Other (please specify)
20	How do skills using digital technologies help in your workplace? Check the one you feel is most important.	Ability to do the job Ability to work on a team Ability to communicate Ability to get and process information Ability to make decisions Ability to plan, organize and prioritize work Ability to analyze quantitative data Do not help Not applicable

Table 5.0A - Digital Preparation by Institutes of Higher Education

21	How well do you think your university or college prepared you to use technology tools for today's global workplace? Choose from 1 through 5 where, 1 indicates not prepared and 5 very prepared:	1 2 3 4 5
22	How important do you think availability of new technologies will be to students choosing a higher	1 2

	education institute to attend? Choose from 1 through 5 where 1 indicates not important and 5 the most important:	3 4 5
23	What tools or instructor-directed activities do you feel would have or had the greatest benefit to you in the workplace? Rate each from 1 to 5 with the least benefit being 1 and the most benefit rated 5.	Presenting content / delivering information Exploring for information, inspiration Communications and collaborative teamwork Socializing Other (please describe)
24	How relevant do you think your higher education using digital technology is/was? Rate your response from 1 to 5 with 1 being not relevant and 5 being very relevant.	1 2 3 4 5
25	Would you like to participate in a 20-30 minute follow-up interview to discuss your responses to this questionnaire?	Yes No
26	If yes, please provide your email address here:	

Appendix B

Interview Protocol

These questions are meant to get the participants talking about technology and their feelings about the relevance of technology in their education.

Participants can use any course they choose as a model for these questions.

ICT is defined as Information Communications Technology.

1. Background information: In the questionnaire, you provided the following information: age, gender, status as a student/employee, your work title/profession, and your email address. What else would you like to share with me about your background?

2. Digital skills and technology: Please share with me the digital skills and technologies you personally use. How do you use that knowledge for formal learning? How do you use that knowledge for informal learning? What digital technologies do you prefer to use as learning tools? Why?

3. Use of digital technology in coursework at your higher level education: Please describe any situations in which you have used digital technologies as a part of an in-class activity. Please describe any examples you remember of assignments that required the use of digital technologies. What other experiences did you have as a student in a postsecondary educational situation?

4. Using digital technology at work: Please describe the ways in which you use digital technologies in your workplace.

5. Digital technology at work and in your postsecondary experiences: Please compare the experiences you have in your postsecondary educational situations with the digital skills and knowledge you need in your current workplace. What do you think needs to be changed in postsecondary educational experiences to better prepare you for this workplace?

Appendix C

Reflexive Journal – Sample Entries

Date	Event	Notes
July 1–5, 2013	Prepared email text that was to be dispatched when approval received.	
July 19, 2013	The questionnaire was sent to a former student to be piloted. Two questions had to be edited for clarity. Was then sent to the second student for approval. I joined this student in a "live" telephone conversation to get edits or provide clarity as necessary. There were no additional edits necessary. I had my wife proof read the questionnaire. There were no additional edits required.	Minor grammatical errors were corrected – Using a partner for editing is useful for clarity of thought especially if the "reader" doesn't know what the questionnaire objectives are.
July 6-7, 2013	Reviewed responses from the	Identifying participants for

	quantitative survey from participants willing to be interviewed. This review to find diversified members—based on age, sex, education achieved, and profession. The final (advanced) filters used in the downloaded spreadsheet worked well. There was no cut-off date set for filling out the survey. The time allocated for the survey (on-line form) release was immediately following REB approval. The on-line form was reviewed for text, typos, and last minute edits. The final version text for the Letter of Invitation, Confidentiality agreement, and the Informed Consent was completed. A synopsis of the Informed Consent and the Letter of Invitation was added to page 1 of the on-line	diversity is essential; however, getting a good mix of participants is difficult from the information gathered in the questionnaire.

