NEW EPISTEMOLOGIES IN A DIGITAL AGE: WAYS OF KNOWING BEYOND TEXT-BASED LITERACY IN YOUNG ADULT LEARNERS WITHIN AN ONTARIO COLLEGE CONTEXT

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ABSTRACT

The purpose of this study was to examine how young adult learners acquire and construct knowledge in a digital age within a post-secondary context. The research questions were: 1) What digital devices and technologies/tools do young adult learners use for learning and why? 2) How is the digital age (particularly the widespread use of the Internet) impacting knowledge acquisition and construction in young adult learners? 3) How should post-secondary educational curricula and practice be designed or re-designed to support young adult learners?

A mixed methods (convergent parallel design) study was conducted involving 63 student participants (18 to 24 years of age) attending a large urban community college in Ontario.

Analysis of the data revealed five key themes: 1) participants identified and used go-to digital devices and tools (i.e., digital devices and tools participants preferred and opted to use first); 2) participants used a multiplicity of media, modes, and literacies in their learning; 3) participants valued the affordances of old and new educational practices and thus felt to be in a state of transition; 4) participants' use of multiple media, modes, and literacies led to positive sum outcomes (i.e., increased capacity for learning); and 5) the mix of media, modes, and literacies used by participants resulted in more natural learning (i.e., learning that was more in keeping with participants' natural ways of

engaging in and perceiving the world around them). Another key finding was that although there were commonalities among participants, there also existed a great deal of individual difference in terms of the ways participants preferred to learn in a digital age.

Interpretation of the findings resulted in a re-conceptualization of meta-literacy. In the context of this study meta-literacy was defined as the set of literacy types that meet the following criteria: 1) use a dominant invention/technology; 2) are disseminated via a dominant medium; 3) are represented by a dominant mode; 4) appeal to a dominant sense (or senses); and 5) provide for the ability to consume and produce meaningful communicative artifacts via a dominant medium and mode. Orality, traditional literacy, and digital literacy were identified as literacy types meeting the above criteria. It is recommended that meta-literacy, in conjunction with other relevant frameworks, be considered in the design or re-design of college curricula.

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dedicate this dissertation to my mom and dad (Christine and Cliff). My one disappointment is that Cliff will not be there to see this learning journey come to fruition.

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CHAPTER ONE: INTRODUCTION

In “Growing Up Digital: How the Web Changes Work, Education, and the Ways People Learn”, John Seely Brown (2000) wrote: “the World Wide Web will be a transformative medium, as important as electricity” (p. 12). Transformation implies change -- change in the way people interact with the world, and, by extension, change in the way people learn. Brown suggested that our initial foray into this relatively new medium will be one based on what has come before; that is, we will be mimics first rather than revolutionaries. However, in time, as people engage with and embrace the Web, new techniques will come to the fore resulting in unforeseen possibilities. As an example, Brown imagined that the Web will enable a “learning ecology”, an open, dynamic, diverse, and adaptive community. Much has occurred in the years since the article was written, but Brown’s learning ecology remains a powerful and relevant predictive representation of change.

Transformative change enabled by technology, particularly with respect to learning and education, has historical precedent. The inventions of writing and the printing press, for example, have transformed society from an oral to a literate (text-based) society, fundamentally changing how people think and perceive the world in the process (Havelock, 1986; Ong, 1982). In a similar way, the inventions of electricity and digital technologies (of which computers and the

Web are significant examples) are once again fundamentally changing how we think and perceive the world (Jenkins, 2006; Kress, 2003; McLuhan, 1962). As a result, a significant question arises: What impact will digital technologies and tools have on teaching as a practice, and learning as a process? This is a broad and open question.

Focusing on teaching and learning, there are some interesting developments (perhaps “beliefs” might be a better word) that have arisen in a North American context related to technology’s influence on education. First, young adult learners entering post-secondary institutions are, generally, considered more and more technically savvy with respect to the Internet and the use of digital media. Second, the emergence of the Web 2.0 phenomenon has altered how learners participate in educational activities. Third, particularly among young adults, traditional literacy practice (e.g., reading and writing) is thought to be on the decline while new literacy practice (e.g., digital literacy) is thought to be on the rise.

With respect to young adult learners’ expectations and use of digital technologies, since 2004 the Educause Centre for Applied Research (ECAR) has conducted an annual survey of undergraduate students (primarily in the United States although recent versions include student data from Canada and other countries) and published the findings as the *Study of Undergraduate Students and Information Technology*. The ECAR studies have shown that student ownership of computers is high at 98% (Smith & Borreson-Caruso, 2010), with

laptop ownership at close to 90%, and student ownership of smart phones and tablets is on the rise (Dahlstrom, Walker, & Dziuban, 2013; Dahlstrom & Bichsel, 2014). The trend has been towards the ownership and use of smaller, mobile devices. Further, the ECAR studies have shown that students expect to use technology for academic purposes (Dahlstrom, 2012), that technology makes students feel more connected and learning more engaging (Eden, de Boor, Grunwald, & Vockley, 2011), and that students prefer a blend of learning environments, modalities, and communication options (Dahlstrom, 2012; Dahlstrom, Walker, & Dziuban, 2013).

In terms of young adult learners' use of the Internet, Greenhow, Robelia, and Hughes (2009) listed several statistics that indicate a dramatic increase in access to and use of the Internet, particularly among adolescents (12 to 17 years of age in the United States). Evans (2007), summarizing the results of the annual Speak Up survey (a survey given to K-12 students, parents, teachers, and school leaders across North America about educational technology), reported that for the first time students entering post-secondary institutions will have not known a time without the Internet. The above suggest that young adult learners are becoming increasingly familiar with the affordances of digital devices, tools, and the Internet, not only for personal use but for academic use as well. Further, the above suggest that the expectations of young adult learners regarding technology use for learning will be high. From an educational perspective an issue becomes one of how ready educators and the educational system are, or

need to be, in order to meet the learning expectations and needs of young adults and incorporate their preferred ways of knowing.

With respect to young adult learners' participation in educational activities via the Internet (and conceding that the Internet is being used more and more for educational activities), it is important to note that it has undergone significant change as well. Since Berners-Lee and Cailliau first proposed the World Wide Web (i.e., the Web) in 1990, it has progressed from a relatively static interface (Web 1.0) to a dynamic interface (Web 2.0). (Note: the terms *Internet* and *Web* used throughout this dissertation are mostly synonymous; however, an attempt has been made to use the term Internet most often when referring to information dissemination, and to use the term Web most often when referring to information representation.) Whereas users in a Web 1.0 world were primarily consumers of information, users in a Web 2.0 world are both consumers and producers of information. Web 2.0, therefore, is often thought of as the read and write Web. O'Reilly (2005) described Web 2.0 as a set of principles and practices. These principles and practices can be distilled primarily to 1) the Web is a platform, and 2) the users of the platform create content and in so doing continually add data to the platform and thus continually add value. What the Web 2.0 phenomenon has brought back is the notion of *prosumerism* (originally described by Alvin Toffler in his 1980 book *The Third Wave*, albeit from an economic rather than an educational point of view). In essence, users are learners and they are both producers and consumers of content (*prosumers*). Further, they are both producers and consumers of meaning. Komoski (2007) suggested that in an

educational prosumer world, teachers and students co-produce our knowledge-based society. In this context the level and type of participation is altered. Learners have greater access to and seek out online communities of interest becoming active participants in these communities. Moreover, membership in these communities is a function of passion: Learners become heavily engaged within the community, absorbing and contributing information. The result is that learners become *proams* (contraction of professional and amateur); that is, amateurs who become expert at something because they are passionate about it (Gee, 2010). New terminology (in addition to prosumers and proams) to describe learner participation in a digital world has entered the vernacular. For example, the term *maker movement* has become popular and describes a culture enabled by digital technologies that brings learning and community together, where individuals create (make) objects and share their creations with others. Some of the objects created are *mashups* which involves the combining of bits of content from a number of sources to make new content. The key is that digital technologies enable individuals to more easily make and share content. Dougherty (2012) suggested that the maker movement should be a learning strategy incorporated into schools because it is a better way for students to provide evidence of their learning. From an educational perspective an issue becomes one of how digital technologies and tools alter the types of activities young adult learners expect to engage in, the level to which these learners expect to engage with these activities, and the meaning they derive from these activities.

With respect to literacy, with the rise of the use of digital technologies and the emergence of the Web, traditional literary practice (i.e., reading and writing) has been altered. It has been suggested that many students now lack the level of reading and writing (traditional literacy) required to successfully participate in higher education. The Canadian Literacy and Learning Network reports that "42% of Canadian adults between the ages of 16 and 65 have low [traditional] literacy skills" (Literacy Statistics section, 2014., para. 1). In "Making the Grade? Troubling Trends in Postsecondary Student Literacy", Dion and Maldonado (2013) reviewed literacy data from Statistics Canada, the Organization for Economic Co-operation and Development (OECD), the International Adult Literacy Survey (IALS), and the Adult Literacy and Life Skills Survey (ALL) and concluded that "there is growing concern that Canadians' [traditional] literacy skills, including those of students attending postsecondary institutions in Ontario, are not meeting expectations" (p. 1). The trend raises questions about what literacy skills are important for learning.

In terms of writing, Kress (2003; 2010) posited that digital technologies have brought about shifts in communication. In particular, he suggested shifts have occurred away from the dominance of writing to the dominance of the image, and away from the dominance of the book and the printed page to the dominance of the screen. Further, Kress (2007) posited that writing has become less complex because it no longer must carry within the text the majority of the information and thus convey the majority of the meaning. In essence, the visual becomes the primary mode of expression and the written word supports the

visual. Consumers of information expressed in this manner make meaning by creating cognitive connections between what's written and what's shown. It would appear, then, that the purpose and practice of writing, influenced by digital technologies and tools, has changed.

In terms of reading, in *Reading at Risk: A Survey of Literary Reading in America* published by the National Endowment for the Arts (2004), it is reported that regardless of age, gender, race/ethnicity, or education level, literary reading in America is declining. Further, less than half of the adult population in America reads literature, and of all the age groups the steepest rate of decline is in the youngest age group (18-24 years of age), and this rate is accelerating. Although this survey uses the book as the unit of measure (which may or may not be a valid indicator of overall reading practice), the conclusion mirrors that found in popular media (see Bauerlein, 2008; Postman, 1985, Romano, 2005; Tucker, 2009). Terms such as *aliteracy* (defined as having the ability to read but choosing not to) have been applied to this claim. It would appear, then, that the purpose and practice of reading, influenced by digital technologies and tools, has changed.

The potential decline in traditional literacy practice has polarized thinking. Authors such as Bauerlein (*The Dumbest Generation* [2008]) and Postman (*Amusing Ourselves to Death* [1985]) conclude that cultural systems are broken for the overuse of new media has resulted in a shortage of "educated people" who possess the knowledge, skills, and attitudes to be productive citizens. The

assumption is that the time spent engaging with new media reduces the time spent engaging in traditional literacy activities (i.e., reading and writing) and thus reduces learning. On the other hand, authors such as Tapscott (*Grown Up Digital* [2008]) and Jenkins (*Convergence Culture* [2006]) suggest that new media are transforming cultural practice resulting in a more engaged and smarter citizenry. The assumption is that the time spent engaging in new media activities enhances interaction and thus learners' educational experiences. While the former authors approach literacy from a traditional point of view (i.e., the ability to communicate effectively textually, in print-based form), the latter authors approach literacy from a multiliterate point of view (i.e., the ability to communicate effectively orally, visually, and textually in a variety of media). From an educational perspective an issue becomes one of how accurate educators' traditional notions of what it means to be literate are and whether these notions need to change in order to meet the needs and expectations of young adult learners and to align more closely with the learning (and literacy) practices of young adult learners.

With respect to new literacy practices, assuming that traditional literary practice (i.e., reading and writing) appears to be changing, it is thought that new literacies are taking hold and that the use of new literacies among young adults is increasing. New literacies (such as digital literacy, media literacy, and the like) are those made possible by digital technologies and tools. The changing nature of what constitutes literacy has seen the emergence of new lines of inquiry. One example is New Literacy Studies (NLS). Street (2003) suggested that NLS "entails the recognition of multiple literacies" (p. 77) that take into consideration

different social and cultural contexts. Further, Street hinted that the term literacy is too simple a term and “comes loaded with ideological and policy pre-suppositions” (p. 78). Papert (1993) suggested that literacy in its traditional context (referred to by Papert as “letteracy” -- the privileging of reading and writing) does a disservice to those with different intellectual styles. In particular, Papert (1993) suggested that over time letteracy stifles an individual’s innate passion for learning. Tierney, Bond, and Bresler (2006) considered new literacies to be “those associated with digital technologies and multimodal representations” (p. 359). Komoski (2007) suggested transformational learning occurs when language literacy and digital media literacy are melded in a “bi-literate networked world” (p. 1). Literacy, then, has many forms and the baggage that the term carries may not do justice to its many forms. For these researchers new literacies enable new ways of sharing and new ways of knowing. Young adults are engaging in new literacy practices, navigating between various forms of digital expression (e.g., writing blogs; contributing to wikis; creating and uploading videos; recording, re-mixing, and sharing content). Terms such as *transliteracy* (defined as the ability to be literate across a wide range of media) have been applied to this phenomenon (Thomas et al., 2007). From an educational perspective an issue becomes one of what kinds and in what contexts new literacies should be incorporated into educational practice, and how literary practice may need to change given the expectations and practices of young adult learners.

1.1 Purpose of the Study

The developments described above suggest that we are in a transitional stage between the old and the new. Whether the transition is between old and new media, old and new notions of literacy, or old and new educational practice, caught in the transition is the young adult learner and the post-secondary educational system designed to support him or her. Questions arise as to what the many new forms of media and literacy are, how they enable learning, which ones are (or should be) valued, who decides which ones are valued (and in what context), what the impact may be on education, and how all this may change even more over time.

The purpose of this research is to examine, from a post-secondary context, how young adult learners acquire and construct knowledge in a digital age. In addition, this research will explore how new digital technologies and tools have, perhaps, given rise to new literacies and, in turn, new epistemologies. As such, the primary focus of this investigation is to 1) determine how a technology-rich, Web-saturated environment shapes learners' ways of knowing, and 2) speculate on how post-secondary educational learning environments should be designed to support these learners.

1.2 Research Questions

It is hoped that the research undertaken in this study will help to inform the post-secondary educational community, provide insight into how young adults learn, and describe formal educational practices that would be effective in helping them learn. The following questions will guide the research:

1. What digital devices and technologies/tools do young adult learners use for learning and why?
2. How is the digital age (particularly the widespread use of the Internet) impacting knowledge acquisition and construction in young adult learners?
3. Given the above, how should post-secondary educational curricula and practice be designed or re-designed to support young adult learners?

CHAPTER TWO: LITERATURE REVIEW

In this chapter I focus on research and literature that explores what it means to be literate in a digital age, how meaning is made in a digital age, and the role of the education system in the learning process. There are many ways in which to explore the above. I have chosen to explore these concepts through multiliteracy and cognitive perspectives as these perspectives appear to provide a means in which to address my research questions.

2.1 Multiliteracy Perspective

2.1.1 What Constitutes Literacy

A traditional view of literacy focuses on language and the ability to make and convey meaning by engaging in reading and writing activities. Central to the traditional view is a focus on the acquisition of skills. Over the years this view has changed.

In “A Pedagogy of Multiliteracies: Designing Social Futures”, the New London Group (1996) attempted to “broaden this [traditional] understanding of literacy and literacy teaching and learning” (p. 61). The Group put forth two main arguments for change:

> The first relates to the increasing multiplicity and integration of significant modes of meaning making, where the textual is also related to the visual, the audio, the spatial, the behavioural, and so on. This is particularly important in the mass media, multi-media, and in an electronic hypermedia… Second, we decided to use the term “multiliteracies” as a way to focus on the realities of increasing local diversity and global connectedness. (p. 64)

The New London Group recognized that traditional, language-based views of literacy and literacy education had limitations and a more encompassing view (one predicated on multimodality and multilingualism – their two “multis”) was required in order for students to be successful in social futures.

2.1.1.1 Definition of Literacy

The definition of literacy has undergone considerable change as well over the past couple of decades due, in part, to the advent of the Internet and other new digital technologies and their impact on education. What follows is a summary of some key, proposed literacy definitions over this time.

In “What is Literacy?” Gee (1998) argued that “Literacy is control of secondary uses of language (i.e., uses of language in secondary discourses)” (p. 56). According to Gee, secondary discourses are those in social settings, such as schools and workplaces. In contrast, primary discourses are used by families and/or close socio-cultural groups. Gee contended that “Any discourse, primary or secondary, is for most people most of the time only mastered through

acquisition, not learning" (p. 56). As a result he suggested that schools should focus on creating the right settings for improving literacy acquisition, with teaching and learning efforts focused on improving meta-level linguistic skills.

In "Metamedia Literacy: Transforming Meanings and Media", Lemke (1998) defined literacy as "a set of cultural competencies for making socially recognized meanings by the use of particular material technologies" (p. 283). Lemke contended that "Literacies are themselves technologies" (p. 283), that "Literacies are always social" (p.285), and that "all literacy is multimedia literacy" (p. 284). In this sense the scope of what constitutes literacy has expanded to include the interplay between the social and the technological. Lemke's view of literacy can be summarized as follows:

> Every new community, every transformed community, potentially represents a new literacy. Every new system of conventional practices for meaningful communication already is a new literacy embedded in new technologies. All participation in new communities, in new social practices, potentially makes available to us new identities as individuals and new forms of humanity as members of communities. Insofar as education is initiation into communities, and especially into their generic and specialized literacy practices, new information technologies, new communication practices, and new social networks make possible

> new paradigms for education and learning, and call into question the assumptions on which the older paradigms rest. (p. 287)

He recognized that new technologies spawn new communities (and, perhaps, vice-versa), which in turn lead to the development of new literacies, which in turn require new approaches in educational practice.

The United Nations Educational, Scientific and Cultural Organization (UNESCO) declared 2003-2012 as the United Nations Literacy Decade (UNLD). In *Aspects of Literacy Assessment: Topics and Issues from the UNESCO Expert Meeting*, Clinton (2005) summarized the outcomes of the expert meeting held in Paris in 2003. One of the goals of the expert meeting was to come up with an operational definition of literacy. The result was the following:

> Literacy is the ability to identify, understand, interpret, create, communicate, and compute, using printed and written materials, associated with varying contexts. Literacy involves a continuum of learning in enabling individuals to achieve his or her goals, develop his or her knowledge and potential, and participate fully in community and wider society. (p. 21)

The participants in the expert meeting recognized that a single definition of literacy was problematic given the broad interpretations of what constitutes literacy. They concluded that literacy was plural (i.e., a multidimensional concept) and that it was more than a skill: a cornerstone of social betterment. In summary,

they concluded that “Literacy is an evolving concept, where its nature and uses constantly change and adapt to new technologies, new circumstances and new demands; in this sense, not just societies, but individuals manifest and use an evolving range of literacies” (p. 17).

In *A Global Imperative -- The Report of the 21st century Literacy Summit*, the New Media Consortium (2005) summarized the proceedings of the Literacy Summit held in San Jose in April, 2005. The summit comprised a group of educators, researchers, authors, and artists who came together to discuss how changes in communication and language brought about by changes in digital technology had expanded notions of literacy, which they termed 21st century literacy. One outcome of the summit was a working definition of 21st century literacy:

> 21st century literacy is the set of abilities and skills where aural, visual and digital literacy overlap. These include the ability to understand the power of images and sounds, to recognize and use that power, to manipulate and transform digital media, to distribute them pervasively, and to easily adapt them to new forms. (p.2)

The group outlined several characteristics of 21st century literacy (e.g., it is multimodal, interactive, creative, potentially transformative) and suggested schools and post-secondary institutions need to change to better model this new literacy in order to more fully engage students, which the group deemed a global imperative.

In “Participative Pedagogy for a Literacy of Literacies”, Rheingold (2008) defined literacy as “the set of skills that enable individuals to encode and decode knowledge and power via speech, writing, printing, and collective action, and which, when learned, introduce the individual to the community. Literacy links technology and sociality” (A Participative Pedagogy section, para. 1). Rheingold contended that 21st century life required the development of a participative pedagogy in which participants, enabled by technology (especially social media), collaborate via multiple modes to take collective action and build a healthy, public future.

The authors and groups above have articulated that the traditional view of literacy as text-, skill- and language-based is no longer adequate. Literacy should now be viewed as plural (involving a variety of complementary literacies), as social (involving interaction and participation for individual and community improvement), as technological (involving a variety of old and new tools, media and modes), and as evolving constantly.

2.1.1.2 Modifying the Term Literacy

The broadening of the view of what constitutes literacy has seen the emergence of terms modifying the root word literacy. Terms such as transliteracy, digital literacy, and media literacy have become prevalent.

In “Transliteracy: Crossing Divides”, Thomas et al. (2007) defined transliteracy as “the ability to read, write and interact across a range of platforms, tools and media from signing and orality through handwriting, print, TV, radio and

film, to digital social networks" (What is Transliteracy? section, para. 1). In "Transliteracy: take a walk on the wild side", Andretta (2009) contended that transliteracy is "a new concept of literacy, where the ability to read and write associated with textual literacy is complemented by fluency in different types of media" (p. 2). In a transliterate world meaning is made through interaction and participation using a variety of literacies and communication channels.

In *What is 'digital literacy'? A Pragmatic investigation*, Belshaw (2012) proposed eight essential elements of digital literacies (cultural, cognitive, constructive, communicative, confident, creative, critical, and civic) that collectively make up "an overlapping matrix in which certain parts are either foregrounded or backgrounded, depending upon context" (p. 210). He recognized the difficulty in attempting a single, comprehensive definition of digital literacy because of the constant state of flux within the essential elements listed above. Instead, he concluded that "Digital literacy is a *condition*, not a threshold and, as with all 'conditions' requires maintenance and context" (p. 214). Belshaw's work shows that even within a specific literacy (i.e., digital literacy, which is one of many literacies) there are a multitude of factors that affect that literacy. Further, these factors are constantly shifting making an understanding of what constitutes digital literacy at any given time within any given context problematic.

In "Orchestrating the Media Collage", Ohler (2009) posited that "Being able to read and write multiple forms of media and integrate them into a

meaningful whole is the new hallmark of literacy" (p. 8). He called the integration of media into a single narrative a "media collage". Ohler contended that just like with old literacies, new literacies involve the consumption and production of content in order to acquire, construct, and convey meaning. As such, knowledge of and skill in the use of new media (i.e., media literacy) becomes paramount. Ohler defined media literacy as "the ability to recognize, evaluate, and apply the techniques of media persuasion" (p. 10).

In "Beyond Multimedia Literacy: Supporting Mastery in Virtual Environments", Morbey (2011) outlined the concept of "metamodal mastery" which she defined as

> the ability to discover, create, produce, analyze, synthesize, integrate, and share data, content, artifacts, epistemologies, and vocabularies from a variety of fields in many collaborative modes and media, within and across metamedia platforms to enhance student learning through a bridging of the digital and the real. (p. 11)

Morbey contended that the term literacy is outmoded because of its historical roots in language, where competency is derived from prescriptive and repetitive school-based tasks. Instead, she preferred the term mastery because it can be applied more appropriately to a range of media forms, which privilege "the logic of the visual over the linguistic" (p. 11), and in which competency is derived from participation in a variety of

formal and informal activities. The multiplicity of media, modes, and literacies opens up more possibilities and combinations that require a higher level of interpretation. As such the prefix *meta* can be applied to each resulting in *meta-media, meta-modality*, and *meta-literacy*.

These modifications to the term literacy have further expanded what constitutes literacy. Literacy now contains a complex mix of components and layers that create subtle nuances in meaning depending on context.

2.1.2 New Literacy Studies, New Literacies Studies, and New Media Literacy Studies

The changing notion of what constitutes literacy has spawned new lines of inquiry. One example is New Literacy Studies (NLS). Street (2003) suggested NLS "represents a new tradition in considering the nature of literacy" (p. 77). He proposed an alternative model of literacy which posits that "literacy is a social practice, not simply a technical and neutral skill; that it is always embedded in socially constructed epistemological principles" (p. 77). Street's view emphasized the social aspect of literacy. No longer is the acquisition of literacy skills enough for learners, but the social context in which learners are exposed is also of prime importance. Although still rooted in language (text-based literacy), NLS incorporates cultural and social awareness. As such, NLS problematizes what counts as literacy, who decides what literacies are important, and who gains or is marginalized by the answers to these questions (Street, 2003).

Gee (2010) made a distinction between New Literacy Studies (NLS) and New Literacies Studies (plural). He wrote: “The NLS was about studying literacy in a new way. ‘The new literacies studies’ is about studying new types of literacy beyond print literacy, especially digital literacies and literacy practices embedded in popular culture” (p. 172). Although the two are closely related, Gee contended that new literacies studies focus on how digital tools enable meaning as opposed to how language as a tool enables meaning. In both cases these meanings are socially derived within socio-cultural practices. Gee also contended that another line of inquiry is emerging, namely, New Media Literacy Studies (NMLS). He wrote: “NMLS stresses the ways in which digital tools and media built from them are transforming society and, in particular, popular culture” (p. 173). Gee suggested the result is a change in the balance of production and consumption and a change in the balance of participation and spectatorship. New digital tools allow learners to more easily produce content and more easily participate in activities (educational or otherwise). As such, there is a change in how learners organize themselves socially, and, subsequently, how they learn.

The social aspect of New Literacies Studies and New Media Literacy Studies puts emphasis on community and practice. Lave (1992) argued that “people only learn in practice, they always learn in practice” (p. 1), and that learning is socially-situated such that learning is “*an aspect* of activity in the world, not a separate thing” (p. 1). For Lave, schools complicate learning for they separate learning, the individual, and the community. Ideal for Lave would be a blending of learning, the individual, and the community such that learning takes

place as participation in communities of practice. Lave and Wenger (1991) suggested that learners begin by participating peripherally in a community of practice and then proceed gradually to full participation. According to Lave and Wenger, learners given access to information, resources, and community members gradually increase their participation in a community, eventually leading to full membership. Wenger (1998) suggested three conditions were necessary for a community of practice to form: 1) a common purpose or goal (joint enterprise), 2) a common set of resources (shared resources), and 3) collaboration (mutual engagement). Through this process learning occurs. Learning, then, is not just about acquiring a new skill or learning to use a specific tool, “it is a way to connect with the history of [a] practice and to participate more directly in its cultural life” (Lave and Wenger, 1991, p. 101).

The views of Lave, Wenger, Gee, and Street parallel one another; that is, learning, literacy, and community are inextricably linked. The setting (community) in which a learner finds him or herself, the types of literacy practices that occur within this setting, and the types of digital tools that are used in the setting influence how meaning is made.

2.1.3 Multimodality

Within a multiliteracies context, multimodality is about how various modes, such as visual, aural, gestural, spatial, and linguistic modes, are used and/or combined in order to convey and make meaning. Rowsell (2013) defined a mode as “a unit of expression and interpretation” (p. 3). Further, she outlined three

conceptualizations of multimodality (*transmodality*, *intermodality*, and *intramodality*). In transmodality interdependent modes are joined to make meaning, for example, sound and visual in a film (p. 4). In intermodality independent (but complementary) modes are joined to make meaning, for example, image and font in an illustration (p. 5). In intramodality modes are joined to enhance a unit of expression, for example, colour and fabric join to enhance a garment (p. 5). In each case meaning is heightened through the combination of modes.

Whereas in the past the printed word was the dominant mode of communicating meaning, new media have enabled other modes to come to the fore. Kress (2003) explored how new media transforms literacy arguing that the dominance of writing is being replaced by the dominance of the image, and the dominance of the book is being replaced by the dominance of the (digital) screen. He considered writing to be governed by the logic of speech, whereas the image is governed by the logic of space. For Kress, these shifts in modes of representation "will have profound effects on human, cognitive/affective, cultural and bodily engagement with the world, and on the forms and shapes of knowledge. *The world told* is a different world to *the world shown*" (p. 1). Jewitt and Kress (2003) posited: "meanings are made, distributed, received, interpreted and remade in interpretation through many representational and communicative modes – not just through language" (p. 1). Further, they suggested that all communication is multimodal, that writing alone is not enough for learning, and that all modalities are "equally significant for meaning and communication" (p. 2).

In this context written language, then, is but one part of meaning making. Moreover, it is no longer the dominant part. A literate individual is no longer one who can simply read and write, but one who can place language within a broader context – a multimodal world. As information can be expressed through multiple modes, the ability to interpret and connect the multiple modes through a variety of literacies (e.g., print, digital) becomes essential.

2.1.4 Multimedia

Within a multiliteracies context, multimedia is about how various media, such as print (books, newspapers), electronic (radio, television) and computer (Internet, mobile) media are used and/or combined to convey and make meaning. Whereas multimodality is about how information is represented (e.g., aurally, visually), multimedia is about how information is disseminated (e.g., in print, digitally). Lauer (2009) examined how the terms multimodal and multimedia differ and concluded that when the prefix *multi* is added to the disparate terms *media* and *modes* the resultant terms become quite similar; the main difference being that the term *multimodal* is used primarily in academic settings while the term *multimedia* is used primarily in non-academic settings. Further, Lauer concluded that “Modes and media are independent of and interdependent with each other, meaning that although media and modes are different from each other, the media we use affect the ways in which we can realize meaning through various modes” (p. 227). Kozma (1991) suggested that “Media can be defined by their technology, their symbol systems, and their processing capabilities” (p.

180). McLuhan (1964) suggested that media are technologies that have far greater effects than the information or content they disseminate. It can be postulated, then, that the reach of multiple media coupled with the impact of multiple modes of expression result in significant contributions to (and are essential for) meaning making.

As with modality and literacy, the prefix *trans* has also been applied to media. Jenkins (2011) defined transmedia as follows: “Transmedia, used by itself, simply means ‘across media.’ Transmedia, at this level, is one way of talking about convergence as a set of cultural practices” (Transmedia 202: Further Reflections section, para. 7). Jenkins also suggested there are many transmedia “logics” to describe the “flow of content across media.” One of these logics relevant to learning is “transmedia storytelling”. Jenkins (2007) defined transmedia storytelling as

> a process where integral elements of a fiction get dispersed systematically across multiple delivery channels for the purpose of creating a unified and coordinated entertainment experience. Ideally, each medium makes it (sic) own unique contribution to the unfolding of the story. (Transmedia Storytelling 101 section, para. 3)

Of import here is the types of media used are culturally defined and that each medium used adds a layer of meaning to a story. Critical, then, is the ability to be literate in a variety of media in order to fully comprehend or further the story.

2.1.5 The Role of the Education System

The need for change in the education system is a common theme found in new literacy studies, new literacies studies, and new media literacy studies. Tierney, Bond, and Bresler (2006) raised the notion that traditional ways of schooling and teaching may not be adequate to take advantage of the affordances of multiple literacies. Kalantzis, Cope, and Cloonan (2010) concurred. They wrote: “While traditional print-based forms of literacy continue to dominate school curriculum, pedagogy, and assessment, in their out-of-school lives students are increasingly participating in online worlds and other forms of digital culture” (p. 62). Moreover, they suggested that although schools are increasingly attempting to integrate new technology into new learning experiences, often what happens is that these experiences are “not that new in the sense that they are instructional or epistemological breakthroughs” (p. 63). In essence, within a school context, technological innovation does not necessarily result in pedagogical innovation. Rowsell (2013), too, suggested that “while the world forges ahead using visuals, moving images, and haptic texts, teaching and learning in school remains anchored to words, often on printed pages” (p. 3).

In *Confronting the Challenges of Participatory Culture: Media Education for the 21st Century,* Jenkins, Clinton, Purushotma, Robinson, and Weigel (2009) outlined a plan to help schools transition into a new media education space built on the concept of *participatory culture*. For Jenkins et al. “participatory culture shifts the focus of literacy from one of individual expression to community

involvement" (p. xiii). In essence, participatory culture enables individuals to express themselves in multiple ways using multiple media and multiple modalities. Further, this expression is a collective endeavor, where individuals come together to share ideas and methods. In order for this to happen, Jenkins et al. suggested the skills (or literacies) required for individuals to fully participate must be taught (and/or mentored). Further, these literacies must include all forms (textual, aural, visual, digital) — "Youths must expand their required competencies, not push aside old skills to make room for the new" (p. 29) — and should be embedded within a social context —"new media literacies should be considered a social skill" (p. 28). To enable such a transition, appropriate tools and technologies must exist. For Jenkins et al. the advent of the World Wide Web, specifically Web 2.0, provides such a technology. As a dynamic, participatory environment, the Web is an ideal platform for participatory culture. Web 2.0 technologies (e.g., wikis, blogs, and social networks) enable new and innovative ways of participation, socialization, and knowledge sharing and acquisition. O'Reilly (2005) suggested that a central tenet of Web 2.0 is the ability to embrace "the power of the web to harness collective intelligence" (p. 2). Levy (2011) posits that *collective intelligence* is the augmentation of knowledge as individuals contribute ideas and resources collaboratively (primarily through language). Further, Levy suggests technology enhances this augmentation of knowledge. Jenkins (2009) hinted that collective intelligence is a part of the Web 2.0 world, for it is impossible for any one individual to know everything and therefore there is a need to liberate knowledge by pooling expertise, and working

through solutions together. Web 2.0 technologies, therefore, become a means through which new teaching and learning methods and new literacy approaches are realized. In other words, Web 2.0 technologies and their social, participatory, multimodal, collective intelligence nature could act as the catalyst to transform learning and literacy, and enable an evolution towards newly emergent ways of knowing.

Literacy is a fundamental construct humans use to make meaning and to function in the world. Given the shift in what constitutes literacy and the knowledge and skills required to share and make meaning in a digital age, it would appear the role of education in literacy development needs to move toward a higher, meta level enabled by multiple modes, media, and literacies in order to advance knowledge and enable social futures.

2.1.5 The Digital Landscape

The digital landscape, of which the Web 2.0 world is a prominent part, is composed of a multiplicity of factors (multiple modes, multiple literacies, multiple media). The intricacies of how this landscape works and how participants interact with it is an essential research focus. Bolter and Grusin (1999), for example, put forth the idea of *remediation*. Remediation is defined as the representation (or re-representation) of one medium in another. An example would be a TV program distributed via the Web. Bolter and Grusin also suggest that the goal of remediation is immediacy, where the medium itself becomes transparent to the viewer, but often results in *hypermediacy*, where the media become obvious to

the viewer. An example would be the same TV program distributed via the Web but now accompanied by other media forms such as text and/or imagery. Bolter and Grusin refer to this as the double logic of remediation. Through their work, Bolter and Grusin offer a view into the new digital landscape, one that is composed of a tangle of media forms that need to be negotiated and mastered. Fagerjord (2003) suggested the ideas of Bolter and Grusin do not go far enough in terms of the meaning that is conveyed through media. Instead, Fagerjord proposed the concept of *rhetorical convergence*, which involves the merging of diverse media forms through a common technology (such as the Web) resulting in new ways of making and conveying meaning. As cited earlier in this chapter Morbey (2011) proposed the idea of metamodal mastery which promotes an understanding of the world at a meta level through multiple media and multiple modalities. Mackey and Jacobson (2011) proposed the idea of a metaliteracy framework in which multiple literacy types (information literacy, media literacy, digital literacy, visual literacy, and cyberliteracy) are combined and in which heightened critical thinking and collaborative competencies are required for effective participation within this framework. Lotherington (2004) proposed the idea of *digital metaliteracies* to describe “how children are learning to access and enact digital literacies” (p. 306). In the digital age, then, as different media and different modes of representation emerge, skill in the use of the various media and modes must also emerge. An individual learning or working in this environment must possess a repertoire of skills (primary among them the ability to communicate through multiple media, using multiple literacies and modes).

Further, an individual must be able to make meaning within this context. Collectively, then, hypermediacy, rhetorical convergence, metamodal mastery, and metaliteracy hint at a new epistemology, one that goes beyond traditional ways of knowing.

2.2 Cognitive Perspective

2.2.1 Technology, Culture, and Learning

Technology's influence in shaping human thought and consciousness is a recurring theme. In exploring the oral and written history of language, Ong (1982) concluded that the advent of writing and subsequently reading has resulted in a fundamental shift in society from an oral tradition to a literate tradition. Whereas orality relies on repetition and memory, where knowledge is stored in the minds of the collective community and retrieved/shared through speech, literacy relies on the technology of writing, where knowledge is stored in books and retrieved/shared through reading as well as through speech. In literate society orality is not displaced, it is relegated. Moreover, literate society is much more individual-focused, as the act of reading is a more solitary act than a communal act. For Ong, the shift from orality to literacy has restructured human thought and consciousness. Ong considered orality (speech) to be "natural", in which consciousness "wells up … out of unconscious depths" (p. 81). On the other hand, he considered literacy (specifically writing), to be "artificial", in which consciousness "does not inevitably well up out of the unconscious" (p. 81). Ong did not suggest that the restructuring of consciousness through writing was

detrimental; in fact, he considered writing to be “essential for the realization of fuller, interior, human potentials” and that “writing heightens consciousness” (p. 81). What Ong highlighted was a progression from oral ways of knowing to literate ways of knowing. He also suggested that this progression is by no means complete. Ong proposed that new electronic technologies (post-typographic technologies such as television, radio, telephone, computers, and the like) are bringing “consciousness to a new age of secondary orality” (p. 133). Secondary orality contains elements of primary orality as well as elements of literacy, but it is different. It is a progression into even newer ways of knowing. Secondary orality involves a collective, socially sensitive consciousness, where “we are turned outward because we have turned inward” (p. 134). In this sense, secondary orality builds on the experience of primary orality and literacy, but moves us forward into new ways of perceiving the world.

McLuhan (1962) explored the influence of technology in shaping cognition and culture. He separated mechanical technologies, such as print technology, from electronic technologies, such as radio and television. He also separated the aural from the visual. As each gave way to the other (i.e., mechanical technology to electronic technology, and the aural to the visual) he indicated profound changes occurred in culture and cognition. From a cognitive perspective McLuhan (1960) suggested, “A slight change of one of our five senses alters the ratio among the rest. People suddenly begin to want and appreciate different things, they begin to think differently” (7:32). The implication is that meaning making is altered. Further, McLuhan (1962) posited that the mechanical printing

press (Gutenberg typography) closed down the human voice as “people began to read silently and passively as consumers” (p. 250). In this sense, meaning making is individualized and internalized. In contrast to typography, electronic technologies externalize the human voice creating a new social interdependence. In this sense, meaning making is communal and externalized. As McLuhan (1962) put it, “The new electronic interdependence recreates the world in the image of a global village” (p. 31).

Franklin (1999) posited that with the advent of digital technologies we now exist in two worlds, the biosphere and the *bitsphere*, and that each world is structured differently, contributing to social, cultural, and political tensions as we move in and out of each world and navigate the interface between the two. For Franklin the biosphere represents the old and the bitsphere represents the new. Despite the unease these worlds cause, Franklin saw hope in our ability to find a way to navigate between the two and in so doing find “new opportunities to advance the common good” (p. 175). Lawrence Lessig (2002) concurred that “the real struggle at stake now is between *old* and *new*” (p. 6). Writing from a socio-political point of view, Lessig saw digital technologies having the ability to “create and replicate reality much more efficiently than nondigital technologies,” and that this will result in a “world of change” (p. 7). In his earlier work, Lessig saw the clash between the old and new as a negative, whereby political forces would protect the old at the expense of the new. In his later writing, however, Lessig became more hopeful. In the preface to *Remix: Making Art and Commerce Thrive in the Hybrid Economy* (2008) he called for a truce in the war

between opposing forces (the old and the new) and the need to “figure a better way” (p. xix). As such, both Franklin and Lessig tempered their concerns with hope.

The work of Ong, McLuhan, Franklin, and Lessig suggests that there are socio-cultural and cognitive changes that occur as society moves form one technology to another or adopts a new technology at the expense of an old technology. These works also suggest that this movement or progression is by no means complete, that new technologies will inevitably come into being and that these will, in turn, further alter thought and consciousness. As these changes occur understanding is shaped differently and heightened causing tensions during the transition periods.

Not everyone agrees with the premise that technology is the driver of change. From a socio-cultural perspective, Jenkins (2009) argued that technological change does not precede cultural change. Instead, he argued that cultural change precedes technological change and that the technologies that take hold are simply those able to amplify socio-cultural trends and make them available to a larger population. Stahl (1999) believed society has fallen into the trap of “technological mysticism: faith in the universal efficacy of technology” (p. 13). Stahl challenged the underlying assumptions about the influence of technology; namely, that technology causes a new social order, that computers are “*the* decisive technology” (p. 22), that “computers will transform teaching”

(p.22), and that “data processing provides a model for thought” (p. 23). He devalued this line of thought and put it down to technological determinism.

2.2.2 Physiology and Learning

A change in human thought patterns and consciousness resulting from the influence of technology, however, has been linked to human physiology, specifically brain physiology. One example is Mayer’s (2001) Cognitive Theory of Multimedia Learning (CTML). The crux of his theory “assumes that the human information processing system includes dual channels for visual/pictorial and auditory/verbal processing, that each channel has limited capacity for processing, and that active learning entails carrying out a coordinated set of cognitive processes during learning” (p. 41). The application of Mayer’s theory (in tandem with empirical research) results in a number of principles, such as the Multimedia Principle and the Modality Principle. The Multimedia Principle states that “students learn better from words and pictures than from words alone” (p. 63). The Modality Principle states that “students learn better from animation and narration than from animation and on-screen text; that is, students learn better when words in a multimedia message are presented as spoken text rather than printed text” (p. 134). Mayer’s research showed that learning is achieved most efficiently when multiple media, multiple modes, and multiple literacies are involved in specific ways (words alone, particularly in print form, are not enough). The implication is that learning is limited by the natural structure and function of the brain.

Sweller (2011), too, posited that human learning capacity is limited by our cognitive architecture, which he described via his Cognitive Load Theory (CLT). CLT has its basis in biological evolution where humans have evolved to acquire both primary and secondary knowledge. According to Sweller the processes of acquiring primary knowledge, such as learning to listen and speak, come to us naturally and unconsciously with little effort required on our part. In contrast the processes of acquiring secondary knowledge, such as learning to read and write, come to us only through instruction with a great deal of effort required on our part (both teacher and student) as a result of co-opting our primary cognitive and motor skills for secondary uses. Further, Sweller contended that secondary knowledge is essential for humans to function in society and thus the design of instruction must take into consideration human capacity. He summarized the ideas above as follows:

> The difference between listening/speaking and reading/writing is evolutionary. We have evolved to learn to listen and speak. We are able to learn to read and write, but we have not specifically evolved to read and write. The evolved perceptual motor and cognitive skills we use to read and write did not evolve in relation to reading and writing. The skills evolved for other reasons, but we are able to use these skills to learn to read and write. The vastly different evolutionary history of speaking/listening and reading/writing has both cognitive and educational consequences. (Sweller, 2011, p. 41)

The implication is that the design of instruction should balance primary and secondary knowledge acquisition.

If the structure and function of the brain is a limiting factor in learning, then an understanding of how the brain develops in relation to technological stimulation is of prime importance. In his book *The Brain that Changes Itself*, Doidge (2007) explored the phenomenon of *neuroplasticity*. In neuroplasticity the brain is not hard-wired as previously thought, but is constantly changing as a result of experiences, internal thoughts, and external sensory inputs. Doidge (2008) describes this phenomenon as “the most important change in our understanding of the human brain in 400 years” (2:10). Not only can the brain physically change as a result of external stimuli (often technology-generated stimuli), but this change can result in differences in how individuals think and perceive the world. In their book *iBrain: Surviving the Technological Alternation of the Modern Mind*, Small and Vorgan (2008) suggested that new media and technology alter the way adolescent minds develop. This research suggests that on one hand the brain is resilient, able to change and adapt to given conditions and environments, but on the other hand vulnerable, subject to the limitations and excesses of given conditions and environments. Further, this research suggests that the privileging of one media form over another could impact brain development and thus learning. The implications for learning are many. It could be surmised, for example, that a brain stimulated through reading and writing (traditional literacy practice) will be structurally and functionally different than a brain stimulated through multimodality (new literacy practice), and thus a person

stimulated through reading and writing will think differently than a person stimulated through multimodality.

2.2.3 Learning Models and Theories

Traditional educational practice has primarily focused on knowledge transmission through instructivist methods. In this model, external knowledge is transmitted to the learner (to be internalized) by way of a content expert or authority (the teacher or tutor). From a learner perspective, knowledge is acquired rather than made. An opposite view is that of constructivism. Central to constructivism is the notion that learning is a process of constructing meaning from experience where learners build meaning by making connections between the internal knowledge gained from past experience and the external knowledge gained from current experience. Constructivism is not a static concept and can be viewed from a number of perspectives. In reviewing the literature, Kanuka and Anderson (1999) organized the various perspectives of constructivism along two dimensions: 1) objective versus subjective reality, and 2) social knowledge construction versus individual knowledge construction. The result was four epistemological, constructivist positions: 1) Co-Constructivism (objective/social position), where knowledge is an external reality constructed socially through engagement in conversation; 2) Cognitive Constructivism (objective/individual position), where knowledge is an external reality constructed by individuals as they process information internally; 3) Situated-Constructivism (subjective/social position), where knowledge is subjective (consisting of multiple realities)

constructed socially; and 4) Radical Constructivism (subjective/individual position), where knowledge is subjective (consisting of multiple realities) constructed individually. Kanuka and Anderson concluded that although different these constructivist positions share common principles; namely, that learning should not be teacher or content centred, that prior learning needs to be acknowledged, that different learners need different activities, that communication among learners needs to be fostered, that learners need to engage in real world, relevant activities, and that learners need to create something to demonstrate the acquisition of new knowledge. Applying these principles to the technology-mediated world, Kanuka and Anderson suggested that “context-rich, long-term learning environments with tools that enhance communication and access instructional methods that provide real world examples are required” (p. 18). They argued that success in the technology-mediated education space will depend in part on how well educators engage in informed practice based on their epistemological orientation.

The principles of constructivism imply that there are multiple ways of knowing and multiple ways of thinking. Turkle and Papert (1991) referred to this as *epistemological pluralism*. Further, they suggested that the computer is an ideal tool for engaging in epistemological pluralism for it acts as an instrument in which to observe different styles of thought. In essence, the computer simplifies the abstract making it more concrete. This emphasis on the concrete is central to Harel and Papert’s (1991) take on constructivism, which they referred to as *constructionism*. In constructionism, knowledge is made as learners actively

engage in constructing concrete objects (such as a sand castle or a theory of the universe, according to Harel and Papert). Harel and Papert suggested that within a technology-mediated, educational context, knowledge made through working with concrete materials should be favoured over knowledge made through working with abstract ideas. As such, constructionist models of learning should be valued over instructionist models of learning.

Siemens (2004) proposed a new learning approach as an alternative to constructivism known as *connectivism*. Siemens suggested that the pervasiveness of digital technology calls for a completely new approach to learning theory development. Central to connectivism is the notion that learning occurs as individuals connect information through network nodes external to the individual. According to Siemens, knowledge “needs to be connected with the right people in the right context in order to be classified as learning” (p. 4). Further, Siemens suggested that “Our ability to learn what we need for tomorrow is more important than what we know today” (p. 5). Connectivism implies that learning is an ongoing process dependent on a person’s personal networks. In a digital age, the predominant networks are mediated through the Internet and are socially situated. As these networks grow, learning is amplified. From a connectivist perspective, learning how to learn is much more important than learning factual information. Further, becoming literate in creating, maintaining, and using social networks is critical to learning in a digital world. With connectivism Siemens attempted to move beyond “epistemological traditions”

toward the exploration of new ways of knowing and is an attempt to reify thinking with respect to learning in a digital age.

Bates (2011) suggested a distinction needs to be made between epistemologies and learning theories. Whereas a learning theory (e.g., behaviourism) describes how we come to know what we know, an epistemology (e.g., objectivism) “describes the basis on which we know or believe something to be true” (p. 30). In essence, a learning theory outlines the processes (e.g., cognitive, physiological, behavioural) through which we acquire and construct knowledge, while an epistemology outlines the beliefs (e.g., logic, interpretation, evidence based) through which we posit truth. Bates outlined three epistemologies of import to web-based learning: namely, 1) objectivism, 2) constructivism, and 3) connectivism. (Of note is that Bates categorized constructivism and connectivism as epistemologies.) According to Bates, “An objectivist view of knowledge is that truth exists outside the human mind” (p. 30), a constructivist view is that “all knowledge is relative, personal, and dynamic” (p. 31), and “A connectivist view of knowledge is that the nature of knowledge is radically transformed by the technology of the Internet” (p. 31).

Scardamalia and Bereiter (2006) suggested that education’s focus on building better models or methods for learning may in fact be missing the point. Instead, they proposed a fundamental shift in educational practice towards knowledge building. At its core, knowledge building is about advancing ideas. The advancement of ideas is a community endeavour achieved through

collaborative problem solving. Deeper understanding and the creation of new knowledge is gained when existing knowledge is used rather than learned. Scardamalia (2004) posited that “in broad terms, learning is about cultural reproduction, whereas knowledge building is about increasing our cultural wealth” (0:01). In this sense, Scardamalia and Bereiter (2006) suggested educational environments should be structured to allow learners to engage in knowledge *of* activities rather than knowledge *about* activities. Knowledge *of* involves both declarative and procedural knowledge. Knowledge *about* only involves declarative knowledge. Further, they suggest the affordances of digital technologies allow for the creation of knowledge building environments. For them an ideal knowledge building technology would allow learners to engage with *how* and *why* questions (i.e., knowledge *of,* deep inquiry) rather than questions of *what* and *when* (knowledge *about,* shallow inquiry).

Learning models and theories have primarily focused on the cognitive aspects of learning. However, there are other aspects. Bloom’s Taxonomy, for example, outlines three learning domains: cognitive, affective, and psychomotor, which can be simplified to represent knowledge, attitudes, and skills respectively. Within each domain there are various levels of achievement. Bloom’s Taxonomy is the culmination of the work of many theorists (Bloom, Engelhart, Furst, Hill, & Krathwohl, 1956; Krathwohl, Bloom, & Masia, 1964; Simpson, 1966) with revisions continuing into the 21st Century (Krathwohl, 2002). Gardner (1983; 1991) suggested that humans possess a range of intelligences (musical, bodily-kinesthetic, logical-mathematical, linguistic, spatial, interpersonal, intrapersonal,

and naturalistic) which he described in his Multiple Intelligences (MI) theory. He asserted that all humans, due to their biological and physiological make up, possess each intelligence (provided there are no underlying or acquired deficiencies), but that we each have a unique way in which we apply our intelligences to acquire knowledge, solve problems, and interact with the world. Gardner suggested that “people do learn, represent, and utilize knowledge in many different ways” and that “these differences challenge an educational system that assumes that everyone can learn the same materials in the same way” (1991, p. 12). Bloom’s Taxonomy and Gardner’s Multiple Intelligence theory imply that the design of curriculum should take into consideration the whole person and nurture ability in all learning domains and intelligences.

There are many models and theories of learning and there appears to be an appetite for creating new models, new theories, and new approaches to learning. Many of these are predicated on the affordances of digital technologies. The result has been a call to shift away from traditional education practices to new educational practices in order to fully educate the learners of today and, therefore, fully realize their potential.

2.2.4 Technology and the Education System

As described earlier in this chapter, the need for change in the education system is a common theme. The rise and diffusion of digital technologies in society and their potential impact on teaching and learning has resulted in a further call for change in the education system. This call has received more

attention of late, but it is not new. Innis (1951), for example, suggested that technology has had a profound impact on culture and society. Innis's main premise was that the dominant communications media of the day are inherently integrated into the fabric of society and its institutions, and are usurped by those in power to entrench their values and cultural orientation. He referred to this as the *bias of communication* and suggested that this bias determines the character of a civilization. Innis was particularly concerned with how the bias of communication affected the education system. In the essay "Adult Education and Universities" (Appendix II in *The Bias of Communication,* 1951), Innis described his philosophy of education: namely, "Education is the basis of the state and its ultimate aim and essence is the training of character" (p. 203). However, Innis lamented that "universities are influenced by mechanization of education, and hampered by tradition" (p. 208). For Innis, in an ideal educational system "it will be necessary to make certain that every device has been exhausted in the primary schools or rural and urban areas, the high schools, the colleges and the universities to detect and to encourage every sign of intellectual capacity" (p. 207). However, in reality, he posited that the education system has become too mechanized and too conservative resulting in prescriptive curricula and regimented pedagogy. Further, it has adopted the written word and print-based technology as its dominant communications media and, therefore, is inherently biased towards these forms of communication. The result is that educational institutions have perpetuated themselves through text-based communication. Harrison is quoted by Innis in the essay "Adult Education and Universities" and

his quote summarized this tension in education. Harrison wrote: “But I do see all the injury to the higher literature inflicted by the torrential multiplication of printed stuff coinciding with the legal enforcement of mechanical reading – absurdly misnamed *Education*” (as quoted in Innis, 1951, p. 205). The implication is that the scope of the education system has become limited and not open to change.

The advent of new media has furthered the call for change in the education system. McLuhan (1977), for example, suggested that “the future of education requires that we pay much attention to the media we are employing” (8:54). Using the example of the introduction of television in the classroom McLuhan contended that “It [TV] would simply alter the entire pattern and procedures of the classroom and create an altogether new educational form” (Bessai & Becker, 1999, 19:45). Franklin (1999) saw technology as deeply rooted in cultural activities, and having a profound impact on social systems including education. She contended that “The hope that the new communications technologies, particularly film and radio, television, and computers would broaden and deepen the scope of education, just as writing and printing had done in the past, has been largely realized.” (p. 169). However, she lamented that in today’s world prescriptive technologies dominate, leading to a production model of education where institutions create products to be consumed by learners, who in turn become molded to fit within the dominant economic and political paradigm of the day. She was concerned that the production model eroded implicit learning; that is the “by the way” informal learning that occurs as groups work together in social settings. As an alternative, Franklin described a

growth model of education, one based on organic, holistic practices (and holistic technologies) where education provides an environment for social interaction allowing learners to create and learn together. By holistic technologies, Franklin meant those technologies in which the user has control. She posited that “the web of technology can indeed be woven differently” (p. 52). Like Innis and McLuhan, Franklin viewed technology as pervasive, something that could not be opted-out of, and engrained in the social fabric. Further, like Innis and McLuhan, Franklin perceived a struggle between the ideal and the real with respect to education. She voiced her displeasure for prescriptive use of technology for education and imagined a better education system.

Franklin’s preferred “growth model of education” is a theme that has been taken up by others, albeit in slightly different forms. Brown’s (2000) “learning ecology” is an example. Robinson (2010) proposed a move from an industrial model of education to an agricultural model, one in which the role of education is to create the conditions for learners to flourish. Similarly, Mitra (2013) proposed Self Organized Learning Environments (SOLE) which combine broadband, collaboration, and encouragement to create environments which let learning happen rather than make learning happen. Each of these authors have advocated for change, specifically to a more customized and personalized educational experience which places the learner at the centre of the process. Further, each of these authors saw the advent of new media (particularly the Web) as an opportunity to revolutionize the education system. The Web as a medium is relatively new. Our engagement with it is still in its infancy and our first

foray into its intricacies has been (as Brown suggested) to mimic what has come before: to fit the old in the new. This tendency represents a transitional stage, one that is ripe with uncertainty.

It appears that there exists a disconnect between the education system as it is structured today and the needs and expectations of learners. Prensky (2001) suggested that the inculcation of digital technology has resulted in fundamental change, so much so that it can be called a “singularity” from which there is no turning back. Further, he posited that “Our students have changed radically. Today’s students are no longer the people our educational system was designed to teach” (p. 1). The implication is that we are in a transitional stage in education. Further, the driving force behind the transition is technology, primarily digital technology. Yet to be determined is the extent to which this transition will be revolutionary. Nonetheless, there is an opportunity for educators to rethink how teaching and learning is done, and to examine more deeply the design, development, and delivery of educational experiences.

2.3 Summary

Within this body of literature the prevailing thought seems to focus around 1) learning and all that it entails (e.g., the learner, the education system, cognition, theories of learning, epistemology, formal and informal learning), and 2) the digital world and its affordances (e.g., multimodality, multimedia, multiple literacies). Of interest is the interplay between the two, specifically their

interdependence. A consequence of this interplay appears to be pervasive change. As such it is imperative that a deeper understanding be gained so that new educational methods and practices can be brought to bear to engage learners and improve learning. Moreover, it is through research that such an understanding can be achieved. One example is a study conducted by Owston, Wideman, Ronda, and Brown (2009) which investigated whether the incorporation of game development into the curriculum would improve student engagement and aid in the development of traditional and digital literacy skills. They found, among other things, that elementary students participating in computer game development performed significantly better in logical sentence construction. Another example is a project conducted by Lotherington and Chow (2006) which explored the use of multiliteracies and digital tools to teach narrative structure to elementary students. They found that students participating in the project "interlaced old and new literacies… [and] took ownership of their literacy acquisition" (p. 251), and in the process helped the project leads expand pedagogical options in the teaching of literacy.

Yowell (2009) argues "in a time of dramatic change, we have to be supporting qualitative and descriptive research and data in order to be developing new categories and paradigms and theories. We absolutely have to" (9:56). The purpose of my study was to take up this call, to pull from the disparate literature core ideas, to gather appropriate data, and interpret the two in order to develop (or, perhaps, describe) new categories/paradigms/theories related to new epistemologies in a digital age.

In the next chapter I review the methodology used in this study.

CHAPTER THREE: METHODOLOGY

The purpose of this research was to examine how young adult learners acquire and construct knowledge in a digital age in a post-secondary context. In order to fully explore this line of inquiry, a mixed methods approach was used. In this chapter I outline the process and rationale behind the mixed methods choice, the research design of the study, as well as the data collection and analysis methods utilized.

3.1 Choice of Methodology and Rationale

A researcher looks at many factors when choosing a research methodology. Creswell (2009) suggested the selection of a research methodology involves making decisions informed by (paraphrased): the researcher's worldview and experience, the procedures and methods planned, the nature of the research problem, and the audience under study.

Using Creswell's list as a guide, I first looked at the nature and scope of my research idea and my research questions. The research questions were: 1) What digital devices and technologies/tools do young adult learners use for learning and why? 2) How is the digital age (particularly the widespread use of the Internet) impacting knowledge acquisition and construction in young adult learners? 3) Given the above, how should post-secondary educational curricula and practice be designed or re-designed to support young adult learners? The "how" questions (research questions 2 and 3) were broad in scope and required

more general, narrative answers indicative of a qualitative study, while the “what” question (research question 1) was narrow in scope and required more specific, numeric answers indicative of a quantitative study. The “how” questions lent themselves to more open-ended questioning via focus group and interviewing techniques, which are associated with the qualitative approach, while the “what” question lent itself to more close-ended questioning via surveying techniques, which are associated with the quantitative approach. Thus, the nature of the research questions dictated that both qualitative and quantitative data would be collected and that there would be a need to use both qualitative and quantitative methods in the collection of the data. The intent was that the data and methods would complement each other and allow me to explore my research questions in more detail. Creswell (2012) posited that “In general, you conduct a mixed methods study when you have both quantitative and qualitative data and both types of data, together, provide a better understanding of your research problem than either type by itself” (p. 535). In light of the above, I decided to further investigate a mixed methods approach to see if it would be suitable for my needs.