	form. The approval button and "exit" process were added to the on-line form if the participant didn't agree to the "terms" of the survey. This survey form was tested for operation and the 1 test response was deleted from the survey form.	
July 18, 2013	The REB clearance #REB12-288-FIGG (approval) was received. Final documentation was reviewed and released for questionnaire publication on the Google Drive Form.	This approval process took approx. one month. The recommended edits (by the REB) were made. Using a MAC (MSWord) with a HD screen was problematic. There is an MS error on the web found. I phoned the MS for MAC helpdesk to get advice on the issue of missing text in the Word for W7 when sending across ISP servers from a MAC

		for Word.
July 20-22, 2013	Questionnaire web-site URL was released. I began contacting approx. 13 former students who had expressed an interest in participating in the on-line survey. I also asked them to invite all of their friends to also participate.	Instructions in the invitation and URL included suggestions to invite friends to participate in the EDU. Survey. The potential participants and I had discussed this survey in the hopes that recipients will invite friends to participate. It was difficult to anticipate how many would participate. Because of the time constraints of this project, I did not have time to go through another REB process with my current students. I was hoping for 20 participants and since this group of former students was part of the accounting program at school and tend to

		be a “closed shop” and contact each other often.
July 23–early August	Participation in the questionnaire started the week of July 23 and continued until early August. Emails were sent with attachments containing Letters of Invitations and the Confidentiality Agreement along with appropriate instructions. I also specifically suggested we use email.	Contacting this age group is very difficult through email. This group uses Facebook often, but I didn’t anticipate this and didn’t ask for a Facebook ID on the questionnaire. It took several days of searching on Facebook to identify (my) potential participants. I posted invitations along with the EDU survey URL as participants (my contacts) were found. Email is not a viable tool to be used for the initial contact. However, I also did not wish to invite possible problems by sending “open” invitations to “the world” by

		using Facebook. Specific invitations to specific contacts were sent as "messages." The questions had to be edited to limit the number of responses from an open-ended response to "what was used most often." This limiting or narrowing the response possibilities from several possible responses to "one" forced the participant to focus on a single response. It is this focusing that is required making the analysis simpler and relatively straight forward by using advanced spread sheet filters. Filtering for numbers of occurrences was used along with using multiple filters.

		The question, “please describe digital tools you saw your instructor using…” was too open ended and requires to be limited to a selection. The resulting answers were too varied and had several descriptions for the same tool. Using filters was not possible, so this field had to be sorted and categorized manually. Actual applications should have been identified, not just hardware tools used.

Appendix D

Person as Instrument Statement

Technology and the Internet is a communications revolution rapidly underway, akin to and surpassing the communications revolution started by the printing press. An increasingly diverse student cohort is functioning in a revolutionary environment: an unstable knowledge economy in technological / communications flux, under increasing pressure to perform in constantly innovative ways. My experiences on the factory floor, corporate training rooms, and classrooms have had an enormous impact on my beliefs about the power of technology and the computer as a communications tool. It has the power to stimulate learning and promote critical thinking at various levels. The computer empowers students to achieve types of learning never seen before. Learning takes place at the kitchen table, the local store, café, library, or car, in wired environments. Work can be a website, an organization, public or private sectors, or the farm. Work itself can be paid or unpaid, based on reflection, material or virtual, in or out of the home. Workplace learning is not only formal training but increasingly on the fly and informal. The emphasis of globalization has made learning a lightning rod for survival. The emphasis on the knowledge economy has created big demand for innovation—people learning to be creative and entrepreneurial as a way of staying competitive. Following the guidelines of naturalistic inquiry (qualitative) research, I am primarily concerned with the meaning of research participant thoughts regarding technology-related activities relating to learning in school; in other words, technology used as a medium for instruction and

learning. In this role I am the research instrument or what is referred to as the person as instrument.

Validity and reliability are the underpinnings for good research. As the research instrument, I am aware of the challenges of conducting interviews requiring a balance of skill, competence, and rigor with flexibility, insight and tacit knowledge (Erlandson, Harris, Skipper, & Allen, 1993). As a human being, however, I am also aware that I bring to this project a unique set of experiences, beliefs, attitudes, and values. The following is my background.