Next, I looked at myself as the researcher to determine if a mixed methods approach would be consistent with my worldview. I have come to consider myself a pragmatist. Pragmatists are concerned with the interplay between knowledge and action: Knowledge informs action and action leads to more knowledge (Goldkuhl, 2008). Pragmatists are inherently practical. They believe in the application of knowledge in terms of “what works” within a given context or set of

contexts (Creswell, 2009; Goldkuhl, 2004). One of the outcomes I wanted from my study was to speculate on and provide recommendations as to how post-secondary curricula should be designed or re-designed in the Ontario college system based on my findings. This type of output is consistent with the philosophical basis of pragmatism. As such, I felt justified in utilizing a pragmatic stance, but I needed to determine if pragmatism fit well with a mixed methodology approach. Morgan (2007) argued that the pragmatic approach supports mixed methods research and he advocated for its use as an alternative, integrated research paradigm. He wrote:

> The great strength of this pragmatic approach to social science research methodology is its emphasis on the connection between epistemological concerns about the nature of the knowledge that we produce and technical concerns about the methods that we use to generate that knowledge. This moves beyond technical questions about mixing or combining methods and puts us in a position to argue for a properly *integrated methodology* for the social sciences. (p. 73)

Johnson and Onwuegbuzie (2004) argued that pragmatism is an attractive partner for mixed methods research. They posited that pragmatism “offers a method for selecting methodological mixes that can help researchers better answer many of their research questions” (p. 17). It appeared, then, that a mixed methods approach would suit my needs.

Next, I looked at the overarching purpose of my study and the essence of what I wanted to accomplish. I had some preconceived ideas as to what I might find based on my experience and literature review; however, there was much more that needed to be discovered and/or affirmed and/or contradicted. This suggested that I needed a methodology that would help develop a more complete picture of what was going on as well as expand on what was known. Tashakkori and Teddlie (2008) outlined several reasons for utilizing mixed methods. Among them were “completeness” and “expansion”. Johnson and Onwuegbuzie (2004), too, suggested that mixed methods research “is an expansive and creative form of research, not a limiting form of research” (p. 17). These reasons and description fit well with my purpose and further validated that a mixed methods approach would be appropriate for my research study.

Having made the decision to use mixed methods, I reviewed the literature in more depth to ensure I had a good understanding of the advantages and disadvantages of mixed methods research. I wanted to be mindful of not only the benefits of my chosen methodology, but also its limitations. Lund (2012) suggested four general advantages of utilizing mixed methods: Namely, 1) “Mixed methods research is more able to answer complex research questions than qualitative or quantitative research in isolation,” 2) “Qualitative and quantitative results… may be complementary to each other in mixed methods research,” 3) “Mixed methods research may provide more valid inferences,” and 4) “In mixed methods research, qualitative and quantitative results may be divergent or contradictory, which can lead to extra reflection, revised hypothesis,

and further research" (p. 157). Johnson and Onwuegbuzie (2004) listed several weaknesses of mixed methods research. These weaknesses were both practical, in terms of the logistics (expense, time) to carry out a mixed methods study, as well as conceptual, in terms of the researcher's ability to fully understand and carry out the techniques involved in a combined qualitative and quantitative (mixed) research study. Given that I had some control over the weaknesses described above (i.e., I could better inform myself about the appropriate techniques involved), I felt confident that my chosen methodology would reflect the nature of my study and allow me to more accurately answer my research questions.

3.2 Research Design

Johnson and Onwuegbuzie (2004) defined mixed methods research as "the class of research where the researcher mixes or combines quantitative and qualitative research techniques, methods, approaches, concepts or language into a single study" (p. 17). Further, Johnson and Onwuegbuzie (2004) suggested: "A tenet of mixed methods research is that researchers should mindfully create designs that effectively answer their research questions" (p. 20). Based on this definition and suggestion, the following research design was conceived and implemented.

A convergent parallel design was used as the overarching framework for the study. Creswell (2012) proposed that "the purpose of a convergent (or

parallel or concurrent) mixed methods design is to simultaneously collect both quantitative and qualitative data, merge the data, and use the results to understand the research problem" (p. 540). Convergent parallel design is a one-phase approach in which the data are collected, given equal priority, analyzed separately, then integrated and interpreted. Although convergent parallel design is considered a one-phase approach, carrying out such a design in my research study required four stages: preparation, data collection, data analysis, and interpretation.

3.2.1 Preparation

Before data could be collected a number of preliminary steps needed to be taken. Primary among these was to increase my own knowledge of research design. Mixed methods researchers must have a firm understanding of qualitative and quantitative research techniques and approaches. As such, it was incumbent on me as researcher to expand my knowledge of qualitative and quantitative methods. During my graduate coursework I made a point of taking separate qualitative and quantitative research methods courses. This gave me the grounding I needed in the methods utilized in my study (surveying, focus group interviewing, and one-on-one interviewing, which span the qualitative and quantitative paradigms) as well as the processes involved.

3.2.1.1 Setting and Access

Since the focus of my research was young adult learners and how they acquire and construct knowledge in a digital world, I needed participants who fit

the age demographic I was looking for (attending higher education and under 24 years of age) and who had been exposed to digital learning technologies not only in their previous learning environments but in their current learning environment as well (i.e., they had grown up with digital learning technologies and were continuing to use said technologies in their learning). As an educator in the Ontario community college system, I had convenient access to participants (i.e., students). A large urban community college in Ontario was chosen as the setting of the study. At the time data were collected there were over 20,000 full-time students enrolled in a diverse mix of degree, diploma, and certificate programs at the college, and the student body comprised a diverse multi-cultural/racial/ethnic/linguistic community.

Although there are many advantages to using familiar surroundings as the setting for a research study (e.g., ease of access to participants), there are some disadvantages as well. For example, in order to eliminate coercion or bias I needed to ensure that I did not have any prior relationship with the participants (e.g., had not taught them in the past), and I needed to ensure that I had as diverse a representative sample of participants as possible (e.g., the participants were not all from a single program of study). As such, I undertook the following process.

I approached faculty in the English and Liberal Studies department at the college to determine if they would be willing to allow me to invite their students to be a part of the research study, and allow me to use some of their class time to

conduct parts of the research. Three faculty members agreed to participate. I chose faculty from the English and Liberal Studies department at the main college campus for a couple of reasons: 1) I did not teach in this department, nor at the time did I teach students at the main college campus, and therefore the likelihood that I would know any of the potential student participants or have had a prior professional relationship with them was small; and 2) the English and Liberal Studies department at the college offers general education courses to all programs at the main campus, which meant that the potential student participants enrolled in the courses taught by the English and Liberal Studies faculty would come from a wide range of programs and disciplines. I thought this would give me a more representative sample of participants.

The three faculty participants were known to me and represented a sample of convenience. Each was a full-time faculty member with several years of teaching experience using digital technologies. The faculty members discussed with me their ideas of technology enhanced learning and showed me the digital materials they planned to use in their courses. This allowed me to get a sense of the extent to which they were using digital technologies/tools in their teaching and their opinions about the nature of their students, and about how digital technologies/tools have impacted their teaching and learning. Through this process I was able to satisfy myself that each faculty member was exposing her students to an appropriate range of digital technologies/tools. This ensured that the student participants would understand the questions asked of them in the survey, focus groups, and/or one-on-one interviews. Further, I was able to satisfy

myself that each faculty member was neither evangelical about the use of digital technology for teaching and learning nor opposed to its use. This reduced any inherent bias about the use of digital learning technologies/tools that may have been transferred from teacher to student prior to administering the research instruments.

3.2.1.3 Instruments

I prepared three research instruments for this study to complement the methods employed. One was a survey (Appendix A) which was created to provide some demographic data as well as help answer (primarily) the first research question (i.e., What digital devices and technologies/tools do young adult learners use for learning and why?). The survey consisted of 17 questions. The first five questions were designed to gather key demographic and qualifying data (e.g., age, gender, perceived level of English proficiency). Questions six through 16 were designed to gather data about the types of digital devices participants owned and used, the length and amount of time participants used the Internet for formal learning, and the types of Internet activities participants preferred to engage in. These questions were informed by my own experience as an educator in the Ontario college system and by the *Educause Center for Applied Research (ECAR) National Study of Undergraduate Students and Information Technology*. This survey has been conducted annually since 2004. It is a comprehensive survey that explores trends and specifics related to student preferences and use of information technologies in higher education settings.

Question 17 was designed to gather data about perceived mental effort in performing certain Internet-related learning tasks. This question was informed by a cognitive load study conducted by Paas (1992). For this question I employed the 9-point mental-effort rating scale used by Paas.

The second and third instruments were question guides for the focus group and one-on-one interview sessions (Appendices B and C, respectively). The focus group interview guide and the student interview guide each consisted of 14 questions. These questions were informed by my review of the literature, my experience, and by the qualitative research questions in *The ECAR Study of Undergraduate Students and Information Technology, 2010* (Smith & Borreson Caruso, 2010), and were designed to solicit more in-depth data related to my research questions, specifically the types of digital devices and technologies students use, their preferred ways of acquiring and constructing knowledge, their literacy practices, and their learning environment and teaching practice preferences.

3.2.1.4 Ethical Considerations

An ethical review was conducted following York University's guidelines for conducting research in educational settings. Ethics applications were submitted to both York University's and the college's Ethics Review Boards in May 2011. Approval was granted from York University on July 8, 2011 (Certificate #STU-2011-080) and from the college on June 10, 2011.

Willing participants signed an Informed Consent Form (Appendix D) after being provided with details about the study and an explanation as to the level of commitment required.

3.2.1.5 Pilot Testing

Prior to conducting the main study, I tested the research instruments using pilot groups of participants. During my graduate qualitative research methods course I developed the core questions I would use in one-on-one interviewing. I also conducted a pilot study using these questions with two young adults fitting the criteria of the study. (Note: course-based ethics review approval was granted by York University for this pilot and the participants were students not attending the institution in which I conducted the study.) This gave me an opportunity to hone my interview skills, data collection and analysis techniques, and test the applicability of the interview questions. In late July 2011 I tested the survey instrument with a group of 10 willing students in a general education class at the institution in which the study was conducted. (Note: after ethics approval was granted from both York University and the institution where the study was conducted. See above.) I made a point of selecting a class of general education students that would be similar to the students selected for the main study, but that would be located at a different campus. This ensured that the students participating in the pilot would not also be potential candidates for the main study. The purpose of the pilot test was to test the face validity of the survey instrument and the timing of the survey. After the students completed the survey I conducted

a focus group with the students to get their opinion as to the nature of the questions. I took notes (on paper) of our discussion. It was determined that the survey timing was indeed correct (i.e., would take 30 minutes or less to complete) and that the questions were appropriate and understandable. Three suggestions were made by the group. One was to alter the formatting of one question to make it more readable. This suggestion was accepted and the formatting of the one question, which had become misaligned during the conversion of the survey to PDF format, was changed. The other suggestions involved providing more explanation about the ranking and percentage questions, which needed to add up to 100%, and more clarification about the meaning of *mental effort*. These suggestions were accepted and participants in the main study were provided with a brief explanation about the ranking and percentage questions and the meaning of mental effort prior to taking the survey.

3.2.2 Data Collection

Data collection took place over the four months of the Fall 2011 academic term. Three methods were employed: 1) surveying, 2) focus group interviewing, and 3) one-on-one interviewing.

3.2.2.1 Participants

The study participants came from nine class sections taught by the three faculty members (identified as Faculty A, B, and C) who allowed me to approach their students. These nine class sections represented the sampling frame. At the beginning of the Fall 2011 term I visited the nine class sections to explain the

research and invited students to participate. Two of the class sections (a psychology class) were taught by Faculty A, three class sections (a literature class) were taught by Faculty B, and four class sections (a humanities class) were taught by Faculty C. Each class was a general education option offered at the college. General education options are offered for three hours per week for 14 weeks. The number of potential participants in each class section ranged from 20-35 students.

As the study was concerned with the impact of digital technologies and tools on the learning processes, development, and application of new literacies in young adult learners, a number of criteria were set for potential participants. First, potential student participants should be attending college (i.e., higher education) and be less than 24 years of age. With the growth and proliferation of the Internet in education starting in the mid to late 1990s and continuing today, students in this age range are more likely to have grown up using the Internet in education in increasing amounts, with a first experience using the Internet in formal educational settings (and the corresponding instructional technology tools) more likely to occur in elementary or middle school. Students older than 24 may not have been exposed to digital media technologies until later in high school or upon entering college, which meant they would not have a history of technology use for learning, and , perhaps, would not be able to fully answer the questions posed. Second, potential participants should be proficient in the English language. Student participants not proficient in the English language may not fully understand the questions posed in the survey, focus groups, and interviews,

which may skew some of the responses to the questions asked, particularly those related to traditional literacy, such as preference and comfort level reading and writing in the English language. Third, potential student participants should be involved in learning environments that are using digital technologies and tools. Potential participants, therefore, would be more likely to be able to understand the questions (related to specific instructional technology-based tools, terminology, and activities) posed in the survey, focus groups, and interviews. The process and prior selection of the nine class sections outlined in the *Preparation* section ensured the third criterion would be met.

The sampling techniques outlined above represent a sampling strategy that includes purposive, convenience, volunteer, and criterion sampling. Teddlie and Yu (2007) suggested that the sampling strategy employed by mixed methods researchers should be creative, flexible, and logical, and ultimately help the researcher gather the data required to answer the research questions. The logical basis of the techniques employed in this research study provided a representative sample from which I could gather credible data and answer my research questions.

3.2.2.2 Survey

Over a period of three weeks late in September and early in October, 2011, I revisited the nine class sections described above and administered the survey instrument (see Appendix A) to those students willing to participate. The survey was the primary instrument used to gather quantitative data, consisting

mostly of close-ended questions (although there were some qualitative questions included). The purpose of the survey was to gather a breadth of data.

The faculty members teaching the nine class sections provided enough time at the end of each class for me to explain the research and describe expectations of participation. Seventy-eight students agreed to participate and signed informed consent forms. The smallest number of participants per class section was three. The largest number of participants per class section was 16. In each class section I provided brief instructions to willing participants and clarification related to some of the questions (Questions 13, 14, 15, and 17) in the survey identified by the pilot group. I then handed out the paper-based survey and collected the surveys when the participants had finished.

3.2.2.3 Focus Groups

During late October, November, and early December, 2011, I revisited six of the nine class sections described above and conducted six focus groups (one per class section). The six class sections included students who identified on their consent form that they would like to participate in a focus group. My original plan was to conduct the focus groups in the middle of the semester. In four instances I was able to do this conducting Focus Group 1 on October 31, 2011, Focus Groups 2 and 3 on November 1, 2011, and Focus Group 4 on November 5, 2011. However, due to scheduling and teacher/student workload issues, Focus Groups 5 and 6 were not able to be conducted until November 22, 2011, and December 5, 2011, respectively.

The focus groups were designed to gather qualitative data utilizing open-ended questioning. The purpose of the focus groups was to obtain a greater depth of information.

The faculty members teaching the six class sections provided enough time at the end of each class for me to conduct the focus groups. Twenty-one students agreed to participate. These students were a sub-set of the students who completed the survey. The smallest number of participants per focus group was two (in two instances). The largest number of participants per class section was seven. In each focus group I followed the Participant Focus Group Questions Guide I developed (see Appendix B). The shortest focus group was 24 minutes; the longest 46 minutes, with an average length of time of 37 minutes per focus group. The focus groups were audio recorded using a hand-help digital audio recorder. I also took notes (on paper) during the focus group sessions.

3.2.2.4 One-on-one Interviews

During mid-November 2011, I revisited the nine class sections described above and invited those students who had identified on their consent forms that they would like to be interviewed to arrange a time with me for an interview. Ten students agreed to participate and arranged a time with me (in the near future) to be interviewed. These students were a sub-set of the students who completed the survey. The interviews took place in my office at the college. The first interview was conducted on November 22, 2011; the last interview was conducted on December 8, 2011. In each interview I followed the Participant

Interview Questions Guide I developed (see Appendix C). The shortest interview was 19 minutes; the longest 51 minutes, with an average length of time of 33 minutes per interview. The interviews were audio recorded using a hand-help digital audio recorder. I also took notes (on paper) during the interview sessions.

The interviews were designed to gather qualitative data utilizing open-ended questioning. The purpose of the interviews was to obtain a greater depth of information. The timing of the interviews (i.e., at the end of the semester) was chosen so that the students would perhaps be better able to reflect on their experience using digital technologies and tools after experiencing at least one semester in higher education.

3.2.3 Data Analysis

Data analysis began in January 2012 after all data had been collected. In keeping with Convergent Parallel Design the data from the survey, focus groups, and interviews were analyzed separately and then brought together for comparison. (Note: in Convergent Parallel Design [strict theoretical definition] the qualitative and quantitative data are collected simultaneously and then analyzed. In practice, however, in this study the data were collected from the various qualitative and quantitative methods at approximately one month intervals due to the logistics of data gathering [described in the previous section]. Nonetheless, as described below, the data were analyzed separately, then integrated and interpreted in relation to the research questions, which is in keeping with Convergent Parallel Design.)

3.2.3.1 Quantitative Data

Quantitative data were extracted from the survey. The survey data consisted mostly of numeric data, although some textual data were collected as well. Raw data from the paper survey were entered into an Excel spreadsheet. The criteria outlined in the *Participants* section were then applied. The data from 15 participants (of the 78 participants who completed the survey) were removed because the participants were over the age of 24. All data from the remaining 63 participants were included in the analysis as all participants were deemed to satisfy the remaining criteria; that is, they were proficient in the English language (see section 4.1.1 for an explanation of the criteria used to determine English proficiency), and were using digital instructional technologies and tools in their current learning environment.

The data were then reviewed to identify missing values. Missing values refer to unanswered questions resulting in no available data for certain questions. There were five missing values in Question 8 (participants were to identify on average how many hours per day they use the Internet). There was one missing value from one of the eight activities outlined in Question 17 (the participant was to rate his or her perceived mental effort performing a listening activity on the Internet). There were no other missing values. Missing values were dealt with using the *mean of nearby points* method in which replacement values are entered in place of missing values using the mean value of similar cases. George and Mallery (2012) suggested that up to 15% of data may be replaced using this method without compromising outcomes. For Question 8 the five replaced values

represented approximately 8% of the data, while for Question 17 the one replaced value represented approximately 1.6% of the data.

The data were then reviewed for accuracy. Of primary concern were Questions 13, 14, and 15 where participants were asked to indicate their percent engagement doing certain Internet activities. In eight cases (approximately 13% of cases) the percentages did not add up to 100%. A proportion method was used to adjust the data in these cases. For example, one participant when asked to identify his or her percent engagement in consuming and producing Internet content entered 70% and 50%, respectively. The data were adjusted to 58% and 42%, respectively. No other accuracy-related adjustments (outside the eight cases) were made to the data.

The data were then numerically coded in preparation for importation into SPSS for statistical analysis. Questions soliciting nominal or interval data were given appropriate numerical equivalents. For example, questions requiring a Yes or No answer, were coded with a 1 (Yes) or 0 (No). Questions requiring participants to select from a range of values (e.g., the Grade level a participant first started using the Internet for formal learning) were coded similarly to the following: kindergarten (1), Grade One and Two (2), Grade Three and Four (3), …, College (8). Open ended questions soliciting comments (i.e., textual data) were removed for the purposes of the statistical analysis (but retained for the purposes of the qualitative analysis). Descriptive, correlation, and analysis of variance procedures were performed on the data using SPSS and Excel. These

procedures were chosen based on the advice I received from two meetings I had with a representative of the Institute for Social Research at York University.

3.2.3.2 Qualitative Data

Qualitative data were extracted from the focus groups and the interviews. A small amount of qualitative data (textual) was also extracted from the survey (Questions 12 and 16).

The focus groups were digitally recorded (audio only). Summary notes were created from the recordings, entered into Word, and saved as digital files (one file per focus group). Two participants in the focus groups were over the age of 24. I decided to allow these students to participate in the focus groups because they could, perhaps, provide a varied perspective, as well as stimulate and expand the ideas of others (McMillan & Schumacher, 1993). However, the data these two students provided were removed from the summary notes. As a result, data from 19 focus group participants fitting the required criteria were used in the analysis.

The interviews were digitally recorded (audio only). Transcripts were created from the recordings, entered into Word, and saved as digital files (one file per interview). During the note taking and transcription processes, key text passages were highlighted (in Word). Yellow highlighting was used to indicate important passages deemed relevant to the research questions. Red highlighting was used to indicate critically important passages deemed relevant to the research questions. Short notes were added after each highlighted passage to

reflect my initial thinking about the data in relation to the research questions. These notes were highlighted in green. The highlighted summary notes and transcripts were then printed.

The printed summary notes and transcripts were read and re-read several times. Initial codes were entered manually on the printouts on a line by line basis. Initial codes were also derived from survey Questions 12 and 16. The initial codes were then reviewed and a process of more selective, focused coding took place. Similar codes were grouped together; codes deemed irrelevant were discarded. The final focused codes represented the categories of the qualitative data. These categories were then organized in an outline diagram to establish linkages in and among the categories. The process described above was informed by that described by Lofland, Snow, Anderson and Lofland (2006). The outline diagram is shown in Chapter Four (section 4.5) as it contains what I would consider key findings of my study and thus is better represented in that chapter.

3.2.4 Interpretation

Tashakkori and Teddlie (2008) suggested that making interpretations to answer the research questions is the most important stage of a research project. Further, they suggest that “meta-inferences” can be drawn from the information gathered through the quantitative and qualitative means. They defined a meta-inference as “an overall conclusion, explanation, or understanding developed through the integration of the inferences obtained from the qualitative and quantitative strands of a mixed methods study” (p. 101). The interpretation stage

of this study began by bringing together and integrating all the pieces of the data analysis (i.e., the statistical analyses, and the coding and categorizing processes). The findings of the integration are discussed in Chapter Four. The inferences drawn from these findings are discussed in Chapter Five.

3.3 Credibility and Transferability

Ultimately the goal of any research endeavour is to answer the research questions by gathering rich data in a systematic way and by making appropriate inferences based on the data. Credibility is at the core of this process. McMillan and Schumacher (1993) suggested that “Credibility refers to the extent to which the results approximate reality and are judged to be trustworthy and reasonable” (p. 157). Tashakkori and Teddlie (2008) suggested that “Credibility is based on the degree of fit between the participants’ realities and the investigator’s constructions and representations of these realities” (p. 109). The former definition of credibility is written from a quantitative context, while the latter is written from a qualitative context. As mixed methods research involves to some extent both quantitative and qualitative elements, it is in incumbent on the researcher to do one’s best to address the issue of credibility.

In this study I have attempted to enhance credibility by following a systematic, logical method in the research design, from the choice of methodology, through the preparation, data collection, and data analysis stages. Mixed methods research, by nature and definition, involves the combination of

multiple, complementary quantitative and qualitative techniques and approaches, which lends itself to triangulation. Neuman (1997) posited that triangulation involves the use of different types of data collection techniques in order to improve confidence in what is being measured, which leads to greater validity. The implication is that triangulation results in greater credibility, not only in the data collected, but also in the inferences drawn from the data. A previous iteration of the Convergent Parallel Design approach used in this study was, in fact, referred to as the Concurrent Triangulation Strategy (Creswell, 2009).

Another measure of credibility is how well the findings can be generalized to other contexts. McMillan and Schumacher (1993) defined generalizability as the "extent to which the findings of one study can be used as knowledge about other populations and situations – that is, to predict" (p. 16-17). From a global perspective, generalizability is difficult to achieve in education because of the wide variety of educational settings and contexts found worldwide. The focus of this study was on young adult learners in the Ontario college system. The findings and inferences are directed to this narrowed context. As a result, rather than achieving generalizability, the focus was on achieving transferability. Teddlie and Yu (2007) suggested that in some mixed methods strategies the focus is on external validity (i.e., generalizability), while in others the focus is on transferability. Transferability refers to the extent readers of research infer that the situation and findings of a study can be applied to their own situations (Palmquist et al., 2005). My goal was for the findings of this study to be

transferred within the context of the Ontario College system or similar higher education contexts.

3.4 Summary

In this chapter the process and rationale behind the choice of a mixed methods research methodology for this study was explained, the four stage research design (preparation, data collection, data analysis, interpretation) was described, and issues of credibility and transferability were discussed. In the next chapter the research findings are described.

CHAPTER FOUR: FINDINGS

In keeping with Convergent Parallel Design, quantitative and qualitative data were gathered and analyzed separately. In this chapter I present the findings of the study, beginning with an overview of the participants and the quantitative and qualitative instrument types followed by a description of the findings by research question, and ending with the main themes identified in the study.

4.1 Overview of Participants and Quantitative and Qualitative Instruments

The participants in this study were students enrolled in English and Liberal Studies elective courses at an Ontario community college. The primary instrument used to gather quantitative data was the survey (Appendix A). Sixty-three participants meeting the age and English proficiency criteria completed the survey. Qualitative data were collected via focus groups and interviews (see focus group and interview question guides in Appendices B and C, respectively). Nineteen students meeting the age and English proficiency criteria participated in the focus groups. Ten students meeting the age and English proficiency criteria participated in the interviews. The focus group and interview participants were subsets of the survey participants.

4.1.1 Demographic and Qualifying Data

Demographic and qualifying data were collected via the survey. Questions 1 through 5 were designed to gather demographic data and to identify the participants who met the predetermined criteria and thus qualified for the study.

Of the 63 participants who completed the survey, 33 were male and 30 were female, representing a roughly equal gender distribution.

To determine if participants qualified for the study, the following criteria were used: 1) participants should be under the age of 24 (and thus be more likely to have grown up using digital media technologies), and 2) participants should be proficient in the English language (and thus able to provide accurate answers to the questions posed in the survey, focus groups, and interviews). (Note: participants were deemed to be proficient in the English language if they had been working or learning in English for seven to eight years or more, or if they rated themselves six or higher on a nine point English proficiency scale where “1” was considered “not proficient” and “9” was considered “very proficient”.)

The age distribution of participants in the study is provided in Figure 1. The modal value was in the 20 to 21 age group. No participants were 17 years of age or under.

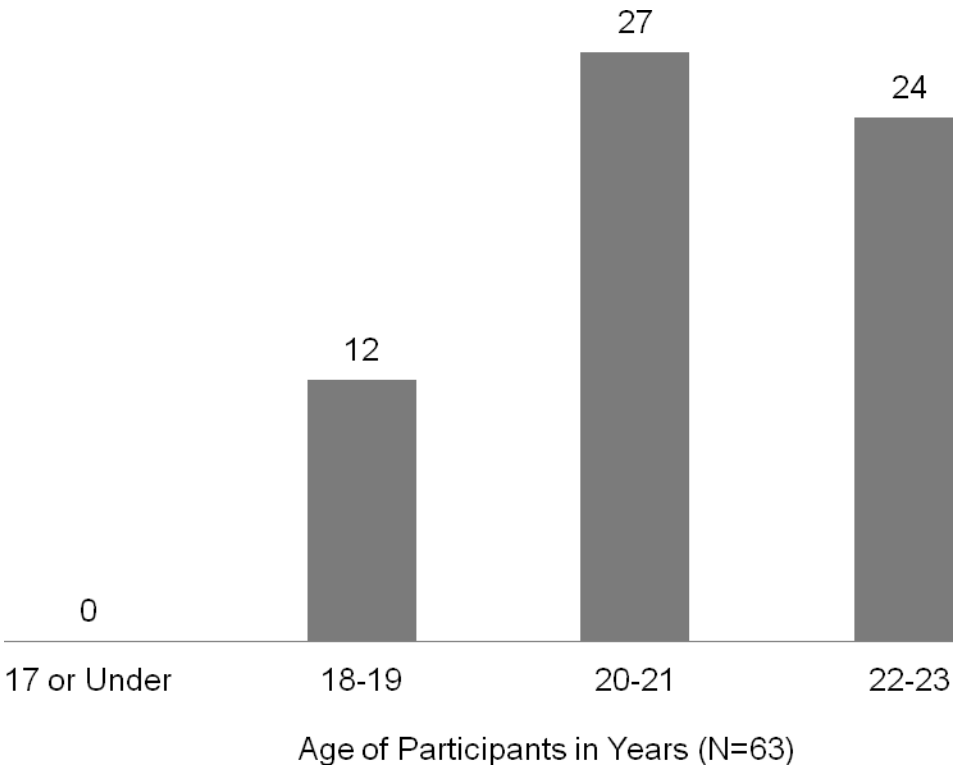

Figure 1. Participant age distribution by count.

Participants were asked if English was their first language, 42 said yes, 21 said no.

Participants were asked how many years they had been working or learning in the English language. Fifty-three said more than 10 years, three said 9 to 10 years, two said 7 to 8 years, two said 5 to 6 years, and three said 3 to 4 years.

Participants were asked to rate how proficient they were in the English language on a scale from “1 – not proficient” to “9 – very proficient”. The average self-rated English proficiency level was 8.

Given the survey data above and the fact that the focus group and interview participants were subsets of the survey participants, 63 were deemed to have met the pre-determined criteria (see Section 3.2.2.1 for a full description of the criteria used) and deemed to be fully able to comprehend the questions asked in the survey, focus groups, and interviews; that is, they were young adults literate in the traditional sense; able to read and write in the English language.

4.2 Research Question One Findings

The first research question was: What digital devices and technologies/tools do young adult learners use for learning and why?

To examine this question, survey, focus group, and interview data were used. Questions 10, 11, and 12 of the survey solicited data related to the types of digital devices participants owned and used (Question 10), the comfort level of participants in the use of the devices (Question 11), and the extent to which participants wanted to use digital devices for formal learning (Question 12). Question 1 of the focus group and interview guides solicited data related to the types of digital devices participants owned and why they used them. Question 2

of the focus group and interview guides solicited data related to the types of digital technologies/tools participants used, how they used them, and why.

4.2.1 Digital Devices

Question 10 of the survey asked participants what types of digital devices they owned and used. All participants in the study owned at least one digital device. The modal number of devices owned was 3. The minimum number of devices owned was 1; the maximum number of devices owned was 7.

A breakdown of participants' digital device ownership as a percentage is outlined in Figure 2. The vast majority of participants owned a laptop (89%), 68% owned a smart phone, 67% owned a MP3 player, 63% owned a desktop computer, and 51% owned a cell phone. Very few participants owned a tablet computer (8%) or eReader (2%). No participants owned a personal digital assistant (PDA). (Note: a PDA was considered a handheld device used as a personal organizer [e.g., a PalmPilot]. Common functionality would include an address book, calendar, task list, and clock.) Five percent of participants specified owning a personal digital recorder or game console under the "other" option. (Note: for the purposes of this study cell phones were considered mobile devices with basic feature capability [such as the ability to place calls and send texts], while smart phones were considered mobile devices with greater feature capability [such as the ability to install applications on top of the ability to place calls and send texts].)

The majority of digital devices owned by participants were portable, mobile devices, which was expected given the majority of digital devices listed were portable, mobile devices. Only desktops and the devices listed by participants under the “other” option (i.e., personal digital recorders and game consoles) where considered non-portable, non-mobile devices.

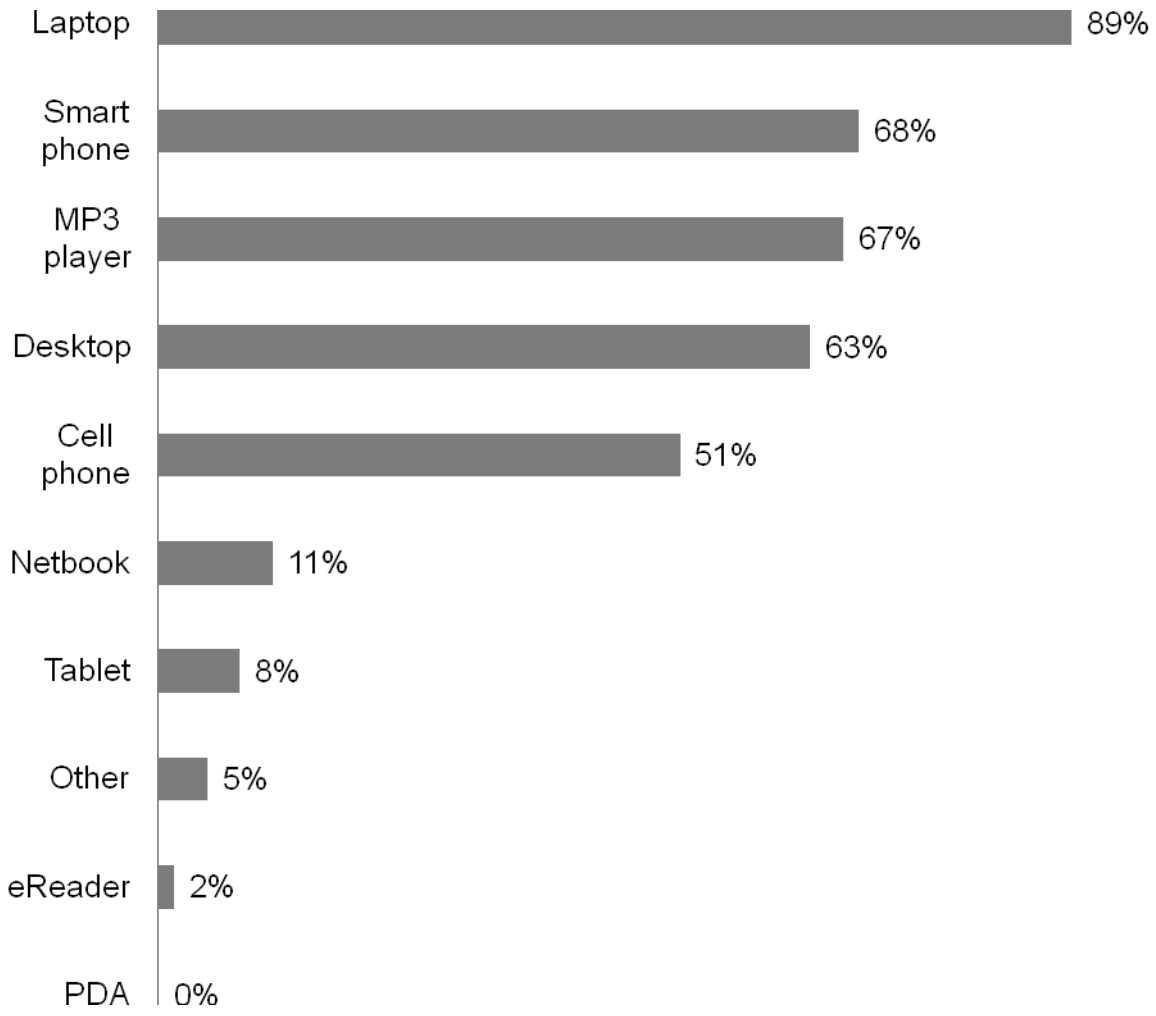

Figure 2. Percentage of participants owning each digital device (N = 63).

The device ownership findings are similar to those found in the *ECAR Study of Undergraduate Students and Information Technology, 2012*. The ECAR study was conducted at a similar time to this study (albeit early 2012 compared to late 2011 for this study). The order of device ownership based on percentage was the same for the common devices listed, although the percentages varied. For example, in the ECAR study, laptop ownership was the highest with a percent ownership of 83% (compared to 89% in this study), smart phone ownership was next with 62% ownership (compared to 68% in this study), desktop ownership was next with 33% ownership (compared to 63% in this study), tablet ownership was next with 15% ownership (compared to 8% in this study), and eReader ownership was next with 12% ownership (compared to 2% in this study).

A comparison between this study and the ECAR 2012 study of students' digital device ownership as a percentage is provided in Figure 3.

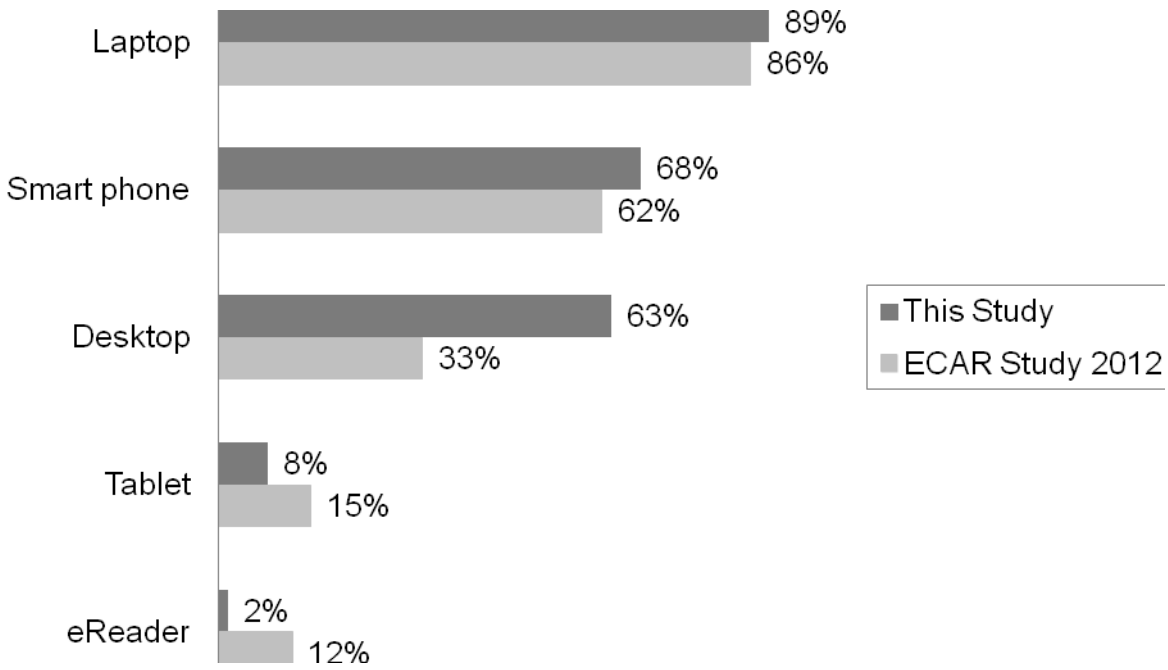

Figure 3 Participant/Student digital device ownership comparison by study.

4.2.1.1 Perceptions of Digital Devices

Question 11 of the survey asked participants how comfortable they felt using digital devices (on a scale of “1 - not comfortable” to “9 - very comfortable”). A mean value of 7.94 suggested the participants were quite comfortable with their chosen devices.

During the focus groups and interviews participants were asked about their favourite devices and how often they used them. The two devices that were mentioned most often were laptops and cell/smart phones. (Note: the participants considered cell and smart phones to be the same device even though the

functionality between them varied.) When asked which device(s) participants couldn't live without, one participant replied "Cell phone and laptop are musts" (Student #6, Interview, December 1, 2011). When asked which devices participants used most often, one participant said "My cell phone and the laptop" (Student #7, Interview, December 5, 2011). When asked how often these devices are used, one participant said "I'm on them all the time…I love technology" (Focus Group #1, October 31, 2011). These sentiments were consistent among the majority of participants in the focus groups and interviews.

During the focus group and interview process it became evident that even though laptop ownership was highest among participants, most participants felt more strongly about their cell/smart phones. One focus group participant said "[I've] had a smart phone since iPhone 3 came out. It has revolutionized my life… no question" (Focus Group #1, October 31, 2011). Another described the cell/smart phone as "pretty much my life" (Focus Group #4, November 8, 2011). And another described it as a "go-to" device (Focus Group #5, November 22, 2011). When asked what participants did with their cell/smart phones, one participant replied "Everything. I use it more than my laptop right now. I check my email, go on Facebook…sometimes I'll download the notes or PowerPoints or whatever and go through them" (Student #1, Interview, November 22, 2011). Another participant said "Everything. Absolutely everything. I have everything on here [smart phone]… banking information, memos…social network" (Student #8, Interview, December 5, 2011).

It is important to note that not all participants felt that strongly about their cell/smart phones. Student #3 (Interview, November 24, 2011) said “I use it [smart phone] on daily basis, but I like to turn it off a lot”. Student #5 (Interview, December 1, 2011) described his cell phone as “old… outdated. Only used for calling. Nothing else” and his preferred and most often used device was his desktop computer.

Question 12 of the survey asked participants if digital devices should be used more often in their formal learning. Sixty-three percent said they should be used more, 33% said they should be used less, and 4% were unsure.

Question 12 also asked participants to comment on whether they thought digital devices should be used more often in their formal learning. Collected comments were consolidated and placed into emergent categories by response; that is, whether participants answered “Yes”, “No”, or “Yes and No” when asked if digital devices should be used more often in their formal learning. Of the 38 participants who answered “Yes”, 15 cited reasons related to increased engagement and the fact that the use of digital device(s) suited their learning preferences; 12 cited reasons related to increased convenience, practicality, and efficiency; seven cited reasons related to better research options and more access to up-to-date information; and four cited reasons related to increased access to resources and information. Of the 19 participants who answered “No”, seven cited reasons related to decreased engagement and the fact that the use of digital device(s) did not suit their learning preferences, four cited reasons

related to reduced access to resources and information due to difficulties in using the devices and the high cost of the devices, four suggested that there was enough use of digital devices in their formal learning and that any more use would lead to wasted time, two cited reasons related to too much dependency on digital devices, and two cited health concerns (specifically eye strain). Of the two participants who answered “Yes and No”, one cited environmental issues (i.e., “I think it can save paper, but I love books”), and one cited reliability concerns (i.e., “you cannot rely on technology too much because it tends to have problems… and at the same time it can be useful”). (Note: the “Yes and No” option was not part of the survey, but was added by the two participants described above.) Four participants did not provide comments. Table 1 provides a summary of the consolidated and categorized comments.

Table 1

Consolidation and Categorization of Digital Device Use Comments

Q12: Do you feel digital/media technology devices should be used more often in your formal learning? Why (please comment)?		
Response	**Category**	**Number**
Yes (N=38)	Increased engagement and match to learning preference	15
	Increased convenience, practicality, and efficiency	12
	More research options and access to up-to-date information	7
	Increased access to resources and information	4
No (N=19)	Decreased engagement and mismatch to learning preference	7
	Reduced access to resources and information	4
	Time wasting	4
	Dependency	2
	Health concerns	2
Yes and No (N=2)	Environmental issues	1
	Reliability concerns	1
Note: 4 participants did not provide comments. N=59		

4.2.1.2 Reasons for Using Digital Devices

The focus groups and interviews were the primary sources for gathering data about the reasons participants used various digital devices. Questions were asked about what participants were using digital devices for and why. Three main reason-related themes emerged after reviewing the data: 1) increased mobility, 2) increased connectivity, and 3) the enabling of activities.

In terms of mobility, the vast majority of participants always had a digital device with them, most often a cell/smart phone and/or a laptop. The cell/smart phone was the most often held device. In Focus Group #5 (November 22, 2011) participants cited reasons related to availability and immediacy (i.e., that the devices were always within reach when needed). Student #9 cited a practical reason: “I don’t have to wait for the computers in the lab” (Interview, December 6, 2011). These sentiments were common among focus group and interview participants.

In terms of connectivity, participants cited two types of connectivity when using digital devices: 1) connectivity to people, and 2) connectivity to resources. There was a strong sense among participants for the need to be connected to others. Student #4 commented:

> [I use] my cell phone because I find I’m able to connect to people. And sometimes I don’t have time to do things at home that would require a computer because I’m at school all day. So, if I need something important

to do, then I would connect to classmates on my cell phone. (Interview, November 29, 2011)

Many participants also cited the need to connect to resources (via the Internet), primarily to search for information and to access the institutional learning management system (LMS) to do school work.

In terms of enabling activities, participants felt that digital devices helped them do their day to day activities whether those activities were school-related or personal. Student #2 commented: “I couldn’t live without the cell phone or computer because I use them both heavily, but for different things. The cell phone is more for contacting people and the computer for my school work, and also for leisure” (Interview, November 22, 2011). The participants indicated a high level of reliance on their chosen devices and many mentioned convenience as a primary reason for using them.

4.2.2 Digital Technologies and Tools

Question 2 of the focus group and interview guides asked participants what types of digital technologies/tools participants used for learning. Although the original intent of the question was to explore the technologies/tools participants used specifically for learning, participants interpreted the question to include any technology/tool used throughout a semester; that is, any technology/tool used in the process of learning whether or not that technology/tool was used specifically to complete learning tasks.

Figure 4 summarizes the digital technologies/tools mentioned and used by the 10 interview participants. Those digital technologies/tools mentioned most often are displayed in larger and darker font. The frequency (N=10) of use of each technology/tool by participant is also displayed in parentheses beside each technology/tool. YouTube and Google were mentioned and used most often (8) followed closely by games (7), and the institutional learning management system (6). Note: the “games” label included any type of digital game activity (e.g., game apps on a smart phone, individual online games on a computer, multi-player games on a game console, and various combinations thereof). The label “Google” referred to the Google search engine (primarily), but also to other Google services (e.g., Google Drive, Gmail, Calendar) except YouTube, which had its own label. Instant messaging and texting were clumped under the label “IM-text”. All applications (other than game applications) downloaded and installed on smart phones or tablets were clumped under the label “apps”.

Figure 4 Word cloud frequency of participant digital technology/tool use (N=10)

4.2.2.1 Reasons for Using Digital Devices, Technologies and Tools

The focus groups and interviews were the primary sources for gathering data about the reasons participants used various digital technologies/tools. Questions were asked about what digital technologies/tools participants were using and why.

A review of the data suggested there were a number of disparate activities participants were involved in when using digital technologies/tools. Table 2 summarizes the activities based on the characteristic of the technology/tool mentioned, as well as the way participants described using the technology/tool.

Table 2

Activities Engaged In by Participants by Digital Technology/Tool

Activity	**Definition**	**Digital Technology/Tool**
Researching	Searching for and finding information	Google, Wikipedia
Learning	Acquiring knowledge and skills	YouTube, Google, Wikipedia, eHow, LMS*
Communicating	Connecting to others asynchronously and synchronously	Various Instant Messaging (IM), text and email tools; Skype, Facebook, LMS*
Being entertained	Watching videos. Playing games. Listening to music.	YouTube, various game applications, Grooveshark
Working	Completing school work (i.e., assignments and tasks)	Various office suite applications, LMS*
Creating	Creating digital content	YouTube, various blog tools, various office suite applications
Networking	Contributing to blogs/wikis, posting to and commenting on social networking sites	Facebook, Wikipedia, YouTube, Twitter, various blog tools
Aggregating	Collecting and consolidating information	StumbleUpon, Tumblr, reddit, Twitter
Organizing	Managing time, calendaring	Various mobile apps, Google, LMS*
* LMS = Learning Management System Note: The same digital technology/tool may be used for more than one activity.		

Digital technologies/tools enabled by the Internet were the most often mentioned and used by participants. Further, a variety of Internet-based digital technologies/tools were used in order to engage in desired activities. For example, when asked what sites were visited when browsing the Internet, one participant replied:

> the three tabs I probably have open all the time would be Facebook, which I use kind of occasionally – I still have it open for … notifications about certain things; occasionally I'll get a chat message – my Google home page, which has my email, my calendar, a couple of sites I have automatically updated…, and then reddit.com. (Student #2, Interview, November 22, 2011)

Student #2 went on to say that "My kind of general 'go to', at least for starting information, would be Wikipedia," and then "Another thing I do use is YouTube. There's a lot of really good resources on there" (Interview, November 22, 2011).

The theme of internet-enabled, multiple digital technology/tool use based on desired activity engaged in was consistent among participants. A list of selected participant comments reflecting this theme follows:

> I like going to YouTube, eHow.com…teaches everything…I usually go to like video websites… [the institutional LMS], that's my home page…check my email…check what's going on with the courses…[Google], that's the

one I use the most as a search engine. (Student #10, Interview, December 8, 2011)

[I] mainly [go to] Google and the sites that the school offers…I go on [the institutional LMS] and then through the course like the teacher puts on different links for the material they are teaching and then I usually research those…I go to Mini-Clips because they have a bunch of games. It kills time… [I go to] YouTube, mainly [for the] music. (Student #9, Interview, December 6, 2011)

I just usually go to places like YouTube or wiki sites…just watch videos… entertainment… [I go to Wikipedia] just to read up on stuff in my spare time. (Student #5, Interview, December 1, 2011)

I go straight to Google when I'm doing any type of research… [I go to] YouTube, but it's not for uploading, it's for commenting on videos. (Student #6, Interview, December 1, 2011)

I use [Twitter] mostly for contact with other students…For school I'll go to Google [for] searching, just searching any questions, topics… I think YouTube is a major thing. You can type anything into YouTube and it pops up a video explaining how to, like even learning how to play guitar or just like anything, so I think that's [YouTube] a really good one that I always go to. (Student #8, Interview, December 5, 2011)

During the interviews many participants went into more detail about a specific activity they liked doing and why. A variety of activity types were described. Although there were a number of common activities among participants, such as searching for information via Google or watching videos on YouTube, some participants described unique activities (among participants) specific to them. Some examples of interview participant comments related to this theme follow:

> I read a lot of people's blogs…usually, if I like what they are saying in their blog, it's nice to give positive feedback. If I really appreciate something someone's doing and makes my day better, I really like to tell them I really appreciate what they are doing and it's interesting. (Student #3, Interview, November 24, 2011)

> On Facebook there is a poems section that's called Notes. So, what I do is I usually write poems there and it has options where you can publically let everyone see it, or just your friends. So, I do that, and a lot of people respond. (Student #4, Interview, November 29, 2011)

> If I hear something random I will Google it… and I like researching… it could be anything, just be a random thought in my mind, and I would plug it into Google… read about it. (Student #7, Interview, December 5, 2011)

> [Searching the Web]… that's how I learned to mod games… I downloaded a mod that was based off a different port for that game and then one of the

> applications wasn't working, so I downloaded another application and then I found out that that application created similar things. And then I opened up some of the mods I'd downloaded – and at this point I'd downloaded a lot of them. I looked at common things, common properties, common files, and eventually learned what means what… Eventually I was able to make a few of my own [mods], make a few changes. (Student #5, Interview, December 1, 2011)

Overall, participants were very positive about the types of activities, enabled by the Web, which they were engaging in. Nonetheless, there was recognition of some of the shortcomings of the digital technologies/tools. One participant commented:

> I would definitely say [the Web is] beneficial. There are downsides to it though. It does help you because you do have a lot of sources [and] you can find stuff very quickly. But the thing you have to watch is where did the source come from. (Student #2, Interview, November 22, 2011)

The sentiment of the advantages and disadvantages of digital technologies/tools was reflected in the focus groups as well. Participants in Focus Group #3 (November 1, 2011) commented that digital technologies/tools had improved their learning, primarily by making things more convenient and accessible, but credibility was an issue. Participants in Focus Group #1 (October 31, 2011) commented that the Internet/Web has played both positive and negative roles, citing ease of use as a positive (particularly around searching for

and accessibility to information), and procrastination (caused by having easily accessible information available) and credibility as negatives.

Overall, participants were very positive about digital technology/tools. However, the sentiment was not unanimous. One participant commented “I don’t really like technology… I don’t like using it all the time” (Student #3, Interview, November 24, 2011).

4.2.3 Summary of Research Question One Findings

Research question one explored the types of digital devices, technologies, and tools young adult learners use for learning and why.

Although most participants owned multiple devices, cell/smart phones and laptops were considered go-to devices most often owned and used. Participants cited mobility, connectivity (to people and resources), and the enabling of activities as reasons for using digital devices. Participants felt a reliance on their chosen devices citing immediacy and convenience as primary factors for this reliance.

Participants used a number of digital technologies/tools (primarily Web-based). Google and YouTube were the most often mentioned digital technology/tools used, followed by gaming and the institutional learning management system. Participants engaged in a number of disparate activities when using digital technologies and tools (primarily Web-based). These activities included 1) researching (searching for and finding information), 2) learning

(acquiring knowledge and skills), 3) communicating (connecting to others asynchronously and synchronously), 4) being entertained (watching videos, playing games, listening to music), 5) working (completing school work; i.e., assignments and tasks), 6) creating (digital content), 7) networking (contributing to blogs/wikis, posting to and commenting on social networking sites), 8) aggregating (collecting and consolidating information), and 9) organizing (managing time, calendaring). Common activities included searching for information (via Google) and watching videos (via YouTube); however, many participants described specific (and different) activities unique to them (among participants in this study).

Although most participants were positive about the use and affordances enabled by digital devices, technologies, and tools, some participants recognized the shortcomings of said digital devices, technologies, and tools; that is, that there were advantages and disadvantages of each resulting in both positive and negative implications for learning.

4.3 Research Question Two Findings

The second research question was: How is the digital age (particularly the widespread use of the Internet) impacting knowledge acquisition and construction in young adult learners?

To examine this question, survey, focus group, and interview data were used. Questions 6 through 9 of the survey solicited data related to participant Internet use (i.e., the age and Grade participants first started using the Internet

and the number of hours per day participants used the Internet [generally and for learning]). Questions 13 through 17 solicited data related to the types and preferences of Internet activities and tasks participants were engaged in. There were a number of questions in the focus groups and interviews designed to solicit data about how the Internet had impacted participants' learning and how participants were acquiring and construction knowledge.

4.3.1 Internet Use

Given the widespread use of the Internet for learning, survey Questions 6 through 9 were designed to gather data about participants' Internet use.

Participants were asked at what age they first started using the Internet. The age distribution of participants' first use of the Internet is shown in Figure 5. The modal value was 10 to 11 years of age. No participants started using the Internet at the age of 5 or under, or at the age of 18 or older.

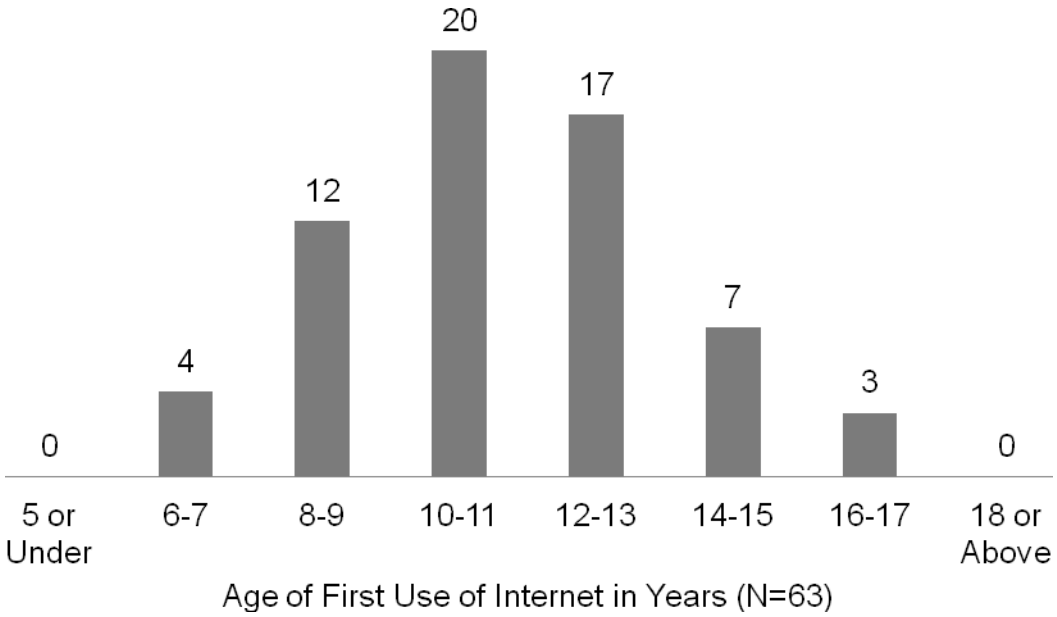

Figure 5. First use of Internet age distribution by count.

Participants were asked at what Grade they first started using the Internet for formal learning. The Grade distribution of participants' first use of the Internet for formal learning is shown in Figure 6. There was a wide range in first use. The majority of participants (41 out of 63) first started using the Internet for formal learning between Grade 5 and Grade 10. No participants started using the Internet for formal learning in Kindergarten; however, five participants started using the Internet for formal learning in college (i.e., post-secondary education).

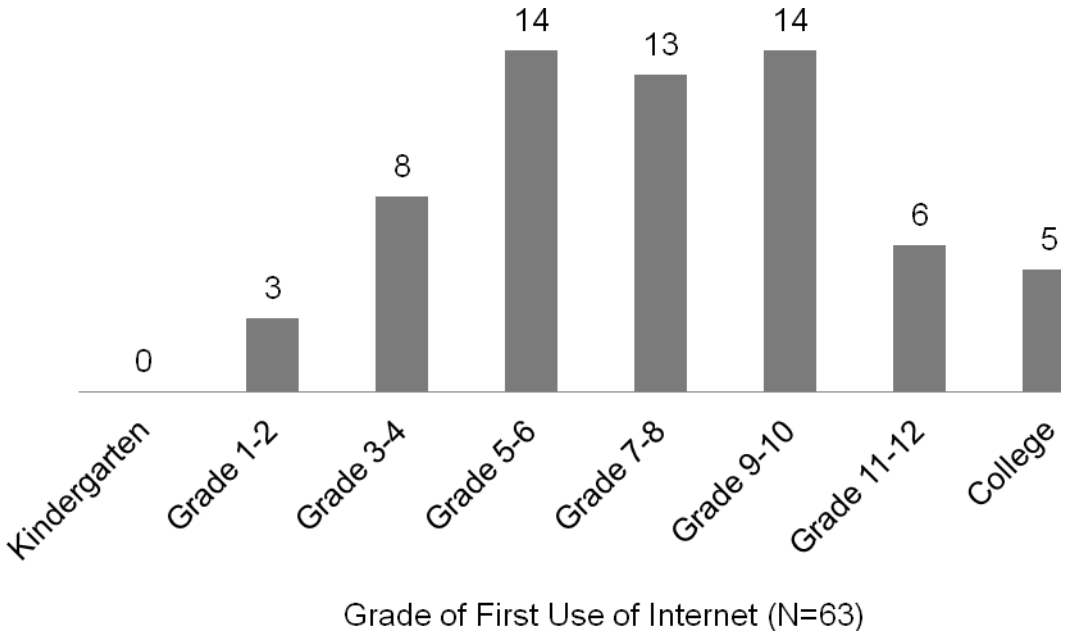

Figure 6. First use of Internet for formal learning Grade distribution by count.

A Pearson product-moment correlation coefficient was computed to assess the relationship between the age of first use of the Internet (in years) and the Grade of first use of the Internet. There was a positive, significant correlation between the two variables, $r = 0.491$, $n = 63$, $p = 0.001$. This may suggest participants' first exposure to the Internet came as a result of attending school and was for learning purposes.

Participants were asked how many hours per day they used the Internet. The distribution of participants' daily use of the Internet is shown in Figure 7. The modal value was four hours per day. All participants used the Internet daily. However, a standard deviation of 2.134 and a kurtosis value of -0.858 for these data indicate a more even distribution across all intervals. There is a broad range

of daily Internet use, including a meaningful proportion of participants in the extreme usage levels. That is, some participants used the Internet for a limited amount of time on a daily basis (one hour or less), while others used the Internet extensively on a daily basis (more than 8 hours per day).

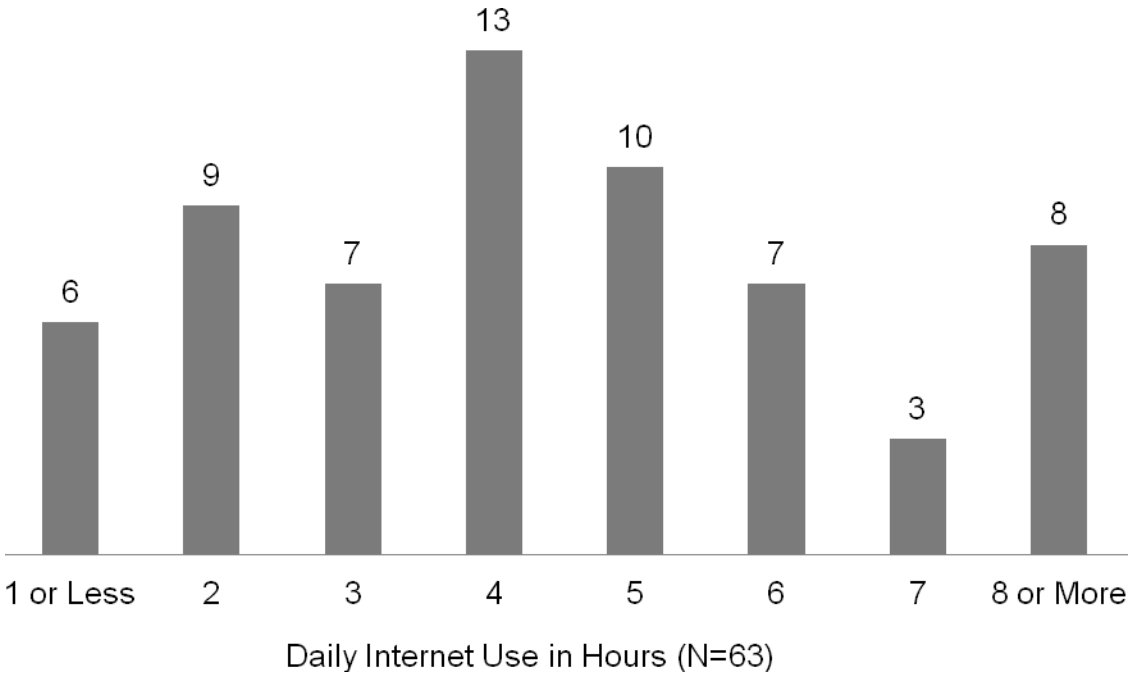

Figure 7. Daily Internet use distribution by count.