First, as a process engineering specialist, I have worked as an engineer estimating, designing, and applying conveyor systems for manufacturing plants, airports, post offices, pulp and paper industry, and materials refining and processing facilities throughout Canada. I have worked as applications engineer developing software for robotics and Numerical Control machine tools. Factory automation was my speciality. My work with computer-based technology dates back to 1980. Due to my wide-ranging manufacturing background, I was involved with CAD/CAM (Computer Aided Design and Computer Aided Manufacturing) in its infancy. I conducted demonstrations and trained clients in various functions and applications of CAD/CAM and manufacturing software.

Second, as a senior support specialist and trainer at a technical helpdesk, I worked with a wide variety of callers and support personnel. My role changed to a training other trainers globally. I conducted many classes for end-users and client trainers. Classes included teaching instructional design, teaching trainers how to plan, organize, and conduct classes for end-users. Clientele included some of the world's largest global

corporations ranging from telephone and communications industries, food and beverage production facilities, nuclear plants, airlines, military, refineries, chemical plants, space exploration, health insurance industries, computer outsourcing service providers, and computer manufactures. For the last 15 years, I was the senior implementation team member and senior business process designer for the world's largest global computer services provider. My responsibilities included consulting and training. In short, I have had multiple levels of experience and exposure to people and their work with a great number of roles and duties in a rapidly evolving digital global knowledge economy work environment.

Third, over the last 9 years I have been a part-time professor at the largest applied arts and technology institute in North America. I have written two e-texts, was the content consultant on a third e-text. Three colleges in Ontario are currently using these texts. I was the instructional designer for several courses intended to teach technology to professionals such as accountants and project managers. I have taught a range of Net-Gen adult learners. Classes have ranged from teaching the theory of telecommunications, communications, and the Internet to specific applications such as Microsoft Access to Microsoft Project i.e. tool theory and application of that theory in the workplace.

And finally, I re-entered school to earn a Bachelor's degree with a double major in Business and Communications, plus a second Bachelor's degree in Adult Education. I am currently completing a graduate degree in education. This study is the thesis required for the completion of the M.Ed. However, I had a number of choices to complete my Master's. Because I have experienced the knowledge economy workplace and the classroom with a variety of levels and interactions, my experience has shown that there

could be a gap between how subjects are being taught and what skills students entering the workplace must have. This study was designed to explore how the current or recent student, prefers to use information and communications technology, how you learn best, what the knowledge economy workplace requirements are, and how you were being taught to prepare you for this workplace. The ultimate goal of this study was to identify the possible gap between your learning preferences and the tools or methods used to prepare you for this workplace. My goal in developing this study was to provide academia and teaching professionals' background information and an understanding about the student, and how their learning preferences are evolving to meet *the real world*. Ultimately, my goal was to develop ideas for a new teaching model and provide to some practical examples for instructors to use when designing lesson plans in the future.

This study is a mixed study using both quantitative and qualitative approaches. The qualitative approach uses principles described by Erlandson et al. (1993) in their work, *Doing Naturalistice Inquiry:A Guide to Methods*. In his work, Erlandson et al. (1993) demand *the person* (you) *is the instrument* of the study. That means you are the primary data-gathering instrument for this study, and I, the researcher, will try to experience, understand, or relate to Information and Communication Technology and your educatioal experience the way you do (Erlandson, et al., 1993). The role of the participant will enable me to study "real world situations as they unfold naturally in a non-manipulative, unobtrusive and non-controlling opennes to what ever emerges" (Patton, 1990, p. 40).