Participants were asked how many hours per day they used the Internet for formal learning. The distribution of participants' daily use of the Internet for formal learning is shown in Figure 8. The modal value was two hours per day. All participants used the Internet daily for formal learning. The distribution is positively skewed, which is expected given the relatively low modal value. A kurtosis value of 2.082 indicates the data is spiked at and near the modal value. Sixty-two percent of participants used the Internet for formal learning for two

hours a day or less. Two participants (or 3%) were more than three standard deviations (SD=1.536) above the modal value and can be considered outliers. These participants indicated that they used the Internet for formal learning for seven and more than eight hours per day, respectively.

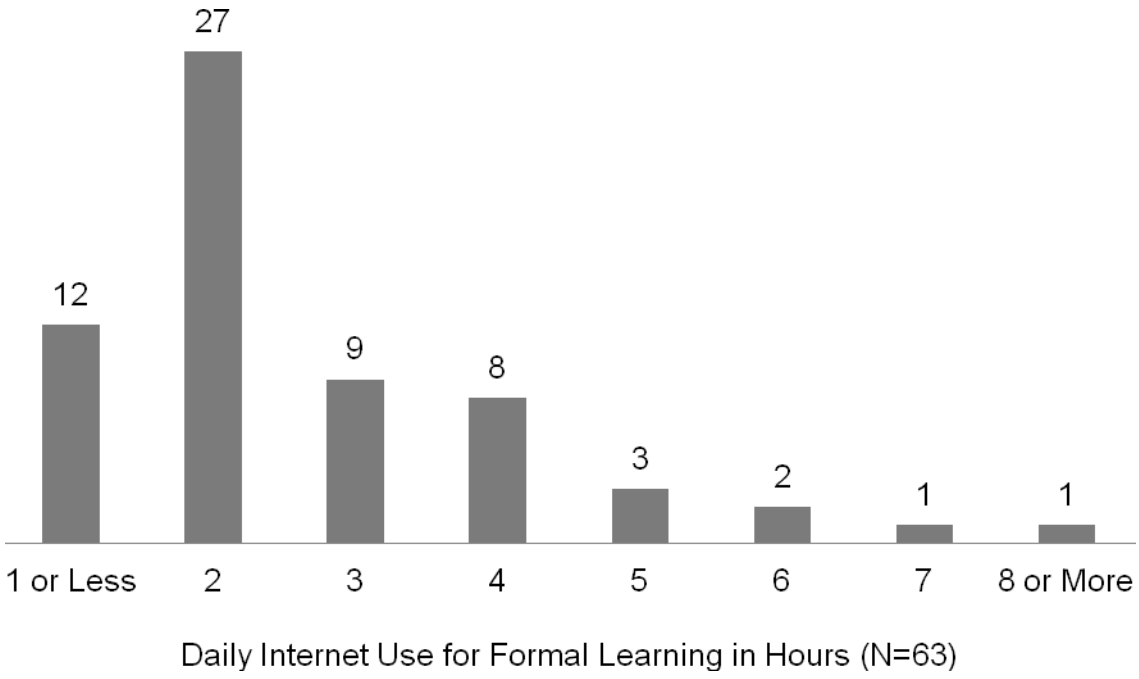

Figure 8. Daily Internet use for formal learning distribution by count.

In terms of Internet use, even though the participants were roughly the same age, the age and Grade at which they first started using the Internet varied widely, as did the number of hours per day they used the Internet (either personally or for formal learning).

4.3.2 Internet Activity

Questions 13, 14, and 15 of the survey solicited data related to the types of Internet activities participants were engaged in, the amount of time they spent engaging in the activities, and their preference for the activities. Each question contained a different list (or set) of Internet activities.

4.3.2.1 Common Internet Activities

Question 13 of the survey asked participants to identify the types of common Internet activities they engaged in, the time spent doing the activities, and their preference for doing the activities. The list of common Internet activities included 1) social networking (e.g., connecting with others via Facebook, Twitter), 2) emailing, 3) searching for and gathering information (e.g., using search engines; reading web pages, online news, articles), 4) participating in non game-based entertainment (e.g., watching YouTube videos, listening to online radio, watching on-demand TV shows), 5) gaming (e.g., playing individual or multi-player online games), 6) collaborating (e.g., working with others and contributing to blogs, wikis, Google documents), 7) learning (e.g., completing formal learning activities; connecting with the school's learning management system), 8) working (e.g., completing tasks for paid or volunteer work), and 9) other. (Note: three participants indicated that they also engaged in "other" activities. Two participants specified these "other" activities as "learning for fun" and "writing/blogging". One participant did not specify the "other" activity he or she was engaged in.

The mean percentage of time participants spent engaged in the common Internet activities listed in Question 13 is displayed in Figure 9. Participating in non game-based entertainment (21%) was the most engaged in activity in this set of activities, followed by learning (18%), social networking (17%), searching for and gathering information (15%), gaming (12%), emailing (10%), working (3%), collaborating (2%), and other (1%).

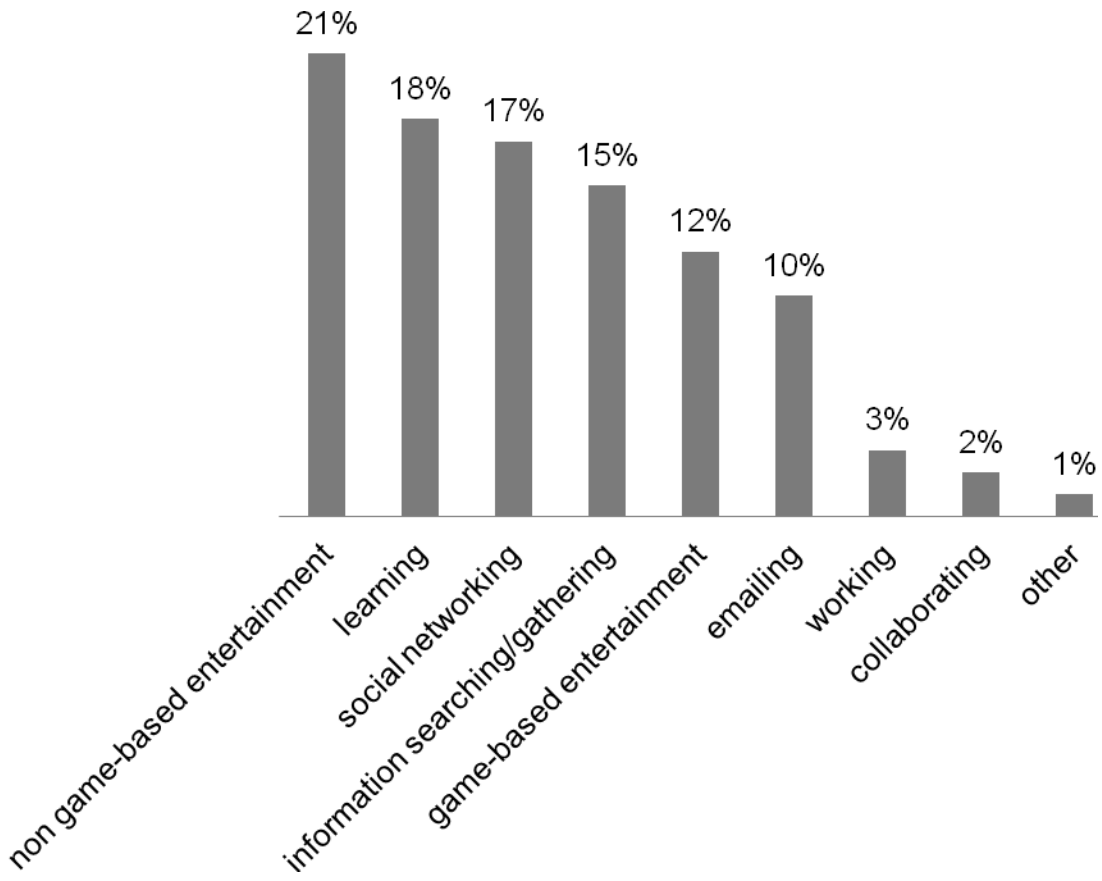

Figure 9. Mean percentage of time participants spent engaged in common Internet activities.

Figure 10 outlines the common Internet activities participants engaged in by count. Figure 10 also displays the participant engagement level as a proportion of all participants for each activity. Level of engagement was arbitrarily categorized as follows: 1) light engagement was defined as 10% or less of participant time spent doing an activity, 2) moderate engagement was defined as greater than 10% but less than or equal to 30% of participant time spent doing an activity, 3) heavy engagement was defined as greater than 30% but less than or equal to 50% of participant time spent doing an activity, and 4) extensive engagement was defined as greater than 50% of participant time spent doing an activity.

No participant engaged in every activity listed in Question 13, although most participants engaged in learning (62), emailing (60), social networking (58), information searching/gathering (58), and non game-based entertainment (57). Approximately half the participants engaged in game-based entertainment (34), while only a small portion engaged in working (16), collaborating (16), and other activities (3). Four of the 10 activities listed in Question 13 had participants that engaged in the activities at an extensive level. Non game-based entertainment and game-based entertainment activities both had four participants engaging in these activities at an extensive level, while social networking and information searching/gathering activities had two and one participants engaging in these activities at an extensive level, respectively. Seven of the 10 activities listed in Question 13 had participants that engaged in the activities at a heavy level while

all of the activities listed in Question 13 had participants that engaged in the activities at moderate and light levels.

The majority of participants engaged in emailing and collaborating did so at a light level (i.e., 10% or less of their online time). Whereas, the majority of the participants engaged in learning, social networking, information searching/gathering, non game-based entertainment, game-based entertainment, and other activities did so at a moderate to higher level (i.e., more than 10% of their online time). Those participants engaging in working were equally split between light level engagement and moderate or higher level engagement.

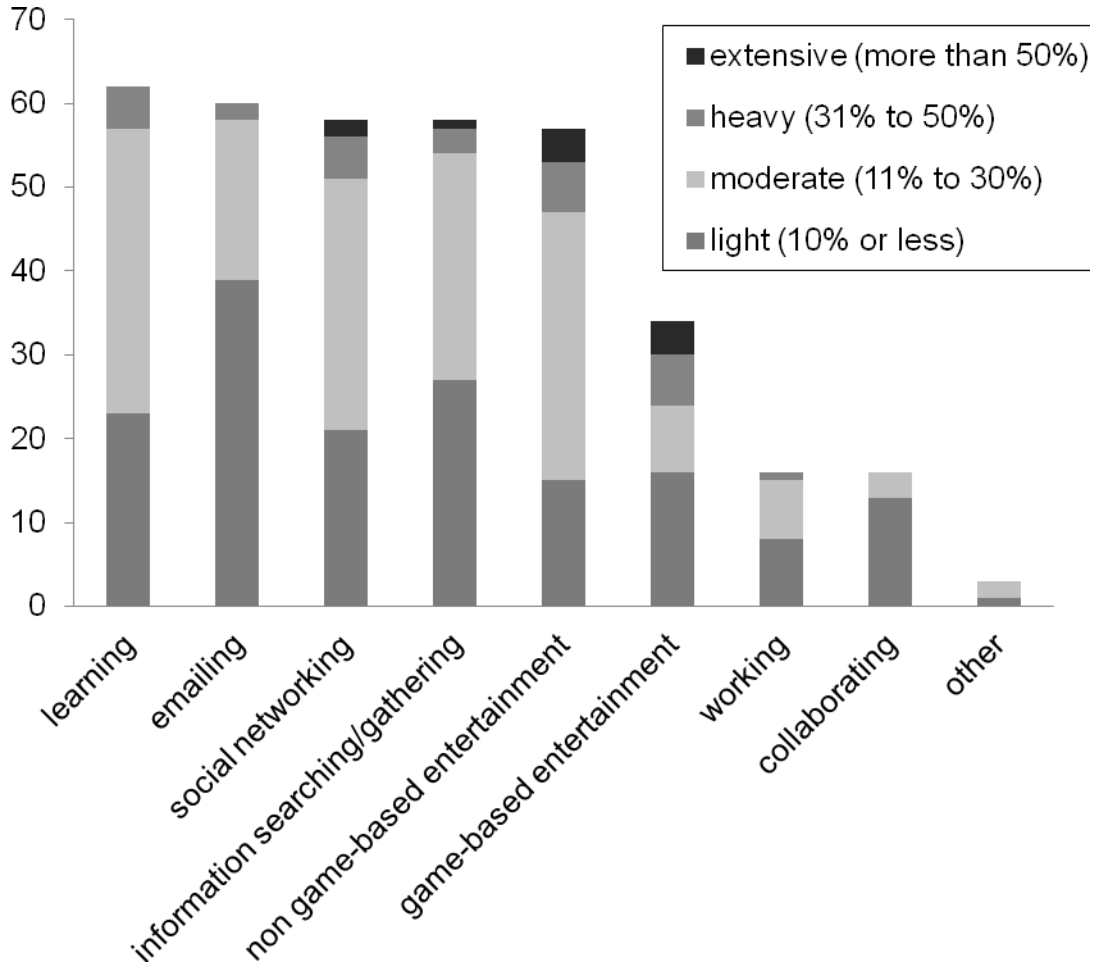

Figure 10. Common Internet activities participants engaged in by count and participant engagement level as a proportion of time spent doing an activity.

Participants were asked to rank their preferences for engaging in the common Internet activities. The number of participants giving a rank of 1 (i.e., most preferred activity) for each activity in Question 13 is displayed in Figure 11. All activities received at least one vote (rank of 1) for most preferred activity. The entertainment activities in this set of activities received the most top votes with

non game-based entertainment and game-based entertainment receiving 18 and 15 votes, respectively, representing 52% of all top votes.

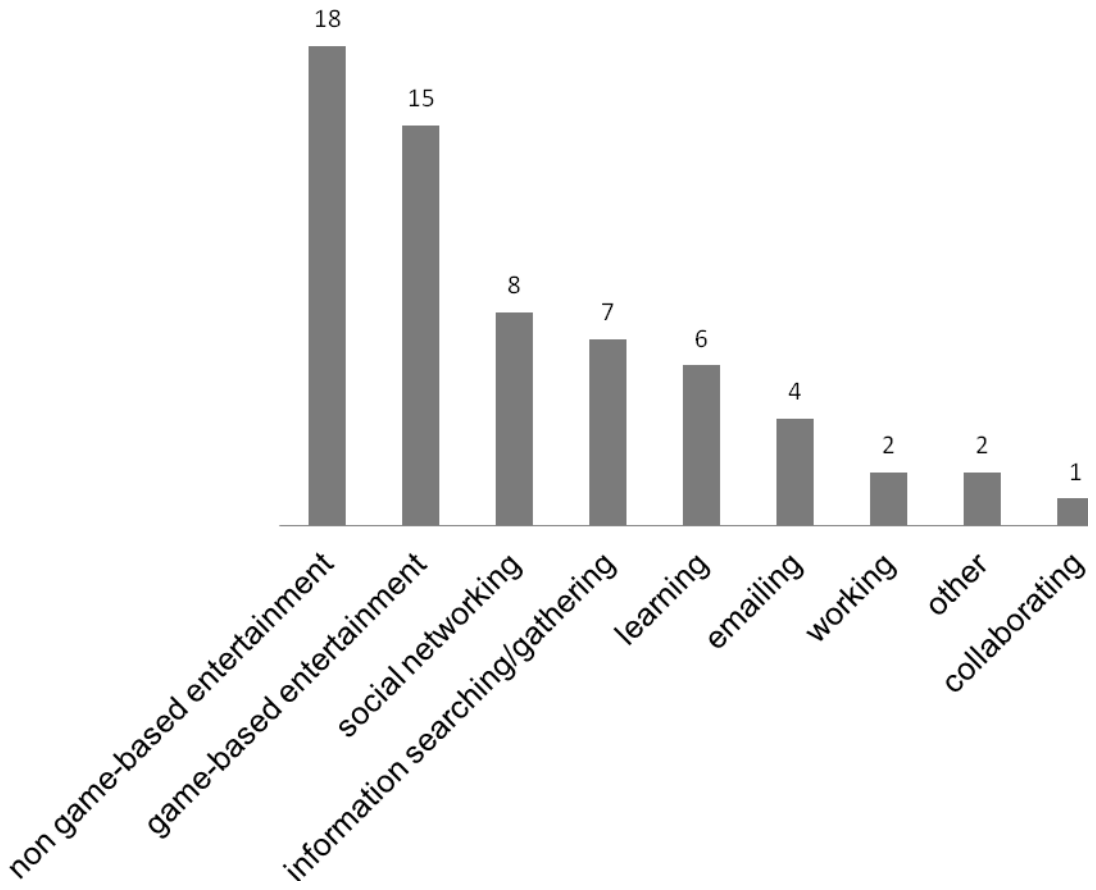

Figure11. Number of participants giving common Internet activities a rank of 1 (i.e., most preferred activity).

Of the common Internet activities listed in Question 13, non game-based entertainment was the most engaged in activity (21% of participants' time), most preferred activity (18 participants), and had the highest percentage of moderate to higher engagement (42 of 57 participants, or 74%). In contrast, collaboration was the second least engaged in activity (2% of participants' time), least

preferred activity (1 participant), and had the lowest percentage of moderate to higher engagement (3 of 16 participants, or 19%).

4.3.2.2 Skill-Based Internet Activities

Question 14 of the survey asked participants to identify the types of skill-based Internet activities (i.e., reading, writing, listening, watching) they engaged in, the time spent doing the activities, and their preference for doing the activities. The list of Internet activities in Question 14 included 1) reading online (e.g., web pages, online documents, online newspapers), 2) writing online (e.g., contributing to blogs, wikis, discussion forums, online documents, commenting on blogs, Facebook posts), 3) watching online (e.g., YouTube videos, on-demand TV shows, news videos), 4) listening online (e.g., online radio, podcasts), 5) interacting online (e.g., playing online games, working through online tutorials), 6) collaborating online (e.g., social networking, instant messaging, working on group projects), and 7) other. (Note: no participant specified an “other” option in this set of activities.)

The mean percentage of time participants spent engaged in the Internet activities listed in Question 14 is displayed in Figure 12. Watching online (32%) was the most engaged in activity in this set of activities, followed by interacting online (18%), reading online (17%), collaborating online (14%), writing online (10%), and listening online (9%).

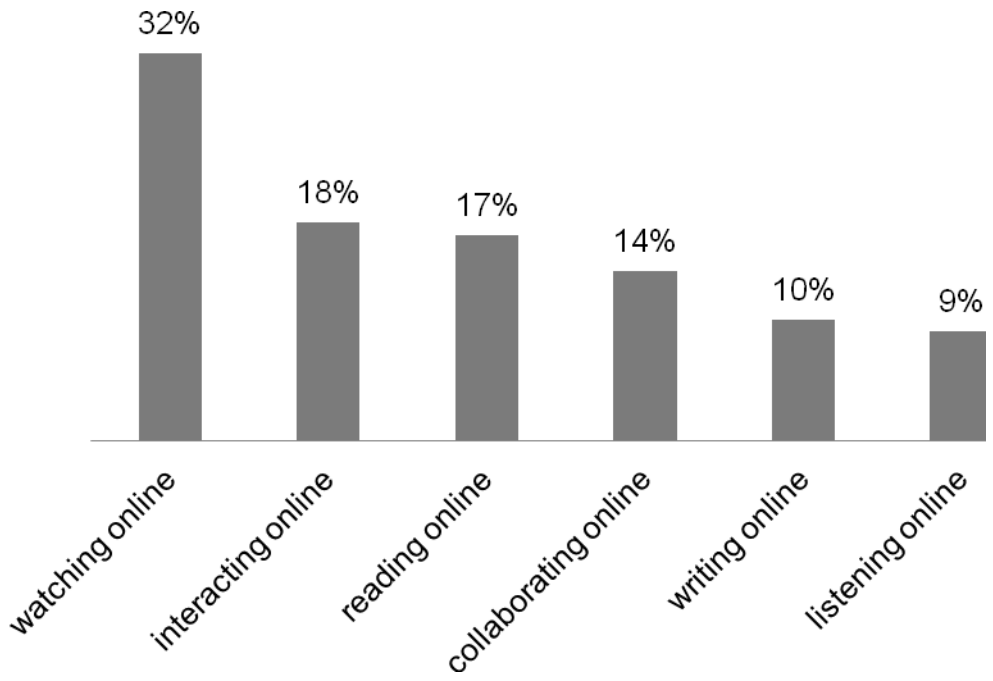

Figure 12. Mean percentage of time participants spent engaged in skill-based Internet activities.

Figure 13 outlines the Question 14 Internet activities participants engaged in by count. Figure 13 also displays the participant engagement level as a proportion of all participants for each activity. Level of engagement (light, moderate, heavy, extensive) was categorized the same way as in Question 13.

No participant engaged in every activity listed in Question 14. Watching online was the most engaged in activity with 62 of the 63 participants doing this, followed by reading online (51), collaborating online (44), writing online (41), interacting online (40), and listening online (31). Four of the six activities listed in Question 14 had participants that engaged in the activities at an extensive level. Twelve participants engaged in watching online at an extensive level, seven

engaged in interacting online at an extensive level, while reading online and writing online had one participant each engaging in that activity at an extensive level. All of the activities listed in Question 14 had participants that engaged in the activities at heavy, moderate, and light levels.

The majority of the participants engaged in the Internet activities listed in Question 14 did so at a moderate to higher level (i.e., more than 10% of their online time). At the extremes, 52 of 62 participants (or 84%) engaged in watching online did so at moderate to higher levels, while 22 of 41 participants (or 54%) engaged in writing online, and 16 of 31 participants (or 52%) engaged in listening online did so at moderate to higher levels.

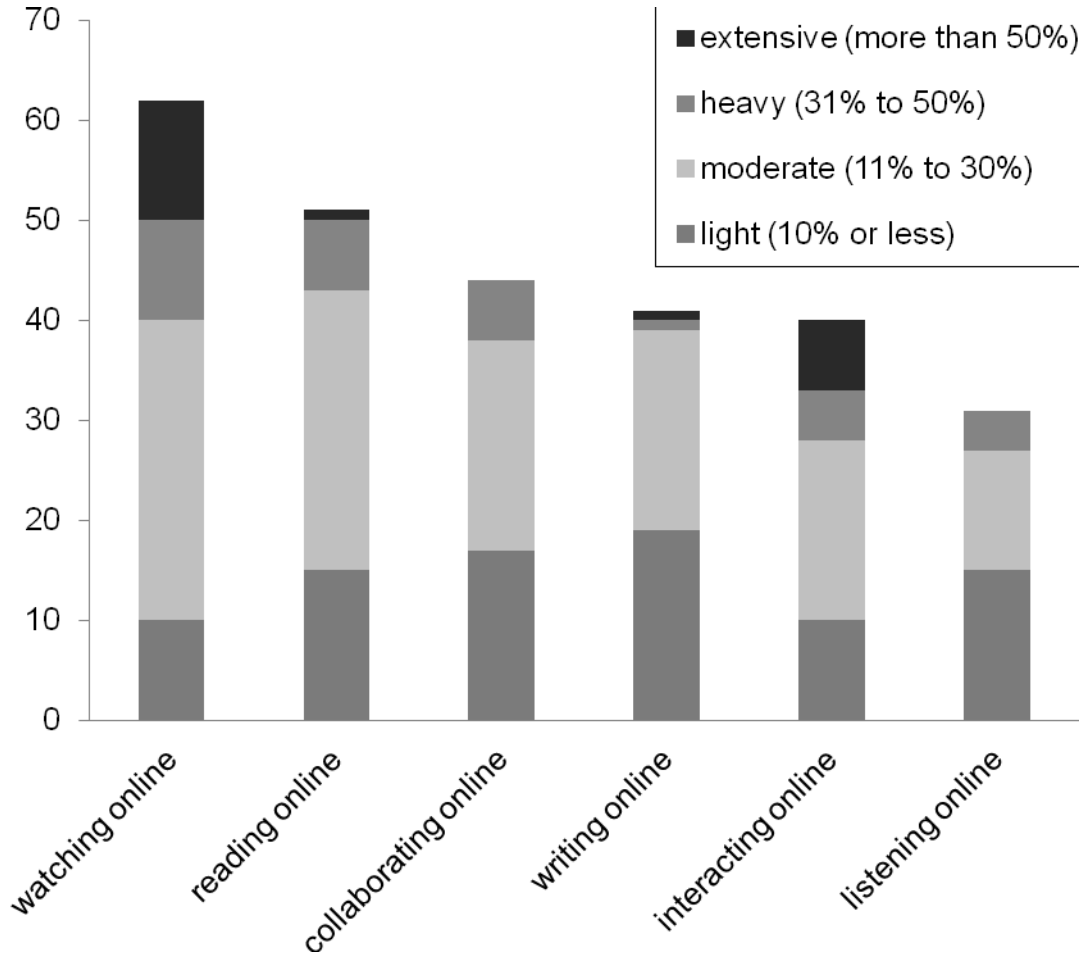

Figure 13. Skill-based Internet activities participants engaged in by count and participant engagement level as a proportion of time spent doing an activity.

Participants were asked to rank their preferences for engaging in the Question 14 Internet activities. The number of participants giving a rank of 1 (i.e., most preferred activity) for each activity in Question 14 is displayed in Figure 14. All activities received at least one vote (rank of 1) for most preferred activity. Watching online was ranked as the most preferred Internet activity by 24 participants, followed by interacting online (15), reading online (9), collaborating online (9), writing online (2), and listening online (2).

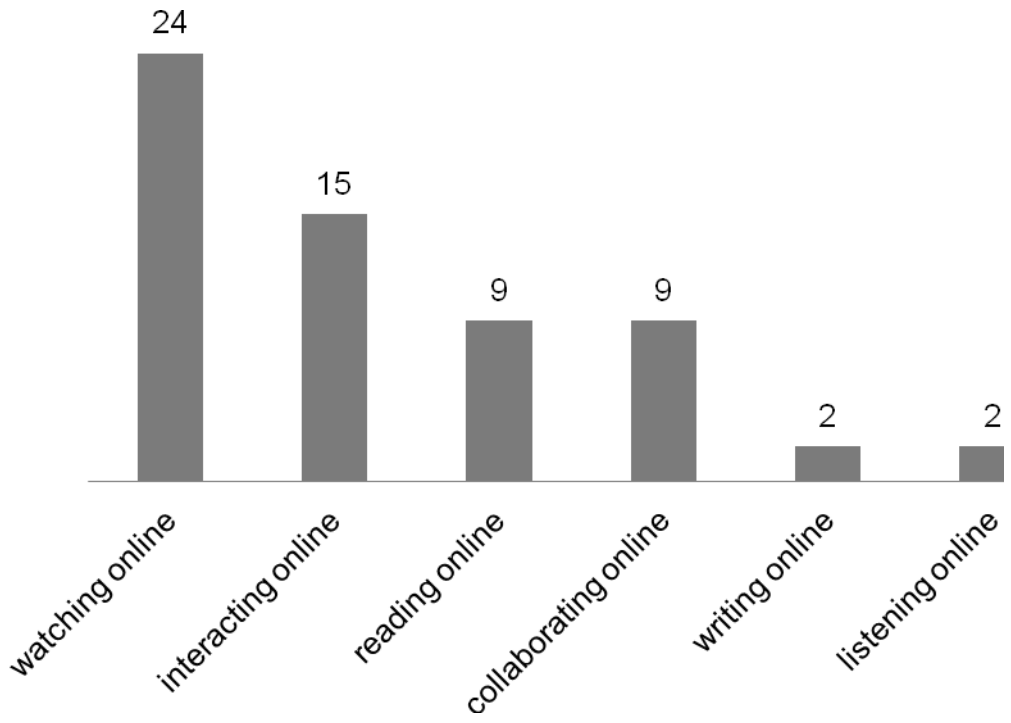

Figure 14. Number of participants giving Internet activities in Question 14 a rank of 1 (i.e., most preferred activity).

Of the Internet activities listed in Question 14, those that had the highest percentage of moderate to higher engagement were the most preferred activities. Watching online was the most engaged in, most preferred activity with the highest level of engagement.

4.3.2.3 Consuming and/or Producing Content on the Internet

Question 15 of the survey asked participants to identify whether they were engaged in consuming content on the Internet or producing content on the Internet (or both), the time spent doing these activities, and their preference for

doing these activities. Consuming content was defined as reading web pages, watching online videos, and listening to online radio. Producing content was defined as contributing to blogs, wikis, and discussion forums; tweeting; commenting on blogs and Facebook posts; creating web pages; posting to Facebook and YouTube.

The mean percentage of time participants spent engaged in the Internet activities listed in Question 15 is displayed in Figure 15. Participants spent most of their time consuming content (72%) as opposed to producing content (28%).

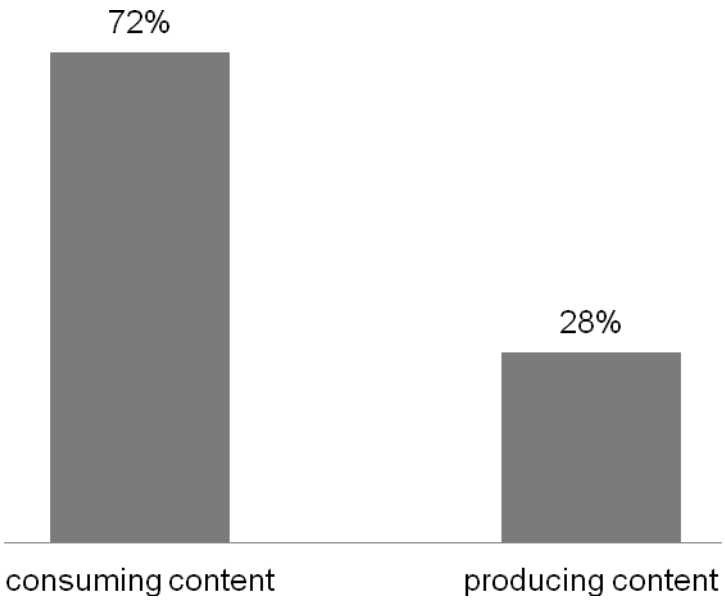

Figure 15. Mean percentage of time participants spent engaged in Question 15 Internet activities.

Figure 16 outlines the Question 15 Internet activities participants engaged in by count. Figure 16 also displays the participant engagement level as a

proportion of all participants for each activity. Level of engagement (light, moderate, heavy, extensive) was categorized the same way as in Question 13.

Sixty-two of the 63 participants engaged in the consumption of content; 53 of the 63 participants engaged in the production of content. (Note: the researcher recognizes that it would be difficult to not consume content if connected to the Internet, and therefore considered the one participant who did not consume content to be an anomaly.) Those participants who engaged in consuming content did so at moderate to higher levels with the majority of activity at the extensive level. Those participants who engaged in producing content did so at all levels with 8 participants engaging at a light level, 19 engaging at a moderate level, 22 engaging at a heavy level, and 4 engaging at an extensive level.

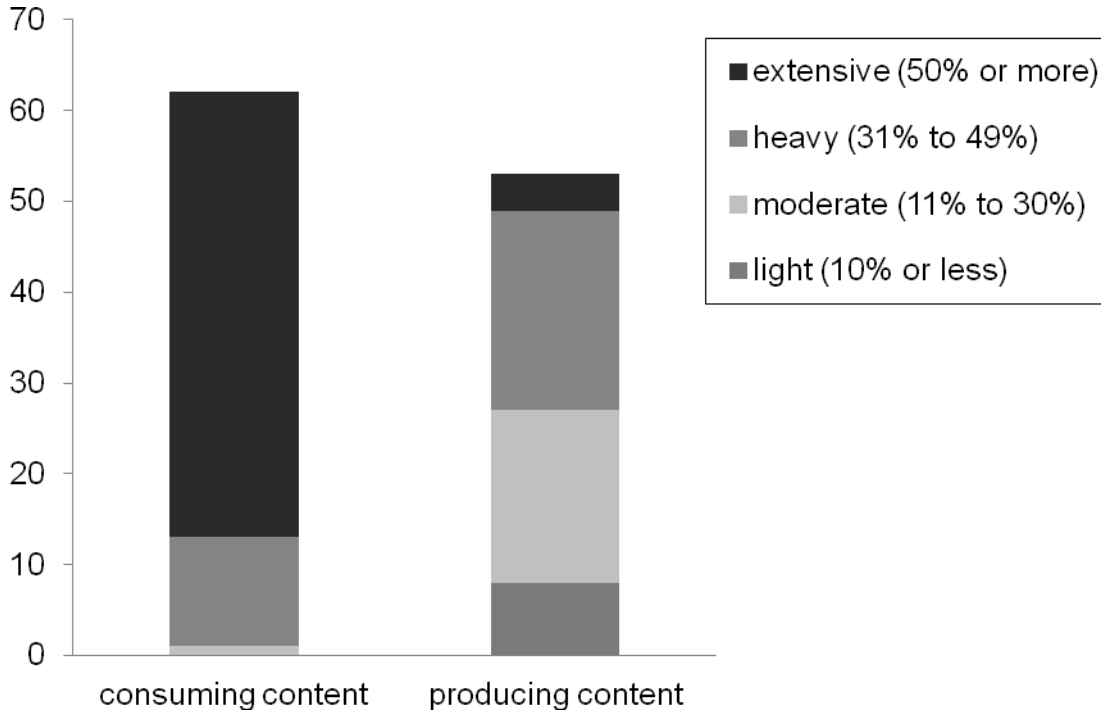

Figure 16. Question 15 Internet activities participants engaged in by count and participant engagement level as a proportion of time spent doing an activity.

Participants were asked to rank their preferences for engaging in the Question 15 Internet activities. The number of participants giving a rank of 1 (i.e., most preferred activity) for each activity in Question 15 is displayed in Figure 17. Consuming content was ranked as the most preferred Internet activity by 50 participants, followed by producing content by 8 participants.

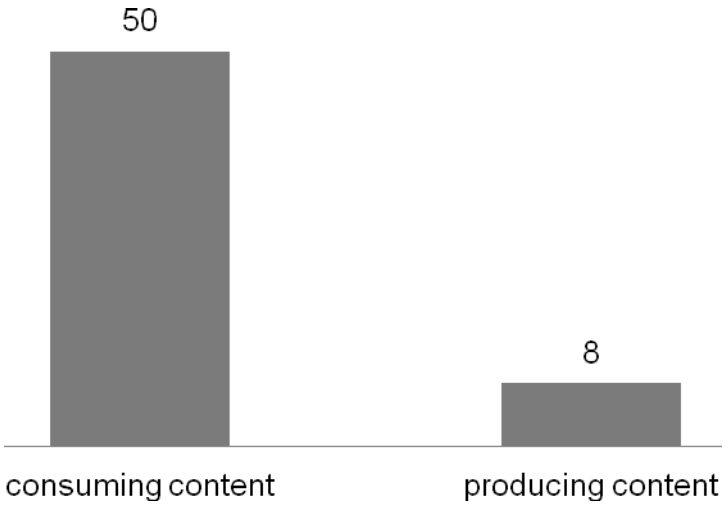

Figure 17. Number of participants giving Internet activities in Question 15 a rank of 1 (i.e., most preferred activity).

4.3.2.4 Digital Technology/Tool-Based Internet Activity

After completing the focus groups and interviews it became apparent that the Internet activities participants engaged in could be categorized further based on the type of digital technology/tool participants used. Table 2 summarizes these activities and is provided in section 4.2.2.1. I decided to include the table there as it more closely aligns with research question one, but it also applies to research question two and so I reintroduce it here. In summary, participants engaged in a number of disparate activities when using Internet-based digital technologies and tools. These activities included 1) researching (searching for and finding information), 2) learning (acquiring knowledge and skills), 3) communicating (connecting to others asynchronously and synchronously), 4) being entertained (watching videos, playing games, listening to music), 5)

working (completing school work, i.e., assignments and tasks), 6) creating (digital content), 7) networking (contributing to blogs/wikis, posting to and commenting on social networking sites), 8) aggregating (collecting and consolidating information), and 9) organizing (managing time, calendaring).

4.3.3 Preferred Use of Internet for Learning

Question 16 of the survey asked participants to specify how they prefer to use the Internet for learning (formal or informal), if at all. Fifty-eight of the 63 participants said they do like to use the Internet for learning.

Participants were asked to comment on how they liked to use the Internet for learning. Note: only those participants who liked to use the Internet for learning (58 of 63) provided comments. Some participants provided multiple comments that could be placed into more than one category. Comments were collected, categorized, and consolidated. Table 3 provides a quantitative summary of the top categorized and consolidated comments. Of the 58 participants who said they liked to use the Internet for learning, 38 cited reasons related to researching and searching for information (i.e., using a search engine or online library database to locate information [articles, web pages, news] and engage in discovery learning), 30 cited reasons related to engaging in formal online learning activities (i.e., connecting to a learning management system and completing assigned tasks), 16 cited reasons related to networking with peers (i.e., collaborating with groups, connecting and interacting with others via social networks for the purposes of learning something), and 15 cited reasons related to

consuming multimedia (i.e., watching online videos, listening to online audio for the purposes of learning something).

Table 3

Categorization and Consolidation of Most Frequent Comments by Participants Who Liked to Use the Internet for Learning

Q16: Specify how you like/prefer to use the Internet for learning (formal or informal learning)?		
Response	Category	Number
Like to use the Internet for Learning (N=58)	Researching and searching for information. Discovery learning.	38
	Engaging in formal online learning activities.	30
	Connecting, networking, collaborating, interacting with peers.	16
	Consuming online multimedia. Watching videos.	15
Note: Participants provided multiple comments that could be placed into more than one category.		

4.3.3 Traditional Text-Based Literacy

The focus groups and interviews provided more detailed information about how participants engaged in traditional, text-based literacy, whether online or in print. For the purposes of this study traditional literacy was defined as the ability to read and write alphanumeric text.

During the interviews participants were asked about their reading and writing habits and their preferences for engaging in reading and writing. Table 4 summarizes the interview participants' reading and writing preferences and contains selected quotes related to their reading and writing habits. All participants were able to read and write in English.

Seven of the 10 participants liked to read, while two did not, and one only liked to read sometimes. In general, participants read both on screen (i.e., electronically on a device) and off screen (i.e., books, magazines, newspapers), preferring off screen format particularly for long passages. Some participants did prefer to read on screen.

Six of the 10 participants liked to write, while three did not, and one only liked to write sometimes. In general, participants wrote both on the computer and on paper. Most participants preferred to write on a computer, but some participants preferred to write on paper.

Participants cited wanting to learn something new and interest as reasons for engaging in reading and writing.

Table 4

Interview Participants' Reading and Writing Habits and Preferences (N=10)

Participant	Like Reading	Like Writing
Student 1	No	No
(Interview, Nov. 22, 2011)	"I'm not a big reader." "I prefer to read something physical [book] rather than online." "I only write when I have to. I'm not a big writing fan either." "I tend to not absorb the material when I read it by myself… If I had a program online where I had the text and the reading… plug in headphones and listen to it and follow along as it is reading… I think I'd learn from that a lot better."	
Student 2	Yes	No
(Interview, Nov. 22, 2011)	"[I like to read but] it has to be something I'm interested in." "For my pleasure reading I probably read it more in book format, but for course material it really doesn't bother me if it is on paper or on screen." "… as far as pleasure goes [I write] very, very little." "[I write] on the computer for sure. I find it a lot easier."	
Student 3	Yes	Yes
(Interview, Nov. 24, 2011)	"I read everyday regardless." "During the school year [I read] more online, but during the summer it's probably more in book format." "[I] read on the iPad every now and again." "For longer things [I prefer] book format… but if it is something short then I don't mind reading it online." "I write quite a bit. Probably write almost every day as well. Not as much as I read, but I do like to write. I only use the computer though for writing... I think because I started doing it at such a young age I'm always going to prefer it that way."	

Participant	Like Reading	Like Writing
Student 4	Yes	Yes
(Interview, Nov. 24, 2011)	"I find that I read more when I was younger. I think it's because of what everything is happening now. Like we have so much technology. I miss it because I used to love reading." "[I prefer a book] because I find I'm more focused when I'm off screen." "Interesting things I find I like [to write about]… any interesting topic like we learn in class." "I find now that I mostly type, write online, but when I was not in college I used to write on paper."	
Student 5	Yes	Yes
(Interview, Dec. 1, 2011)	"I'd say I like to read. If I have a good book, I'll read it." "I'll read something everyday…" "Since I don't have a tablet or ebook [reader] and the laptop takes a while to load, I use a book." "It doesn't matter [whether I read online or not]; it's just that the Internet makes finding reading material easier." "I'd say I like to write." "I have no preference [whether I write online or on paper]."	
Student 6	Yes	Yes
(Interview, Dec. 1, 2011)	"I usually like to read about sports, and then how to do things." "[I read] online mostly. Sometimes I'll pick up a magazine." "I prefer to write essays. I prefer to do it handwritten actually, rather than having a laptop. I like the feel of it. I'm not a fast typer."	
Student 7	Sometimes	Yes
(Interview, Dec. 5, 2011)	"[I read] leisurely…I read [for school], but I don't necessarily enjoy it." "I don't necessarily like [reading online], I'd rather physically have a book… short reading is fine [online]… news articles… like smaller articles." "I do like to write [on paper]. I think the tangibility of it and me being able to just walk around and having the freedom of just writing whatever I want as opposed to being strapped to the computer… I know you can do it on a laptop, but I don't carry a laptop around."	

Participant	Like Reading	Like Writing
Student 8	Yes	Yes
(Interview, Dec. 5, 2011)	"I like to read anything from fantasy and science fiction… blogs sometimes." "I prefer a book… I think when it comes to learning I like ebooks better." "[I read] everyday. I'm a fast reader so I go through multiple books a week." "I do a lot of creative writing… I do it on my blog. I also have a journal set up on my computer." "[I prefer to write on a computer]. I can do it much faster, it's more legible… my [hand] writing is not the best."	
Student 9	No	Sometimes
(Interview, Dec. 6, 2011)	"I'm actually really bad at reading… I read what I have to read. I'm very slow at reading." "I usually read… on the computer, and if it's actually a good article for what I need, then I print it off and [read] the rest of it." "If I have to read something that is not getting to the point, I wouldn't like reading it, but if it's long information that has a lot of good facts and stuff, then I wouldn't mind reading it." "[I like to write] sometimes… I prefer typing though… I prefer to speak to someone."	
Student 10	Yes	No
(Interview, Dec. 8, 2011)	"This semester I started reading a lot… I'm starting to enjoy reading now… Maybe it's because I got pushed into reading more, because I had to read… it's pretty interesting… like learning." "[I read] because I like to learn new things." "[I write] because I have to. I'd rather read than write." "Sometimes I write first on paper and then put it on the laptop. But if I'm in a rush I just use the laptop."	

4.3.4 Multiple Literacy Learning

The focus groups and interviews provided additional information about how participants engaged in learning using multiple literacies. For the purposes of this study multiple literacies are defined as those that include traditional, text-based literacy as well as other forms of literacy (e.g., digital, media, information, social). Multiple literacies enable learners to make meaning using a variety of media (e.g., print, digital) and modes (e.g., text, images, audio, video).

During the interviews participants were asked about how they acquire and construct knowledge, how they prefer to learn something new, and how they interact with others.

In general, participants used multiple literacies in the process of learning. For example, one participant described his learning process as follows:

> [I] just read a little bit first, using Google or Wikipedia. Then I start using links and get into deeper things. Like I usually just read it over to see if I want to do this, then I might watch a video or something, then I start trying to do it myself. (Student #5, Interview, December 1, 2011)

Combining older traditional literacies and newer digital literacies was common among participations. Student #5 went on to say “[I like] the combination. Typically break the ice by reading first, then I watch a video… I don’t have one learning style, I can adapt and use many” (Interview, December 1, 2011). Student #6, when asked about his preferred ways of learning something, said

“Listening would be the first, watching the second, reading the third, and then doing” (Interview, December 1, 2011). Student #10, when asked a similar question, said “I think a combination because you can learn by watching, but there is stuff you need to learn by reading” (Interview, December 8, 2011).

Learning by doing was also a common theme. As explicitly stated in the quotes above, Students #5 and #6 expressed the need to engage in practical application of their new learning. Other participants felt the same way. Student #8, when asked about her preferred ways of knowing, commented “[I like] watching and actually doing it… I’m apparently a kinesthetic/visual learner; I’m a mix of two. So, I both have to see it and do it myself” (Interview, December 5, 2011). Student #2, when asked to rank a variety of learning preferences (e.g., watching, listening, reading) commented “Watching would definitely be first… If I could add ‘doing it’ that would be in there with watching as well. I kind of like to see how it is done and then do it myself, that type of thing” (Interview, November 22, 2011). Student #1 commented “[I] like to do a visual and then apply the visual to [the] practical” (Interview, November 22, 2011).

Visualization was a common theme. Many participants commented they prefer, as part of their learning process, to watch something to help them achieve a learning objective. One participant in Focus Group #5 commented “I love watching stuff. I think I learn things so much easier when I see it instead of [just] read about it” (November 22, 2011). Student #8 commented “I learn better when I can see something being done rather than it being explained to me. So, to go

onto YouTube, there are a million videos on just about any topic" (Interview, December 5, 2011).

Many participants felt the need to be collaborating with others and involved in social processes while learning. One participant commented "I find when I have people around me I work more. If I'm just by myself I usually do other stuff. I don't really do my schoolwork" (Student #9, Interview, December 6, 2011). Another participant commented "I do like the social… I'm a very social person, so I do enjoy face to face, but I also do enjoy online too" (Student #4, Interview, November 29, 2011). The recognition of the affordances of both face to face and online collaboration was felt by others. Student #7 commented "I'm kinda split, like face to face is great for you to get to form somewhat of a bond. Online, too, though is convenient because there are so many people that have conflicting schedules" (Interview, December 5, 2011). Participants in Focus Group #1 noted that they would much rather meet socially face to face, but that it was "so much more efficient to do everything online" (October 31, 2011). The recognition of the affordances of the Internet as an enabler of social activity was also prevalent. Student #3 commented

> I think every year we had one project that was a class project, where everyone had to do their part online and then we would all combine it at the end of the year kind of thing. So, I don't think we would be able to do that without the Internet. (Interview, November 24, 2011)

Participants were involved in a variety of social activities/communities enabled by the Internet. Student #2 described how his high school friends were able to continue gaming together as they moved on to post-secondary education in various cities:

> There's actually a campaign where all of us are online. We don't actually meet in person because we are all in different cities. Occasionally like two people will go over to one person's house and both of them will be there, but the rest of us will be online…So, we are all now all over the place, but we didn't stop. So we said "alright", we found a couple of programs online to use and we'll use Skype to do the voice. (Interview, November 22, 2011)

Student #9 described how his friends got together face to face to engage in multi-player gaming with others online:

> Sometimes we [friends] are in the same location. Sometimes we take two TVs and put two PlayStations together, each PlayStation can hold two people. But in a game you can have four people, so if you have two different PlayStations with two people, then all four of you can play together. (Interview, December 6, 2011)

Student #9 went on to describe how his friends would invite other players from around the world, who they had never met, to join in their game play. Student #6 described his involvement with an online fantasy league sports community and

the value he perceived from doing so: “It’s just, you know, for fun…just communicating with other guys from all over the world… it was a learning experience” (Interview, December 1, 2011). Student #7 described how her interest in antiques led her online to be involved with auction communities: “Misguided freight auction… or antique sales… I love searching for those… that’s how I started doing this…because there is no other way of finding out about these. So, randomly one day I put “auction in Toronto” [into Google]” (Interview, December 5, 2011). She went on to describe how online auction communities had opened up a whole new world for her.

4.3.5 Mental Effort

Question 17 of the survey asked participants to rate their perceived mental effort in performing a set of tasks. Paas (1992) defines mental effort as “the amount of capacity that is allocated to the instructional demands.” Salomon (1983) defines mental effort investment as “the number of nonautomatic elaborations applied to a unit of material… capturing the essence of such constructs as depth of processing and mindful processing.” Informed by these definitions, Question 17 asked participants to rate the energy they expend in concentrating on doing a set of tasks using Pass’s (1992) 9-point rating scale, which ranged from “1-very, very low mental effort” to “9-very, very high mental effort”. Eight tasks were listed: 1) reading traditional print-based media for 10 minutes, 2) reading digital media for 10 minutes, 3) writing using traditional print-based media for 10 minutes, 4) writing using digital media for 10 minutes, 5)

watching instructional videos for 10 minutes, 6) listening to online instruction for 10 minutes, 7) interacting with online content for 10 minutes, and 8) collaborating with others online for 10 minutes. Table 5 summarizes the descriptive statistics for Question 17.

Table 5

Descriptive Statistics for Perceived Mental Effort in Performing Tasks Listed in Question 17 Using a 9-Point Rating Scale

Task	Minimum	Maximum	Mean	Standard Deviation	Variance
Reading (print)	1	9	5.48	2.062	4.253
Reading (digital)	1	9	5.65	2.230	4.973
Writing (print)	1	9	5.56	2.291	5.251
Writing (digital)	1	9	5.54	2.278	5.188
Watching (online)	1	9	5.24	2.500	6.249
Listening (online)	1	9	5.25	2.552	6.515
Interacting (online)	1	9	5.83	2.091	4.372
Collaborating (online)	1	9	5.94	2.147	4.609
N=63					

A multiple factor without replication analysis of variance (ANOVA) was conducted to determine if any significant differences in mental effort existed between the tasks listed in Question 17, as well as between the participants doing the tasks listed in Question 17. There was no significant difference in mental effort between tasks [$F(7,62) = 1.24$, $p = 0.280$]; however, there was a significant difference in mental effort between participants [$F(62,7) = 6.41$, $p = 0.000$]. These results suggest that, collectively, participants found no one task more or less taxing (in terms of mental effort) than another, but that there were significant individual differences in perceived mental effort in performing the tasks. That is, taken collectively students appeared to expend the same amount of mental effort for each task; however, taken individually, students showed significant difference in the perceived mental effort they expended in performing each task.

4.3.6 Summary of Research Question Two Findings

Research question two explored how the digital age (particularly the Internet) has impacted knowledge acquisition and construction in young adult learners.

Participants valued the affordances of the Internet. All participants used the Internet on a daily basis. The modal value was 4 hours/day with approximately half that time used for school related purposes. Although participants were roughly the same age, the age and Grade in which they first started using the Internet, as well as the number of hours they used the Internet

per day (for personal and/or school use), varied widely. There was a strong relationship between the age participants first started using the Internet and the Grade participants first started using the Internet.

Participants engaged in a number of activities on the Internet. These activities can be categorized under the following headings: 1) researching (looking up, gathering, and aggregating information); 2) consuming (watching, listening, reading, being entertained); 3) connecting (social networking, interacting and collaborating with others); and 4) learning (reading, writing, completing learning tasks, using learning management systems and other teaching/learning technologies and tools).

In terms of common activities, participants spent the majority of their time engaged in non game-based entertainment (and they did so at mostly at a moderate level although some participants did so at light, heavy and extensive levels as well); followed by learning (and they did so mostly at a moderate level although some participants did so at light and heavy levels as well); and then social networking (and they did so mostly at a moderate level although some participants did so at light, heavy and extensive levels as well). Most participants (by count) were engaged in learning, followed by emailing (primarily at a light level although some participants did so at light and heavy levels as well), and then social networking and searching for and gathering information (equally split between light and moderate levels of engagement, although some participants did so at heavy and extensive levels as well). (Note: social networking and

searching for and gathering information were tied for the third most engaged in activity by count.) Most participants preferred to be engaged in non game-based and game-based entertainment on the Internet (with those participants engaged in game-based entertainment doing so at roughly equal proportions between light, moderate, heavy and extensive levels of engagement).

In terms of skill-based Internet activities, participants spent the majority of their time watching, followed by interacting, and then reading, and they did so primarily at moderate to extensive levels in each case. Most participants (by count) were engaged in watching, followed by reading, and then collaborating (with collaborating being engaged in at roughly equal proportions at light, moderate and heavy levels). The majority of participants preferred to be engaged in watching, followed by interacting, with reading and collaborating tied for the third most preferred mode-based activity.

In terms of the consumption and production of content, participants spent the majority of their time consuming content on the Internet rather than producing content (72% versus 28%, respectively) and preferred to consume online content rather than produce it. Participants consumed content primarily at an extensive level, while they produced content at all engagement levels (light, moderate, heavy and extensive).

Participants valued the affordances of both traditional, text-based literacy as well as newer, digital literacies, and used multiple literacies in the process of acquiring and constructing knowledge.

In terms of mental effort in performing certain tasks (e.g., reading online versus reading off line; writing online versus writing on paper; watching; listening; interacting; collaborating), participants, collectively, found no one task more taxing to perform than another (i.e., there was no significant difference between tasks); however, individually, participants varied widely in the mental effort expended per task (i.e., there were significant individual differences among participants in performing said tasks).

4.4 Research Question Three Findings

The third research question was: Given the findings of this study, how should college post-secondary educational curricula and practice be designed or re-designed to support young adult learners?

This question was an emergent one in that possible answers revealed themselves during the review of the findings. Further, this question was a practical one and was designed to inform the researcher's own practice. An initial exploration of this question was done through some focus group and interview questioning. Participants were asked to reflect on their ideal learning environment, to comment on how they like to be evaluated, to provide examples of effective and ineffective instruction using digital technologies that they had experienced, and to provide advice for instructors looking to incorporate digital technologies in their teaching.

4.4.1 Ideal Learning Environment

Participants were asked to reflect on their ideal learning environment in the focus groups and interviews. There was no consensus as to what constituted an ideal learning environment. Participants described a variety of characteristics they found contributed to an ideal learning environment. Student #1 commented:

> It would be interactive, extremely interactive. Instead of textbooks we could use tablets… You could upload the text into the tablet, the tablet could be interactive. You could read it if there is a key word, a definition, you could click on it and it would pop up a video or pop up a multimedia kind of thing. That would be perfect for me; it's interactive, it's interesting, it's more than one dimension. (Interview, November 22)

Student #3 commented "I like small classrooms. I like being able to talk to my teacher and they knowing who I am" (Interview, November 24, 2011). Participants described a variety of components they found contributed to an ideal learning environment. Student #6 commented "[I like] having the classroom there, definitely having socialization with students, getting the teacher too. Content is very important" (Interview, December 1, 2011). Student #10 commented "I like those classes where you have the lecture one day and then you do online the next day" (Interview, December 8, 2011).

In general, participants described a mix of characteristics (e.g., interactive, hands-on, social, interesting) and components (e.g., classroom [physical or online], teacher, students, content) that collectively made up an ideal learning

environment. Student #5 commented “My ideal learning environment would be something like my marketing course, where everything is perfectly balanced… classroom participation, teacher lecture, in-class activity, taking notes, watching the video. I don’t mind a PowerPoint every now and then” (Interview, December 1, 2011). Student #5 went on to say

> In-class I like to be the backbone of the learning experience – teacher/student interaction – and for the online to be something to support what we learned in class, like an FAQ, ask a simple question… get some documents online, that kind of thing. (Interview, December 1, 2011)

The characteristics and components mentioned by participants were those associated with both older, more traditional educational practice (e.g., physical classroom, lecturing, print-based content) as well as those associated with newer, more innovative educational practice (e.g., online classroom, active learning, digital content). Participants preferred a mix of older and newer educational practices. Further, there were individual differences in the way participants preferred these educational practices, characteristics, and components to be mixed.

4.4.2 Evaluation Preferences

In the focus groups and interviews participants were asked to describe how they preferred to be evaluated. There was no consensus as to how participants preferred to be evaluated. Participants described a variety of

preferred ways, consisting of both older, more traditional evaluation methods, and newer, alternative evaluation methods.

In terms of traditional evaluation methods, Student #5, when asked about evaluation preferences, commented

> I prefer the more traditional approach… something I've gotten very, very used to growing up. I've written a lot of essays before and I'm pretty good at them... I've made a few videos before and they usually don't turn out so well. (Interview, December 1, 2011).

One participant in Focus Group #6 (December 5, 2011) commented that she preferred tests because that is what she grew up with. A comfort level with traditional methods was a common theme among some participants. One participant commented that he liked to be evaluated using a traditional mode (i.e., writing), but that he also liked to do so using newer methods (i.e., digital journal): "I do like the [digital] journals, reflecting on the content you learned in class… I like writing" (Interview, December 1, 2011).

In terms of alternative evaluation methods, there were a variety of ways in which participants liked to be evaluated. Student #10 commented about his experience creating group multimedia presentations: "I enjoyed the [multimedia] presentations. I actually learned a lot… We included a video, some pictures, and just text" (Interview, December 8, 2011). Student #1 commented

> Best thing I've learned is presentations. I love doing presentations… Anything interactive I enjoy. So, if it is either making a video or building something or trying to see how something works… It makes the class more interesting…I can stand back and say, "Yeah, I created that." (Interview, November 22, 2011)

Student #4 described another memorable alternative evaluation task:

> We had a music video in high school that was on a specific theme. So, we worked as a group to create the video that we learned in class… so that was another nice way… showing people there's other ways to learn besides essays. (Interview, November 29, 2011)

Student #3 talked about a possible alternative evaluation task:

> I think it would be fine to even do like little skit things in front of the class, or make one and tape it, or bring it in and show the class, or post on YouTube and present it that way… do something creative. (Interview, November 24, 2011)

In addition to valuing a variety of evaluation methods, participants felt strongly that the evaluation task (regardless of method) should be relevant. Student #1 said "It [evaluation task] has to be constructive" (Interview, November 22, 2011). And Student #9 commented "[Evaluation task has to be] relevant to what I'm learning and relevant to the way I'm getting marked" (Interview, December 6, 2011).

4.4.3 Effective and Ineffective Instruction Using Digital Technologies

In the focus groups and interviews participants were asked to provide examples of effective and ineffective instruction using digital technologies that they had experienced**.** The majority of participants felt that digital technologies should be used. One participant in Focus Group #1 commented “I appreciate any use [of digital technology], to be honest. Any use is appreciated” (October 31, 2011). However, this sentiment was not unanimous. One participant in Focus Group #3 said “[The] classes I’m enjoying the most this semester are the ones that don’t use any digital media technology” (November 2, 2011).

Overall, participants felt that effective instruction involved using a variety of technologies coupled with a variety of teaching strategies and methodologies. When asked to provide an example of how an instructor had used digital technology well to aid learning, one participant replied:

> Okay, I would say my psychology class. Our teacher was really good not just in using PowerPoints, but using all different kinds [of technologies], like showing videos. She had assignments that were based on surveys that we had to do, we had an online response to certain questions, we also had online tests. So, I find that she used all different aspects not just one thing. (Student #4, Interview, November 29, 2011)

When asked to specifically explain what made his marketing class a good example of effective technology use, Student #5 replied “Because it was balanced. The teacher taught us material, we watched videos or PowerPoints

that helped reinforce that learning, and we talked about it in classroom discussions" (Interview, December 1, 2011).