A partial list of previous papers written: 2009-2011

- Universities for Sale—The Good, Bad and the Ugly

- The Humanist Perspective in the Classroom
- Issues in the Adult Classroom
- Adult Learning and the diverse classroom
- Accountability, Imperative, Collaborative Utility
- Reflections on: My Life, the World around Me and the Role of Adult Education
- An Analysis of a Computer Based Training program
- Distance Learning: A Technology Overview
- Some Thoughts and Observations About The Web and Its Effect On Communications: A Class Discussion
- Instructional Design Issues
- Reflections on the Postmodern Age and Adult Education
- Mass Media, Ideology, and the Internet: Millennium Meditations
- Mass Media and Consumerism

eTexts written (texts included Instructor guides and student course materials)

- Globalization and E-Commerce for Financial Managers - 2011
- Business and Information Systems for Financial Managers – 2011
- Project Management for Financial Managers (content consultant) - 2011

Appendix E

Case Coding

Thesis Questions:

- How do Net-Gen adult learners currently use digital technology to meet their learning needs?
- Which digital technologies were used for learning in their postsecondary classrooms?
- What digital skills and knowledge are required in their knowledge economy workplaces?
- What digitally enhanced postsecondary learning experiences did the Net-Gen adult learners perceive were most relevant to their learning style and most helpful in preparing them for their workplaces?

Case Reports:

Themes	General Coding Categories	Key Descriptor – Phrases/Quotes	Example of Units of Data
Digital tech in class	formal learning	Learning management systems	"Very few professors, probably less

			than 5%, use the web-portal for feedback on assignments"
Digital tech in class	Formal/informal learning	Learning management systems	"If everybody used the school web portal and posted their lessons on-line before class I could have learned 25% more"
Personal learning preferences	Formal/informal learning	No tech environment	"I am light years ahead of profs who use Stone Age overhead projectors"
Digital tech in class	Formal learning	No relevancy or application	" I am here to learn. I need an efficient [digital]

			classroom environment”
Digital tech in the workplace		No tech environment	“No digital technologies currently deployed in [workplace] operations were taught or even introduced in school”

Theme	General Coding Categories	Key Descriptor – Phrases/Quotes	Example of Units of Data
Digital tech in the workplace	Informal learnig	Self-taught	“I use Excel extensively at

			work and this was hardly touched upon in school"
Personal learning preferences	Formal learning	Self-taught	"Most things were presented using acetates on an overhead projector"
Personal learning preferences	Informal learning	Informal learning - social	"We (the students) often studied together sharing on-line notes and documents"
Personal learning preferences		Informal learning - social	"Graduate work is mostly done with a small group of students doing collaborative work, sharing files and applications, and holding meetings

			through Google”
Personal learning preferences		Social-collaboration	“We texted a lot in informal teams in order to get our projects done”
Digital tech in the workplace	Communications	self-taught - social	“My communications with clients and sales personnel is entirely through digital tools”
Digital tech in the workplace	Communications	Self taught	“Communication in the office uses various types of digital technology tools. Instruction to secretaries is often done through dictation software and electronically

			signed”
Digital tech in the workplace		Self-taught	“I use cell and smart phones, email, texting, and Skype on a daily basis, often communicating worldwide”

Theme	**General Coding Categories**	**Key Descriptor – Phrases**	**Example of Units of Data**
Digital tech in the workplace	Adapting	social	“I know how demanding the workplace is. I need to be prepared”
Digital tech in the	Adapting	Self-taught	“I need to

workplace formal			continuously upgrade my spreadsheet skills in order to do the job"

Appendix F

Demographics

Table F1.0

Demographics

	21 - 25	26 - 30	31 - 35	%
Female	3	5	10	58
Male	2	6	5	42
%	16	35	48	

Appendix G

Educational Levels

Table G2.0

Education levels of Participants in Higher Education.

	Student	**Graduates**	**%**
College	10	2	39
University	14	4	58
Other or Specialized	1	0	3

Appendix H

Educational Accomplishments

Table H3.0

Diplomas and Degrees Held by Participants.

	Count	%
College diploma	12	39
Undergraduate degree	5	16
Graduate degree	6	19
Postgraduate degree	4	13
Multiple degrees	3	10
Other	1	3

Appendix I

Application of Knowledge

Table I4.0

Disciplines Requiring a Direct and No Direct Application of Knowledge

Disciplines requiring direct application of knowledge		
	Count	**%**
Business and related	16	52
Computers and technology	4	13
Engineering	6	19
Law and related	2	6
Science	1	3
Disciplines not requiring direct application of knowledge		
Liberal Arts and Humanities	2	6