Participants felt that digital technologies helped in the organization of their learning. When asked about why she enjoyed using a SMART Board, Student #8 commented "I think it was the whole, just how organized it was. It was very hands-on. As a student you would go up to the board and it was fun to sort of play around… at the end of the lesson you just save the document" (Interview, December 5, 2011). Student #10, when describing why he liked professors to use the institutional LMS, said "It's very organized. Much easier to see, instructions are there, it's more clear" (Interview, December 8, 2011).

In general, participants valued the use of an LMS by instructors. Student #9 commented "Some teachers don't put anything on [the institutional LMS], so I don't see how that is effective" (Interview, December 6, 2011). Student #7, when described an example of effective use of technology by a professor, said "But then on top of what he did in class he would have instructional videos that he would post on [the institutional LMS] that would take you through beyond what he did in class" (Interview, November 22, 2011). Student #6, when describing another example of effective use of technology, said

> Oh yeah, this teacher, she actually had a video in [the institutional LMS]. She cancelled the class, but she put a video there. Even though she couldn't do the class you could easily just go on [the institutional LMS] and

see what the next topic in class would be. That was really good. (Interview, December 1, 2011)

Overall, participants felt that ineffective instruction involved combining just one primary digital tool with just one teaching method. For many in this study, the tool was PowerPoint and the method was lecturing. Student #1, when describing an ineffective class, said

> Too much PowerPoint; too much talking [lecturing]…Yeah, PowerPoints, they kind of… work, but only if the professor is using them properly. So, if he is just sitting there lecturing – talking, talking, talking – and then the next slide – talk, talk, talk – no, it doesn't work. (Interview, November 22, 2011).

Student #5 commented

> The PowerPoints were a little bit distracting at times, because all that information can be found in the book. And the teacher is just usually explaining about the PowerPoint, not making sure the class actually knows the material. Another class was my organizational behavior class where literally everything on that PowerPoint was from the book. It became distracting; we could just read the book. And the teacher comes in and just reads off the PowerPoint, like reading off the book. What I would prefer is that we came into the class having already read that chapter, and then discuss it and maybe have an activity in class, because

> organizational behavior seemed to me to be a very hands-on course. (Interview, December 1, 2011)

Student #9 commented “Because I find most teachers they just read the text book to you on their PowerPoint slides, and I don’t see how that is effective, because I’m supposed to be reading that stuff by myself” (Interview, December 6, 2011). Student #2 commented “And then other teachers will barely use anything and just talk the entire class. Some teachers can do that very well, others can’t do it at all. You barely learn anything” (Interview, November 22, 2011). And Student #8 commented “I think plain text, reading off the PowerPoint sort of thing [is ineffective]. Not really explaining anything. Literally reading to the class” (Interview, December 5, 2011). In general, participants did value PowerPoints and lecturing, but not when they were used by instructors all the time as the only instructional tool and method.

4.4.4 Advice for Instructors

In the focus groups and interviews participants were asked to provide advice for instructors looking to incorporate digital technologies in their teaching.

Although participants, in general, valued instructor use of digital technologies in teaching, they did have some concerns about the amount of technology used and the purpose of the technology used. Student #5, when asked to provide advice to instructors in using digital technology, said

> I'd say go for it, but like anything else, you have to use it wisely, and you don't want to use it too much. And you become dependent in it. Or when students start becoming bored and start taking it for granted. (Interview, December 1, 2011).

Student #2 said "Ah, definitely use it [digital technology], but I would watch how you use it, because there definitely is too much" (Interview, November 22, 2011). Student #4 commented "I don't think everything has to be in the use of technology. There [are] a lot of other ways [to learn]" (Interview, November 29, 2011). One participant in Focus Group #3 said "Too much dependence on technology can lower motivation both for the students and for the teachers" (November 1, 2011). Another participant in Focus Group #3 commented "Sometimes the good old ways are still good" (November 1, 2011).

In general, participants wanted more content posted online. Student #3 commented "I think it would be nice if we had more posts online" (Interview, November 24, 2011). Student #6 said "post more things on [the institutional LMS] for one. Post answers to tests… so people can see what they did right and what they did wrong" (Interview, December 1, 2011). One participant wanted instructors to post more visuals online: "Show more pictures… videos, I guess" (Student #10, Interview, December 8, 2011).

Participants felt that instructors have a responsibility to model the effective use of digital technology, to use it wisely and creatively in their teaching. Student #3 commented "Make sure it works. Basically the same advice they [instructors]

give us before we do a PowerPoint. Like, be ready, make sure it works, know your room, know what's available to you in that room" (Interview, November 24, 2011). And Student #8, when providing advice about how digital technology should be used by instructors, commented

> Creativity is the best thing. Really show that you are into what you're teaching. And I think having just the base knowledge of everything and going through everything with the students… really use it as a conversation rather than you are lecturing… get them [students] involved… have a conversation. People remember conversations, but they don't really remember lectures. (Interview, December 5, 2011)

4.4.5 Summary of Research Question Three Findings

Research question three was an emergent question designed to help the researcher speculate on how post-secondary curricula and practice should be designed or re-designed based on the findings of this study. It was also a practical question.

In general, participants described a mix of characteristics (e.g., interactive, hands-on, social, interesting, relevant, organized), components (e.g., classroom [physical or online], teacher, students, content), and evaluation methods (essays, tests, multimedia presentations) that collectively made for effective teaching and learning. Further, this mix consisted of older, more traditional educational practice (e.g., physical classroom, lecturing, print-based content, essays and tests) as well as those associated with newer, more innovative educational

practice (e.g., online classroom, active learning, digital content, alternative evaluation methods). Participants preferred a mix of older and newer educational practices. When this mix was seen to be well balanced, participants felt learning was more interesting and relevant. There were individual differences, however, in the way participants preferred older and newer educational practices to be mixed.

Participants valued the use of digital technologies in teaching provided the technologies were used wisely and creatively. The coupling of appropriate digital technologies with appropriate teaching strategies and methods was seen as contributing to effective teaching. Participants wanted instructors to be proficient in the use of instructional technologies and to model effective technology use.

4.5 Key Themes

In Chapter Three (section 3.2.3.2) I described the coding process I used for the qualitative data in this study. The process resulted in the identification of key themes, which are shown in Table 6. The themes are included here as they represent key findings of this study.

Table 6

Outline Diagram of Key Themes Gleaned from the Qualitative Data

A. Go-to Technology		
	A1. Factors: convenience, connectivity (people and resources), reliance, ease of use, mobility, “whatever works”, relevance, practical, purposeful, proficiency, efficiency, comfort level	
	A2. Implications: Bring Your Own Device (BYOD)/Bring Your Own Application (BYOA) versus prescribed devices and tools	
B. Multiplicity		
	B1. Mix/balance of media/modes/literacies	
		B1.1. Other “multis”: multitasking, multisensory, multiple intelligences, multiple devices, multiple tools
	B2. Factors: flexibility, versatility, complexity, “fit” with learning preferences	
	B3. Wide variance in student preferences	
C. Transitioning		
	C1. Between old and new, passive and active learning	
		C.1.1 Legacy/traditionalism hangover
	C2. Impact/influence of school on student expectations/preferences	
	C3. Burgeoning prosumer/DIY/maker/mash-up culture	
D. Positive Sum		
	D1. Building (cognitive) capacity	
	D2. Enhancing engagement/interest/motivation	
	D3. Adding value	
E. Natural		
	E1. Learning as a human need/trait	
	E2. Learning that is authentic and that invokes passion/emotion	
	E3. Learning that appeals to all senses (multisensory)	
	E4. Learning that is social/conversational, creative, comfortable, curious	

Participants identified go-to digital devices and tools. Go-to devices and tools were those that participants preferred and opted to use first. As described earlier in this chapter, smart phones and laptops were considered go-to devices, while Google, YouTube, various game technologies, and the institutional learning management system were considered go-to tools. Many factors were identified by participants as to why they chose certain devices or tools, but for the most part go-to devices or tools were considered something participants relied on, felt comfortable with, were easily accessible, convenient, kept them connected (to both resources and people), and were easy to use, efficient, and purposeful. From an educational perspective, this theme may impact decisions around whether or not to adopt a bring your own device (BYOD) and/or bring your own application (BYOA) policy, or whether to go with institutionally prescribed and/or supplied technologies.

Participants used a multiplicity of media, modes, and literacies in their learning. Participants also varied widely in which media, modes, and literacies they preferred to use and in which proportion. The mix and balance among the media, modes, and literacies adopted by participants was complex, involving considerations for the multiple technologies participants used, the multiple senses each affected, and the multiple intelligences each addressed. Key factors suggested by participants in their choice of media, modes, and literacies were flexibility, versatility, and how well each fit with their learning preferences.

Participants hinted at being in a state of transition between old and new educational practices. Participants valued the affordances of both old and new educational practices. There was a sense that the type of educational practices the participants experienced in middle and secondary school (many of which could be classified as traditional educational practices, i.e., predicated on traditional classroom instruction using traditional literacy-based methods) influenced their post-secondary expectations and preferences to some degree. That is, generally speaking, participants felt comfortable with traditional education practices and expected to see the same in post-secondary education. However, participants were open to exploring new educational practices provided they piqued their interest and added value. There was also a sense that these new educational practices had not quite taken hold just yet and that there was a burgeoning prosumer/do-it-yourself/maker/mash-up culture waiting to come to the fore.

There was a sense that the mix of multiple media, modes, and literacies used by participants coupled with the use of go-to digital devices and tools as well as old and new educational practices resulted in positive sum outcomes. That is to say each device, tool, medium, mode, literacy, and practice provided an affordance that when taken collectively enhanced engagement and enabled participants to build learning capacity.

There was a sense that the mix of multiple media, modes, and literacies used by participants contributed to more natural learning. Participants hinted that

they felt comfortable in their chosen way of acquiring and constructing knowledge, that they had a variety of ways of doing so available to them, that learning using multiple literacies (via multiple media and modes) was easier, more convenient, more interesting, more in keeping with their natural ways of engaging in and perceiving the world around them.

4.6 Summary

In this chapter an overview of the participants and the quantitative and qualitative instrument types was presented, along with the quantitative and qualitative findings by research question, and the main identified themes of the study. In the next chapter, the research findings are interpreted and discussed.

CHAPTER FIVE: INTERPRETATION AND DISCUSSION

The final step in Convergent Parallel Design involves the interpretation of the findings of the merged qualitative and quantitative data in order to more fully analyze the research questions. In this chapter I present my interpretation of the findings of the study and discuss the relevance of these findings in the post-secondary context in which I work as a college educator.

5.1 Overview

In Chapter One I described the purpose of this research: to examine how young adult learners acquire and construct knowledge in a digital age in a post-secondary context. The three research questions under study were:

1. What digital devices and technologies/tools do young adult learners use for learning and why?
2. How is the digital age (particularly the widespread use of the Internet) impacting knowledge acquisition and construction in young adult learners?
3. Given the findings of this study, how should college post-secondary educational curricula and practice be designed or re-designed to support young adult learners?

In Chapter Four I presented the findings of the research (with respect to the research questions above) obtained from 63 college participants who were attending a single Ontario college and taking a wide range of programs, who

were under the age of 24, and who were using digital tools/technologies in their learning.

In Chapter Five I interpret the findings, list some recommendations for post-secondary educators and institutions, discuss some limitations of this study, and suggest possible further research. The interpretation process begins with a review of the key themes identified in the study and then explores these themes in the context of each research question. With respect to each research question, I begin with a restatement of the research question, followed by a discussion/interpretation of the findings related to that research question.

5.2 Review of Key Themes

In Chapter Four (section 4.5) I outlined five key themes gleaned from the qualitative data. They are: 1) participants identified and used go-to digital devices and tools; 2) participants used a multiplicity of media, modes, and literacies in their learning; 3) participants valued the affordances of old and new educational practices and thus felt to be in a state of transition; 4) participants' use of multiple media, modes, and literacies led to positive sum outcomes; and 5) the mix of media, modes, and literacies used by participants resulted in more natural learning.

5.3 Research Question One Interpretation

The first research question was: What digital devices and technologies/tools do young adult learners use for learning and why?

The findings of this study showed that participants used a variety of digital devices and tools in their learning for a variety of reasons. The devices and tools used were primarily Internet-enabled and their use was based on a wide range of desired activities in which participants wished to engage. Certain devices and tools were more commonly used among participants. Laptops and smart phones were considered go-to devices (most often owned and used), while Google, YouTube, gaming applications, and the institutional Learning Management System (LMS) were considered go-to tools (most often used).

The findings suggest that there are two disparate tendencies occurring with respect to digital device and tool use. On the one hand there are a small number of dominant devices and tools used by the majority of participants, but on the other hand there are a large number of fringe/niche devices and tools used by only a few individuals. In other words there is a large amount of individual difference in terms of the digital devices and tools participants used (with more difference exhibited in digital tool use given that there are many more digital tools available than digital devices). This high and low frequency digital device and tool use can be described by the probability distribution known as the *long tail* (see Figure 18). In his book *The Long Tail,* Anderson (2006) used the example of the change in the economics of the music industry brought about by the Internet to describe the long tail concept. He posited that there are a few popular artists who sell millions of songs/records (high-frequency), but there are also many, many niche artists who sell marginally (low-frequency). Taken collectively, however, the volume of niche artist sales rivals that of the volume of the popular artist sales.

As such, niche artists cannot be ignored as a market force in the music industry. This is made possible by the Internet, which provides a low cost distribution medium for niche artists, and, in turn, makes much more music available to potential buyers.

The concept of the long tail can be applied to digital device and tool use in education. As mentioned above, there were a few devices and tools that were used often by the participants in the study, but there were also many more devices and tools used marginally by participants. In Figure 18 the digital devices and tools identified by participants in this study are shown mapped to the long tail probability distribution. Figure 18 shows, for example, that the vast majority of participants owned a laptop and used YouTube and Google, but only a small number of participants owned an eReader or used Tumblr. Nonetheless, the large amount of choice and availability of the niche devices and tools suggests that they should not be ignored given that participants valued them and the affordances each provided.

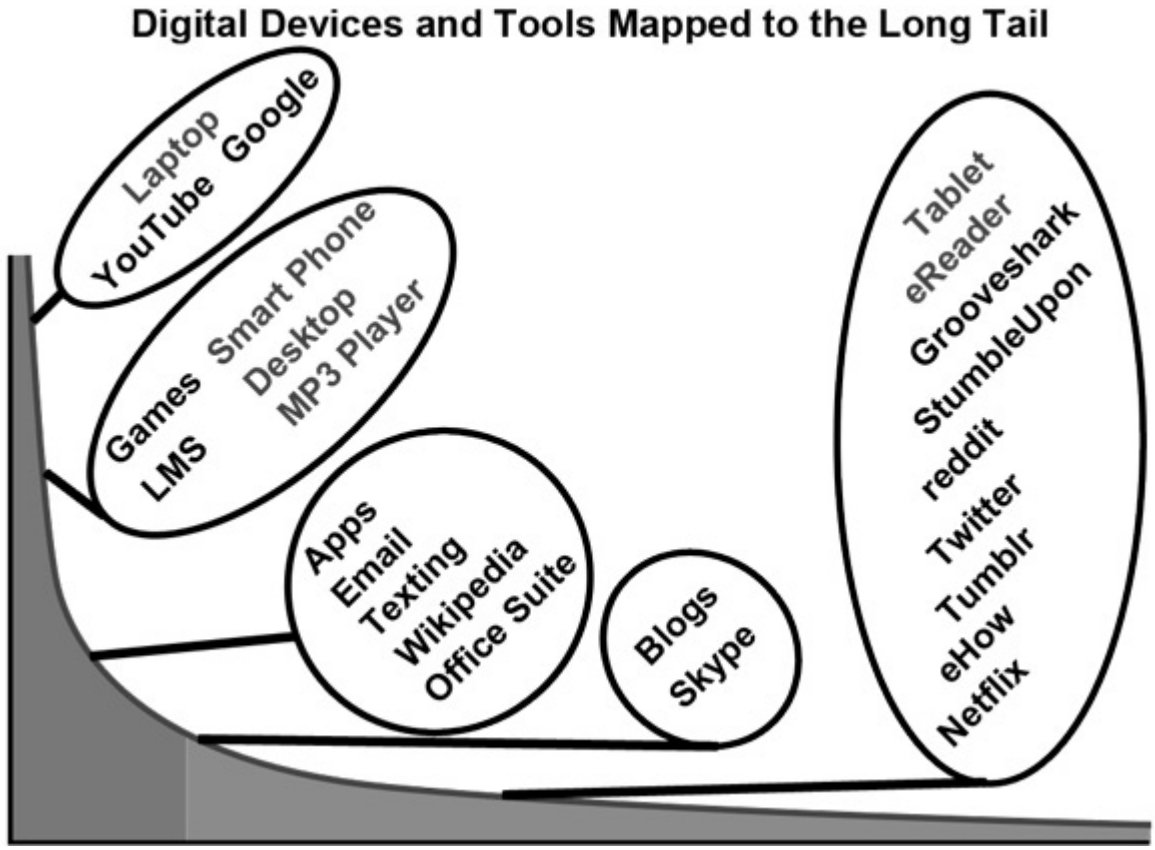

Figure 18. Digital devices and tools identified by participants in this study mapped to the Long Tail probability distribution.

From an educational perspective the long tail concept implies that consideration should be given to both students collectively and students individually. For example, the findings of this study showed that: 1) collectively, students use and value the affordances of the institutional learning management system (as have other studies [see Lopes, 2009]); and 2) individually, students use and value a variety of other niche digital tools. As such, educators may want to ensure that they use a mix of dominant tools (e.g., LMS) in combination with niche tools in order to address the expectations of students.

The large amount of individual difference in terms of digital devices and tools owned and used, as well as the activities engaged in while using these devices and tools (as indicated in the findings of this study), has implications for future educational practice. For one, there is no simply way in which to categorize students. The tendency has been to try and label students based on perceived attributes and behaviours. Prensky (2001), for example, has suggested that students born in the digital era (which can be defined loosely as beginning in the early 1980s) have grown up with technology, use it constantly, and as a result "think and process information fundamentally differently from their predecessors" (p. 1). He labeled this group "Digital Natives". Oblinger and Oblinger (2005) have suggested that young people born into the digital age can intuitively use digital devices and tools, are more visual learners, and are more connected. They labeled this group as the "Net Generation". The findings of this study suggest that young adult learners are a more complex group than these authors claim. Further, the attributes described above may not be exclusive to young adult learners. Young adult learners may not all be intuitive users of technology, they may not all be visual learners, they may not all be connected, and they may not all think differently, while older learners may in fact be intuitive users of technology, more visual learners, more connected, and think differently. More recent research has supported this assertion. Helsper and Enyon (2010) posited that "Although young people do use the Internet more, our analysis does not support the view that there are unbridgeable differences between those who

can be classified as digital natives or digital immigrants based on when they are born" (p. 517). Jones, Ramanau, Cross, and Healing (2010) suggested that:

> It is far too simplistic to describe young first-year students born after 1983 as a single generation…[this] generation is not homogenous in its use and appreciation of new technologies and that there are significant variations amongst students that lie within the Net generation age band. (p. 722)

Jenson, Taylor, and Fisher (2010) in reviewing the literature concluded that little empirical evidence exists to support the digital native and net generation claims and that other factors (such as socio-economic factors) are much more determinants of technological adeptness than age. It appears, then, age is not an appropriate basis in which to distinguish between student groups. A more apt way may be to base differences on affinity (i.e., the comfort level and use of digital technologies and tools can be explained more accurately based on predilection or interest rather than age). Regardless, as the evidence suggests, identifying difference based on a single factor (e.g., age or affinity) is problematic given the complexities of the multitude of factors at play.

Another conception that the findings of this study contradict is that young adult learners have certain learning attitudes and preferences (influenced by the digital age in which they have grown up) that are at odds with traditional educational practice. For example, popular thought (see Tapscott, 1998)

suggests young learners prefer active inquiry using digital devices and tools as opposed to passive traditional teaching methods (such as lectures), and, from an assessment perspective, for example, that they prefer creating videos or Web sites as opposed to traditional assessment methods (such as writing essays). The findings of this study indicated that this is not necessarily the case (some participants did and some did not). Participants in this study appreciated both old and new educational practices with their attitudes and preferences highly influenced by their prior educational experiences. Other researchers have found this as well. For example, Margaryan, Littlejohn, and Vojt (2011) found no evidence "to support popular claims that young people adopt radically different learning styles" (p. 429), and, in fact, found that university "students appear to conform to traditional pedagogies" (p. 429). As a result it would be imperative that post-secondary educators use evidence rather than assumption when designing learning experiences for young adults, and that they use a mix of teaching methods and assessment techniques.

In terms of digital device ownership and use, the findings of this study are similar to other studies conducted at roughly the same time. Dahlstrom, Dziuban, and Walker (2012) in conducting the 2012 ECAR *Study of Undergraduate Students and Information Technology* (using data collected early in 2012, a few months after the data collected in this study) found that laptops and smart phones were the most commonly owned student devices (86% and 62%, respectively). (Refer to Figure 3 in Chapter Four for a comparison of the similar findings between this study and the 2012 ECAR study.) Kobus, Rietveld, and van

Ommeren (2013) in conducting a survey of Dutch university students (in November 2011, one month after the data were collected in this study) also found that laptops and smart phones were the most commonly owned student devices (83.8% and 67.9%, respectively). Table 7 provides a comparison of findings in terms of popular device ownership between this study, the ECAR 2012 study, and the Dutch study.

Table 7

Comparison of Findings Between Three Studies in Terms of Post-Secondary Student Digital Device Ownership

Popular Device	This Study	2012 ECAR Study	Dutch Study
Laptop	89%	86%	83.6%
Smart phone	68%	62%	67.9%
Tablet	8%	15%	7.2%
Study Information			
Data collected	October, 2011	February- April, 2012	November, 2011
Sample Size	63	106,575	3,132

The findings are consistent and show that laptops are the dominant device, followed by smart phones and then tablets. More recent data, such as the 2013 ECAR study (Dahlstrom, Walker, & Dziuban, 2013) and the 2014 ECAR

study (Dahlstrom & Bichsel, 2014), show that laptops remain the dominant device, followed by smart phones and then tablets, but that smart phones and tablets are gaining traction. Nonetheless, laptops remain, according to students, the most important device for academic success (Dalstrom & Bichsel, 2014).

There has been a push in education to adopt certain exclusive devices in classrooms. Some institutions have required the use of laptops in certain programs; some institutions are implementing tablet programs. Given the findings of this study (that students prefer to use a wide range of devices and tools, while doing a wide range of activities), prescribing one technology over another seems problematic. This is not to say that prescribing the use of some technology is a bad idea as the integration of technology in curriculum is now considered fundamental. However, there is a tendency when prescribing the use of a device to design learning more so around the device rather than around the intended learning outcomes or objectives. As such, a bring-your-own-device (BYOD) and bring-your-own-application (BYOA) approach may be more in keeping with the preferences of young adult learners and the way they learn. In fact, a more suitable approach may be to adopt a bring-your-own-devices (BYODs) and bring-your-own-applications (BYOAs) strategy given that students use a multitude of devices and tools in their learning. This conclusion is based primarily from a learning perspective. The researcher recognizes that there are other important factors (e.g., support, economics, fit with industry) that impact the decision to prescribe a certain device. Nonetheless, it may be more appropriate to recommend certain devices and applications (plural) in a given program of study.

Further, within a given program of study it may be more appropriate to design learning activities that are device and application agnostic, which is consistent with the bring-your-own-everything (BYOE) trend (Dahlstrom & Bichsel, 2014; Dix, 2010).

5.4 Research Question Two Interpretation

The second research question was: How is the digital age (particularly the widespread use of the Internet) impacting knowledge acquisition and construction in young adult learners?

The findings of this study showed that participants valued the affordances of the Internet. All participants used the Internet on a daily basis and engaged in a variety of activities on the Internet. Participants spent the majority of their time on the Internet consuming content, but also spent a meaningful amount of time producing content on the Internet. These findings indicate that the Internet has become a de facto part of students' day to day lives, and with that there is an expectation that the Internet is an integral part of knowledge acquisition and construction.

The findings of this study also showed that participants valued the affordances of both traditional, text-based literacy as well as newer, digital literacies in the process of acquiring and constructing knowledge. Further, participants used multiple modes, media, and literacies while acquiring and

constructing knowledge. Given the multiplicity of modes, media, and literacies used by participants (enabled by the Internet), it raises questions about what constitutes literacy in a digital age. Many higher education institutions have begun to embed in policy a common set of competencies (i.e., a mix of knowledge, skills, attributes) that graduates will exhibit after completion of a given program of study. Many have termed this set of competencies *core literacies*. The University of California, Davis ("General Education Requirement", n.d.), for example, outlines four core literacies (literacy with words and images; civic and cultural literacy; quantitative literacy; and scientific literacy) as part of a general education requirement. Rowan University (2013) outlines six core literacies (artistic literacy; communicative literacy; global literacy; humanistic literacy; quantitative literacy; and scientific literacy) as part of a new general education model. Seneca College (2012) outlines 10 core literacies (written communication; oral communication; quantitative literacy; information literacy; creative thinking; ethical reasoning, personal and social responsibility; inquiry and analysis; critical thinking and problem solving; digital literacy; and intercultural knowledge and global perspective) in its 2012-2017 Academic Plan. There is little question that the competencies described above are important, but are they all literacies? It would appear some clarity of definition is needed.

As described in Chapter Two, literacy is not a static construct and has undergone considerable change in meaning over the past couple of decades. The traditional view of literacy as a singular construct (i.e., text-, skill-, and language- based resulting in the ability to read and write) has evolved to become

a plural construct (i.e., involving a set of complementary skills and attributes) so that we now speak in terms of multiple-literacies as opposed to a single literacy. Further, modern literacy now includes social and technological aspects as well so that we now speak of a literate individual being able to communicate in a variety of social settings using a variety of devices, tools, media, and modes. In essence, literacy has grown to include many more components and many more types. What, then, are the components and types that could be considered for inclusion under the literacy umbrella?

One possible starting point in which to explore this question would be to think of the mix of components and types as *meta-literacy*; in other words as a literacy of literacies. The term meta-literacy, then, becomes the umbrella under which the components and types reside. The term meta-literacy has been used by others. Mackey and Jacobson (2011) used the term metaliteracy to describe a framework for information literacy related to the digital world, specifically the critical consumption, production, and sharing of information online. Lotherington (2004) used the term metaliteracy to describe a process in which children use a variety of digital literacies to make and convey meaning (which she referred to as digital metaliteracies). In contrast, the term meta-literacy in this exploration is used to encompass more than the literacies that fall under the information or digital literacy constructs. Nonetheless, it is useful to think of literacy in terms of the consumption, production, and sharing of knowledge, information, and ideas in multiple ways as it highlights the communicative aspect of literacy.

The next step would be to explore the components in common between various literacy types. Using the premise that literacy involves some form of communication, common among literacies is some kind of invention and/or technology that aids communication. The invention of language, for example, provides a means for communication in oral cultures, as do the inventions of the alphabet and printing in literate cultures, and the invention of electronic computer networks in digital cultures. (It is important to note, too, that earlier inventions remain relevant in subsequent cultures. For example, language remains relevant in literate and digital cultures, as does the alphabet in digital cultures.) Other common components among literacies include the use of a dominant medium and the use of a dominant mode to aid communication. At this stage it would be useful to clarify what is meant by the terms “media” and “modes”. Lauer (2009), using Kress and Van Leeuwen’s (2001) work as a guide, posited that media are the means by which information is disseminated, while modes are the means by which information is represented. Examples of dominant media would include: air — through which sound waves propagate — (in oral cultures); print (in literate cultures); and the Internet (in digital cultures). Examples of dominant modes would include: the spoken word (speech) in oral cultures; the printed word (text) in literate cultures; and the screen in digital cultures. (Again, it is important to note that modes are not exclusive to a particular culture. For example, speech is an important for communication in literate and digital cultures, as is text in digital cultures.) The distinction between media and modes can be imprecise. Lauer (2009), for example, posited that the distinction between the two depends more

so upon the context and audience in which each is used rather than in defined difference. (Note: Lauer's conclusion was based on the terms "multimedia" and "multimodal" as opposed to "media" and "modes".) The use of the word "screen", for example, as a mode may cause some debate, but it is based here on the notion that the digital information participants consume is represented on the screens of the various digital devices (i.e., laptops, smart phones, tablets) they choose to use. The term "text", as well, may cause some confusion. Some authors (Rowsell [2013] for example) use the term "text" to mean any produced artifact. As such, digital images, words, and animations, for example, could be considered "texts". In this study the term "text" is used literally; that is, to represent words.

Another common component among literacies is the dominant sense each uses to aid communication. In oral cultures sound is the dominant sense. In literate cultures sight is the dominant sense. In digital cultures, it is not as clear as to what the dominant sense is. Sight and sound seem to be equally dominant. Further, given the increase in haptic technologies, touch is also worthy of consideration as a meaningful sense used in digital cultures. It is worth noting that other senses are used to aid communication in other cultural contexts (oral, literate, digital), but there tends to be a dominant sense used (or in the case of digital cultures a couple of dominant senses).

The final common component among literacies used to aid communication discussed here is that of the consumption and production of informational

artifacts. (Note: the researcher recognizes that there are most likely other common components shared among literacy types, but the ones described above form the core of meta-literacy.) Each literacy type contains the means for individuals to both consume and produce content/information/knowledge (that is to make and convey meaning) using the dominant medium and mode of a given literacy type. In oral cultures the spoken word is both uttered and heard. In literate cultures the printed word is both read and written. In digital cultures informational artifacts, such as videos, are both consumed and produced.

The components listed above (i.e., dominant invention/technology; dominant medium; dominant mode; dominant sense(s); and the ability to consume and produce meaningful communicative artifacts in a dominant medium and mode) provide a means in which to identify true literacy types. Earlier a number of core literacies were described. Examples included civic and cultural literacy, global literacy, and ethical reasoning. Each is a noble awareness and/or attribute, but are they true literacies given the criteria listed above? Proposed here is a more specific classification of what constitutes a literacy type. In this case, after applying the criteria, civic and cultural literacy, global literacy, and ethical reasoning (and the like) would not be considered true literacy types. They may more aptly be described as awarenesses and/or competencies and/or attributes and/or ways of being.

What, then, are true, specific literacy types? After applying the component criteria described above, three predominant literacy types have been identified;

namely, orality, traditional literacy, and digital literacy. The researcher recognizes that there may be additional literacy types that could be included. Ohler (n.d.), for example, included “Art” as an essential literacy type along with “Digital”, “Oral” and “Written” literacies in what he referred to as the DAOW of literacy. Bolter (1998) and Elkins (2009) argued that visual literacy should be considered an essential literacy because of the importance of imagery in our everyday lives. Bolter (1998) suggested this is particularly important in a digital age. He wrote: “Literacy in electronic environments may have more to do with the production and consumption of images than the reading and writing of either hypertext or linear prose” (p. 7). Elkins (2009) called for the valuing of images (as objects that convey meaning and enable meaning making) in post-secondary education in the same way that text has been valued. It could be argued, too, that quantitative competency should be included as an essential literacy. Nonetheless artistic, visual, and quantitative competence are excluded as specific literacy types in this re-conceptualized meta-literacy framework because 1) they meet some, but not all, of the component criteria listed above (e.g., artistic competence), and/or 2) they are closely aligned with one of the three literacy types identified (e.g., quantitative competence with traditional literacy), and/or 3) they span all three identified literacy types (e.g., visual competence). For example, it could be argued that artistic competence does not have a dominant medium or mode (i.e., it uses many), that quantitative competence is a subset of traditional literacy (i.e., historically grouped as reading, writing, and arithmetic), and that visual competence is a component of each of the specific literacy types outlined in the

meta-literacy framework (reflected as a dominant sense) and thus does not stand alone (i.e., it is integral to all types of literacy). Moreover, it could be argued that artistic and quantitative competences (along with other core literacies described earlier) become realized as an individual becomes meta-literate. This is not to say that they are unimportant; visual, artistic, and quantitative competence are essential for building knowledge and communicating ideas.

Table 8 provides a summary of the components and types of literacy discussed above that collectively comprise meta-literacy.

Table 8

The Components and Types of Meta-Literacy.

Meta-Literacy			
	Orality	Traditional Literacy	Digital Literacy
Invention Technology	Language	Alphabet Printing	Electricity Computers and computer networks
Medium (predominant)	Air (Sound waves)	Print	Internet
Mode (predominant)	Speech	Text	Screen
Sense(s) (predominant)	Sound	Sight	Sight/Sound
Consumption & Production	Yes	Yes	Yes

It would be incumbent at this stage to propose a definition of literacy and meta-literacy. The following definition of literacy borrows heavily form Ohler's (2009) definition of modern literacy which is predicated on the ability to read and write in current media forms. A possible definition of literacy, then, could be: the ability to communicate and make meaning via dominant, established media and modes. A possible definition of meta-literacy, then, could be: the set of literacy types that meet the following criteria: 1) use a dominant invention/technology; 2) are disseminated via a dominant medium; 3) are represented by a dominant mode; 4) appeal to a dominant sense (or senses); and 5) provide for the ability to consume and produce meaningful communicative artifacts via a dominant medium and mode.

From an educational perspective, then, why is this important? The findings of this study showed that participants 1) used a variety of media, modes, and literacies in their learning, 2) used a variety of digital devices and tools in their learning, 3) valued the affordances of the Internet, 4) valued both traditional, text-based literacy, as well as newer, digital literacy, and 5) consumed and produced digital content. Each of these findings fits within the meta-literacy framework above. That is, participants used all three literacy types (meta-literacy) in the acquisition and construction of knowledge.

In order to more fully understand today's learners it would be necessary to identify their literacy development. Take, for example, the ontogeny of a meta-literate individual within the context of the modern, digital age. It begins with the

acquisition of oral language which frames his or her understanding of the world. Once oral communication is established there are a couple of pathways an individual can take towards meta-literacy. A traditional pathway involves an individual acquiring the ability to read and write, which further frames his or her understanding of the world, and then progressing to acquire the ability to consume and produce digital information, which, in turn, further frames his or her understanding of the world (Kress, 2010; McLuhan, 1962; Ohler, 2009; Ong, 1982). Alternatively, a modern pathway involves the acquisition of reading and writing skills concurrently with digital literacy skills, which may frame an individual's understanding of the world differently. Sandvik, Smørdal, and Østerud (2012) as well as Falloon (2013) have shown that the thoughtful use of digital devices (iPads) and tools (apps) for early traditional literacy learning can positively impact a child's learning pathway. Lotherington and Chow (2006) have shown how thoughtful use of digital technology allowed children to acquire sophisticated literacy understandings (e.g., narrative structure) by reworking an old story ("Goldilocks and the Three Bears") into a new digital narrative.

The acquisition of oral language and communication (listening and speaking) comes about naturally with little effort on an individual's part (assuming there are no underlying physical or mental incapacities; Sweller, 2011). The acquisition of reading and writing skills does not happen naturally and requires considerable effort on both the individual's and the community's part (Ong, 1982; Sweller, 2011). The acquisition of digital skills requires individual and community effort, but is not as onerous a process as acquiring the ability to read and write.

Perhaps this is due to the fact that digital tools enable multimodal representation of the natural world (i.e., a combination of visual, auditory, and textual information). Perhaps this is due to the fact that in some cases already acquired reading and writing skills make it easier to navigate digital environments. Mitra (2013), for example, in his “Hole in the Wall” experiments showed how children who had never been exposed to digital devices and tools were able to navigate and make meaning in digital spaces with little intervention.

Of import here is that orality forms the bases from which traditional literacy and digital literacy emerge. Further, although the acquisition of traditional literacy and digital literacy skills can happen concurrently (as described earlier), becoming digitally literate requires competence in traditional literacy. In other words, a prior literacy influences a successive literacy: the prior literacy is not lost, but integrated (re-mediated) into the successive literacy. Ong (1982) described the technologizing of the spoken word (i.e., the re-mediation of orality in electronic media) as *secondary orality*. Ong (as cited in Klein & Gale, 1996) described the technologizing of the textualized word (i.e., the re-mediation of traditional literacy in electronic media) as *secondary literacy.* In each case orality and literacy are re-framed in digital contexts. This re-framing may result in enhanced meaning and comprehension. Why would this be the case? Rowsell (2013) suggested that when elements reach across modes (i.e., are transmodal) there is an implication or tendency that “the sum of all parts is greater than the whole” (p. 5). Mayer (2001) suggested that humans possess two channels in which to process information (auditory and visual), that each channel has limited

capacity, and that humans use both channels to actively acquire and construct knowledge. Further, Mayer suggested that when information is presented in such a way to take advantage of each channel (without overloading one or the other) and promote active processing, meaning making increases. Both Rowsell and Mayer hint that learning that is adapted to fit our human physiology (i.e., more natural learning) is more effective. Rowsell (2013) suggested that “working with multimodality is an entirely natural act” (p. 3). In the re-conceptualized meta-literacy framework described above, the progression is to move from a natural process (orality) to an artificial process (traditional literacy) to a process that contains natural and artificial aspects (digital literacy). In general, however, the trend has been to move back towards more natural processes through the use of multiple modes and media that make use of our multiple senses. It could be surmised, then, that as an individual moves across literacy types, uses multiple modes, media and senses, and re-frames his or her oral and literate understandings in digital spaces, the capacity for acquiring and constructing knowledge increases. The result is that learning becomes a more natural process, which, ultimately, leads to positive sum outcomes. Indeed, a key theme of this research study was that participants felt that the mixing of media, modes, and literacies resulted in more natural learning.

A key finding of this research study was that when participants were asked to rate the mental effort expended in performing certain tasks (e.g., reading online versus reading off line; writing online versus writing on paper; watching; listening; interacting; collaborating), it was found that, collectively, no one task

was more taxing to perform than another (i.e., there was no significant difference between tasks); however, individually, there was wide variety in the mental effort expended per task (i.e., there were significant individual differences among participants in performing said tasks). This finding further reinforces the need to consider students both collectively and individually. Often, the tendency is to emphasize what is best for students collectively; that is, to design learning experiences around the majority. Given the finding that there was no significant difference between tasks when looking at students collectively, the tendency would be to maintain status-quo; that is, to use traditional materials, which are often rooted in traditional literacy, because that is what has already been developed and the impact (in terms of mental effort) on students collectively is insignificant. However, given the finding that there is significant individual difference in mental effort in performing tasks, educators must look to re-design learning experiences that address this difference; that is, include ways to consume and produce artifacts using oral, traditional, and digital literacies.

Another key theme identified in this study was that participants valued the affordances of old and new educational practices and thus felt to be in a state of transition. This transition appears to be primarily between traditional literacy and digital literacy. The findings showed that some participants are more aligned with traditional literacy practice, some more aligned with digital literacy practice, and some in between the two. Further, participant preference appeared to be a function of prior experience, often heavily influenced by prior schooling. There are a couple of important inferences that can be drawn from this finding. First, as

stated earlier, prior literacy types are not lost as one transitions between them. The ability to listen and speak in traditional literacy is essential, as is the ability to read and write in digital literacy. Jenkins (2009) and Ohler (2009) have both highlighted the importance of text-based literacy (reading and writing) in the digital world. As such, the move from one literacy type to another is best thought of as transitional rather than transformational, where all prior knowledge, skills, attributes acquired in a previous literacy type become relevant in a successive literacy type. Second, there is a sense that the move from traditional literacy to digital literacy is still in its infancy. The findings point to a slower transition than perhaps popular thought dictates. Although there has been movement towards digital literacy practices in formal schooling, the reality is many of the common practices are still rooted in traditional literacy. And, this is both institutionally and student driven. Students still want and expect traditional literacy practices and institutions still want and expect to provide students with them. Some evidence to support this notion in the findings of this study can be found in participants' level of consumption and production of digital content. Although most participants consumed and produced digital content, the majority of participants preferred to consume content rather than produce it, with participants spending 72% of their time consuming digital content and 28% of their time producing digital content. This suggests the transition to digital literacy is incomplete. Listening and speaking (orality) and reading and writing are often thought of in equal terms, which indicate these literacy types are mature. (Note: this is not to say that individuals spend equal amounts of time listening and speaking, or reading and

writing, but the tendency is to think of each pair as equivalents.) Further, individuals tend to be able to listen, speak, read, and write when required. However, as the findings show, individuals do not think in equal terms between consumption and production in digital spaces, and may not be able to — or have not yet had the required time to learn to — produce digital content, which indicates digital literacy is an immature literacy type.

The re-conceptualized meta-literacy framework described above provides one possible way in which to view knowledge acquisition and construction in young adult learners. Within this framework it would appear, from a student/learning perspective, that competence in all three literacy types becomes essential for learning. Lacking ability in a given literacy type would affect one's ability to fully comprehend an idea, concept, or message. Moreover, from a teacher/teaching perspective, it would appear curriculum design that is mindful of all three literacy types (that includes content, activities, assessments and the like in all three literacy types) becomes essential for teaching and learning. For this to happen, educators, too, need to be competent in all three literacy types as well in order to model meta-literate expectations.

As educational institutions, educators, and students transition into the digital world, an understanding of the changing nature of literacy is important. The legacy of text and traditional literacy has had a disproportionate influence on current educational practice. Although gradual, a changing view of what

constitutes literacy in education is being realized, and the impact of technology is being felt. As de Castell (2011) posited:

> More and more, social practices at work, home, play and school, that have enjoyed relative stability and ‘certainty’ until just decades ago, are being re-mediated by technologies, which fundamentally displace the (deceptively) monological authority of text. (pp. 19-20).

Given the fact that modern literacy now comprises a multitude of components and literacy types, is socially situated, and involves a number of technologies, the privileging of one literacy type over another would appear to have a deleterious effect on overall teaching and learning.

5.5 Research Question Three Interpretation

The third research question was: Given the findings of this study, how should college post-secondary educational curricula and practice be designed or re-designed to support young adult learners?

As described in Chapter Four, research question three was both an emergent question, designed to best be answered after the first two research questions had been interpreted, and a practical one, designed to help the researcher, as a post-secondary educator, better design curricula. The discipline of curriculum/instructional design includes a vast repertoire of theories, models,

taxonomies, quality rubrics, and best practices. As such, question three was a broad and open question. Further, given the complexities of the post-secondary landscape, the researcher recognizes that there is no “one way” in which to design curriculum. To narrow the scope of the interpretation of research question three, some considerations for curriculum/instructional design that seem relevant given the findings of this study are included below rather than attempt to propose a complete post-secondary curriculum design model for young adult learners. These considerations consist of a series of relevant theoretical frameworks. This list is not comprehensive, but formed based on fit with the findings of this study.

5.5.1 Framework 1: Universal Design for Learning

In this study participants described a mix of characteristics (e.g., interactive, hands-on, social, interesting, relevant, organized), components (e.g., classroom [physical or online], teacher, students, content), and evaluation methods (essays, tests, multimedia production) that they felt made for effective teaching and learning. In addition, participants described a mix of educational practices ranging from older, more traditional educational practices (e.g., physical classroom, lecturing, print-based content, essays and tests) to newer, more innovative educational practices (e.g., online learning, active learning, digital content, alternative evaluation) that they felt made for effective teaching and learning. In general, participants preferred a mix of older and newer educational practices and when this mix was well balanced they felt learning was more

interesting and relevant. There were individual differences, however, in the way that participants preferred older and newer educational practices to be mixed.

The notion of individual difference in learning forms the basis of the Universal Design for Learning (UDL) framework. The principles of UDL are:

> I. To support recognition learning, provide multiple means of representation — that is, offer flexible ways to present *what* we teach and learn.
>
> II. To support strategic learning, provide multiple means of action and expression — that is, flexible options for *how* we learn and express what we know.
>
> III. To support affective learning, provide multiple means of engagement — that is, flexible options for generating and sustaining motivation, the *why* of learning. (Hall, Meyer, & Rose, 2012, p. 2)

The multiplicity of means of representation, expression, and engagement outlined in these principles come from the recognition and value of individual difference. Multiplicity was a key theme identified in this study; individual difference was a key finding. This suggests that the findings of this study fit well within the UDL framework, and, therefore, the UDL framework should be considered when designing curriculum for young adult learners. The UDL framework also implies that when learning is designed with individual difference

in mind, ultimately all learners (collectively) benefit. Inclusiveness, then, entails consideration for learners collectively and individually. This study also found interplay between what participants preferred/engaged in collectively and what they preferred/engaged in individually. This would suggest consideration should be given to learners as a whole as well as learners individually when designing curriculum. For example, the design of learning outcomes or objectives would involve consideration for learners collectively, whereas the design of content, activities, teaching strategies, and assessments would involve consideration for learners individually; that is, involve multiple means to help learners achieve outcomes or objectives.

5.5.2 Framework 2: Community of Inquiry

Participants in this study valued social interactions with peers and instructors and felt that these interactions contributed to learning. The social aspect of learning comprises one of three core elements highlighted in Garrison, Anderson, and Archer's (2000) Community of Inquiry (CoI) framework. The core elements are referred to as "presences"; namely, 1) social presence, 2) cognitive presence, and 3) teaching presence. Although the CoI framework was originally conceived from the study of asynchronous, text-based communication in an online/distance, higher education context, its generic nature makes it applicable to other educational contexts. From a participant perspective, the key dimensions of social presence are "identifying with the community, communicating purposefully in a trusting environment, and developing interpersonal

relationships" (Garrison, Anderson, & Archer, 2010, p. 7). The findings of this study showed that participants felt a willingness to become part of a community of learners. This suggests that the findings fit well within the CoI framework, and as such, the CoI framework should be considered when designing curriculum for young adult learners. From my experience as an educator in the Ontario College system and in designing curriculum, more emphasis is often placed on the teaching and cognitive presences. However, Garrison, Anderson, and Archer (2010) assert that all three presences are interdependent. Given the above, then, it would seem prudent for curriculum designers to ensure thoughtful consideration be given to all three presences, with opportunities for students to become socialized in a safe, trusting learning community built into the curriculum.

5.5.3 Framework 3: Interaction

As mentioned earlier, participants in this study valued their interactions with peers and instructors. Interaction is considered an essential component of the educational process. Anderson and Garrison (1998) outlined three types of interaction common in education; namely, 1) student-teacher interaction, 2) student-student interaction, and 3) student-content interaction. Although these types of interactions were originally conceived to describe interaction in a distance education context, their generic nature makes them applicable to other educational contexts as well. These three types of interaction are specifically included in the Quality Online Course Initiative (QOCI) rubric (Illinois Online Network, 2006), which is used as a guide for developing and evaluating online

courses. Given that participants in this study valued student-student and student-teacher interaction, it would appear the interaction framework described above fits well with the findings of this study. As such, the interaction framework should be considered when designing curriculum for young adult learners. From my experience, more emphasis is often placed on student-content interaction when designing curriculum. Although Anderson (2003) has asserted that deep and meaningful learning results as long as one of the three types of interaction occur at a high level (his Equivalency Theorem), he notes that including more than one type of interaction "will likely provide a more satisfying educational experience" (p. 4). It would seem prudent, then, for curriculum designers to ensure thoughtful consideration be given to all interaction types, with opportunities for students to interact with one another, their instructors, and the content built into the curriculum.

5.5.4 Framework 4: Meta-Literacy

Participants in this study used a wide range of digital devices and technologies in their learning, as well as a wide range of media, modes, and literacies in their learning. Further, participants valued a well-balanced mix of older and newer educational practices in their learning. These findings formed the basis of a re-conceptualized meta-literacy framework proposed in this dissertation. From a curriculum/instructional design perspective, it would seem essential for educators to design content, activities, and assessments that span literacy types outlined in the meta-literacy framework (i.e., orality, traditional

literacy, and digital literacy). (Note: the meta-literacy framework described above was informed by, but different from, the metaliteracy framework described by Mackey and Jacobson [2011] and the digital metaliteracies concept described by Lotherington [2004].) As with the other frameworks discussed above, from my experience, more emphasis is often placed on a specific literacy type (most often the one preferred by the educator). In this study, participants felt that the coupling of appropriate digital technologies with appropriate teaching practices contributed to effective teaching. It would seem prudent, then, for curriculum designers to ensure thoughtful consideration be given to all literacy types, with opportunities for students to consume and produce educational artifacts in all three main literacy types built into the curriculum. In addition, as instructors begin to integrate instructional technologies and tools into their curriculum in order to address the inclusion of digital literacy, participants felt strongly that instructors become proficient in the use of these technologies and tools; that is, they wanted instructors to model effective technology use.

5.6 Recommendations for Post-Secondary Educators and Institutions

Given the findings of this study and the subsequent interpretation of the research questions, some suggested recommendations for post-secondary educators and post-secondary institutions follow:

1. Consider moving towards a bring-your-own-device (BYOD) and a bring-your-own-application (BYOA) approach. The findings of this study showed

that participants' ownership of mobile devices was high, that they relied on their devices and tools (applications) for learning, and that they used a wide variety of devices and applications in their learning. This indicates that participants already have devices and tools that could be used for educational purposes. Institutional resources, then, could be targeted towards enhancing the infrastructure necessary for participants to use these devices and tools for learning and in so doing help further develop their digital literacy skills. This would include 1) ensuring adequate and reliable bandwidth and wireless connectivity is available throughout the institution, 2) creating learning spaces (e.g., classrooms, labs, libraries, common areas) that are designed and equipped for digital device and tool use (e.g., adequate and convenient power is available; adequate and convenient presentation systems are available; adequate furniture is available and configured appropriately), and 3) maintaining enterprise systems (such as student management, learning management, and library systems). It is recognized that in vocational education certain programs require students to use specialized and prescriptive technologies in order to meet industry requirements. In these programs the institution should provide the necessary technology. Further, it is recognized that the transition towards a BYOD/BYOA approach will take time to allow curriculum and learning spaces to be redesigned.

2. Incorporate relevant frameworks (such as Universal Design for Learning, Community of Inquiry, Interaction, and Meta-Literacy) in the design,

development, and delivery of curriculum. The findings of this study showed that participants used a wide variety of media, modes, and literacies in their learning. Further, the findings showed that there was a great deal of individual difference in the way participants preferred multiple media, modes, and literacies to be mixed. This indicates that participants want curriculum that is well balanced and accessible, that takes advantage of the affordances of a variety of media, modes, and literacies, and includes multiple ways for participants to acquire and construct knowledge and demonstrate that knowledge. This would best be done by incorporating a variety of complementary learning frameworks and models into the curriculum.

3. Provide support and professional development opportunities for educators implementing recommendations 1 and 2 above. The findings of this study showed that prior schooling and current teaching practice play a pivotal role in knowledge acquisition and construction and literacy development of young adult learners. Students look to educators to model expectations. As such, educators should continually refine their current practice through ongoing development of curriculum design, development, and delivery skills, with emphasis on incorporating appropriate learning frameworks and technologies into the curriculum.

5.7 Limitations of the Study

The limitations of this study revolve around context and data. The study was conducted at one large urban college, with a relatively small sample of 63 participants within the Ontario post-secondary college context. The participants included in the study met a very specific set of criteria: they were 18-24 years of age, proficient in the English language, and had grown up using digital devices and tools in their learning. (Note: this set of criteria was necessary in order to answer the research questions.) As such, this brings into question whether the findings and interpretations of this study are generalizable. Nonetheless, as mentioned in Chapter Three, the intent of this research was not so much geared towards generalizability but to transferability. The intent was to provide interpretations of the findings and have the reader determine if these interpretations are applicable to other contexts. To aid the reader, the researcher has attempted to reference research with similar findings in other contexts.

Another limitation of the study is that the data collected in the study is time-specific. Given the rapid change in technological advancement (and subsequently technological obsolescence), the findings of this study may become dated relatively quickly. One clear example can be found in the survey instrument used in this study. Question 10 asked participants to select which digital devices they owned. Included on the list were cell phones, smart phones, and personal digital assistants (PDAs). It became evident in conducting the interviews and focus groups, and in analyzing the data, that participants

associated cell phones with smart phones (i.e., they did not distinguish between the two even though they have different functionality) and that they did not know what a PDA was. During the relatively short time from research instrument design to implementation technological obsolescence had already occurred. However, it is hoped that the interpretations contained within this study may have greater shelf life.

5.8 Suggestions for Further Research

As with any research endeavour, the pursuit of answers to certain questions invariably raises many others. The purpose of this study was to determine the effect of the digital age on knowledge acquisition and construction in young adult learners, and, subsequently, determine some changes needed in post-secondary curriculum design as a result. It is hoped that this study has provided at least some useful information in this regard. Nonetheless there is much more that could be learned. The following are some suggestions for further research.

The re-conceptualized meta-literacy framework is a core contribution of this study. It is, however, incomplete. More research is required to review the components and types outlined in the framework and to determine if they are accurate or not. As an example, the researcher struggled with whether or not to include “art”, “visual literacy”, and “quantitative competency” as literacy types. Research that investigates the merits of inclusion or exclusion of these

competencies as literacy types would seem appropriate. Further, more research is required to determine if the re-conceptualized meta-literacy framework is even valid, and in so doing further our understanding of what it means to be literate in a digital age.

Four key frameworks were identified in this study as worthy of consideration when designing curriculum for young adult learners. Design-based research that investigates the impact of certain educational interventions implemented based on these frameworks would seem prudent. For example, a study that investigates whether the integration of alternative assessments — designed around the three literacy types so that they include the consumption and production of oral, written, and digital artifacts — leads to better student outcomes would seem appropriate.

The researcher's initial impetus for conducting this study (before it was refined to the purpose described above) was to determine if we as a society were heading into a post-literate era. The literature reveals two main meanings for the term *post-literacy*. First, post-literacy can refer to the further development of adults who had acquired traditional literacy skills in adulthood (see Dave, Ouane, & Sutton, 1989). Second, post-literacy can refer to the displacement of traditional literacy by a future literacy (see Ridley, 2009; Tucker, 2009). It is the latter application of the term post-literacy that interests the researcher. The findings of this study do not support this concept of post-literacy; however, the researcher

admits to being intrigued by the idea and suggests more research based on the post-literacy thought experiment be conducted.

Another intriguing idea that was discovered during the literature review for this study was the notion that the physiological make-up of the human brain could be altered based on the types of inputs received (Doidge, 2007; McLuhan, 1960; Small & Vorgan, 2008). Research that investigates whether a brain stimulated through traditional literacy practice (i.e., reading and writing) is structurally and functionally different from a brain stimulated through digital literacy practice (i.e., through a variety of media, modes, and senses) would be fascinating.

5.9 Summary

At the beginning of this dissertation John Seely Brown's 2000 article "Growing Up Digital: How the Web Changes Work, Education, and the Ways People Learn" was referenced. Brown suggested that as we move into the digital age we will first mimic what has come before, that the eventual change will be transformational, and that the Web will enable a learning ecology. The findings of this study support Brown's first and third suggestions. At this time it is unclear whether the second suggestion will be realized. In the time since the article was written the Web has certainly had an impact (and continues to have an impact) on education. It appears, too, that we have been (and continue to be) mimics. Formal teaching and learning practice has not changed substantively in this time.

There appear to be pockets of innovation happening in education resulting in a number of small transitions. These transitions may eventually become transformational, but at this time formal teaching and learning is still heavily rooted in the past. In support of this conclusion, a key theme identified in this study was that participants valued both older and newer educational practices and thus felt to be in a state of transition.

Brown's notion of the Web as a "learning ecology" is still relevant. Brown posited that a learning ecology would be open, complex, adaptive, diverse, dynamic, and interdependent. These descriptive words suggest there are a multitude of factors involved. The use of the word "ecology", too, implies a naturalness to the learning enabled by the Web. A key theme identified in this study was that of multiplicity: multiplicity in the tools, technologies, media, modes, and literacies used by participants. Another key theme identified in this study was that the multiplicity of media, modes, and literacies used by participants resulted in more natural learning (e.g., involved the use of multiple senses), which, in turn, led to increased capacity for learning and ultimately positive sum outcomes. As such, it would seem that a learning ecology enabled by the Web is being realized.

As we transition into a Web-enabled learning ecology educational space, the findings of this study hint at some considerations. Primary among them is that we should use evidence rather than assumption when designing curricula and educational environments. Too often decisions are made based on popular

thought. An example would be the decision to prescribe a certain technology (e.g., a device or tool) over another. The findings suggest we need to be device agnostic. Another consideration is that we need to refrain from attempting to categorize learners based on one or two factors. Given the complexity of learners and the learning environment in the digital age (based on multiplicity) it would seem imperative that consideration be given to the collective as well as the individual needs of learners. Finally, the findings of this study suggest that we should embrace relevant frameworks that aid us in the design, development, and delivery of curriculum. One of the suggested frameworks was that of meta-literacy. Meta-literacy suggests that the capacity for learning is increased when orality, traditional literacy, and digital literacy are combined so that learners consume and produce educational artifacts using the affordances of each.

If the past and present are any indications, the future of education will continue to be hotly contended and debated. The issues are complex. Nonetheless teaching and learning will continue to be at the heart of education and, as such, understanding the process of learning and the practice of teaching will be paramount. It is hoped that the findings of this study, coupled with the re-conceptualized meta-literacy framework, will help to further this understanding.

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Appendix A: Survey

New Epistemologies in a Digital Age: Ways of Knowing Beyond Text-Based Literacy in Young, Adult Learners within an Ontario College Context — Survey

Thank you for your participation in this survey.

The survey is designed to gather data from students about their digital/new media technology use and their literacy practice. All data collected will be completely anonymous; survey responses will not be associated with anyone's name or identity in any way. The findings may be presented or published in appropriate professional publications and conferences but only group data will be reported and no participant will be identifiable in any reporting of the data or findings.

Please complete the following 17 questions. The survey will require approximately 30 minutes to complete.

1. What is your gender?

   ☐ Male ☐ Female

2. What is your age?

17 or under	18-19	20-21	22-23	24-25	26-27	28-29	30 or above
☐	☐	☐	☐	☐	☐	☐	☐

3. Is English your first language?

   ☐ Yes ☐ No

4. How many years have you been working or learning in English?

less than 1	1-2	3-4	5-6	7-8	9-10	more than 11
☐	☐	☐	☐	☐	☐	☐

5. How proficient are you with the English language?

Not proficient							Very proficient	
1	2	3	4	5	6	7	8	9
☐	☐	☐	☐	☐	☐	☐	☐	☐

6. How old were you when you first started using the Internet?

☐ I've never used the Internet

5 or under	6-7	8-9	10-11	12-13	14-15	16-17	18 or above
☐	☐	☐	☐	☐	☐	☐	☐

7. In what Grade did you first start using the Internet for formal learning (i.e., working on class learning activities and/or completing assigned learning tasks)?

☐ I've never used the Internet for learning

Kindergarten	1-2	3-4	5-6	7-8	9-10	11-12	College
☐	☐	☐	☐	☐	☐	☐	☐

8. On average, how many hours per day do you use the Internet?

☐ I don't use the Internet

1 or less	2	3	4	5	6	7	8 or more
☐	☐	☐	☐	☐	☐	☐	☐

9. On average, how many hours per day do you use the Internet for formal learning (i.e., working on formal learning activities and/or completing assigned learning tasks)?

☐ I don't use the Internet for learning

1 or less	2	3	4	5	6	7	8 or more
☐	☐	☐	☐	☐	☐	☐	☐

10. Which digital/media technology devices do you own (select all that apply)?

- ☐ I don't own any digital/media technology devices
- ☐ desktop computer
- ☐ laptop computer
- ☐ netbook computer
- ☐ tablet computer
- ☐ cell phone
- ☐ smart phone
- ☐ ebook reader
- ☐ portable digital audio player (e.g. iPod)
- ☐ personal digital assistant (PDA)
- ☐ others (please specify) _____

11. How comfortable are you using digital/media technology devices?

☐ I don't use digital/media technology devices

Not comfortable							Very comfortable	
1	2	3	4	5	6	7	8	9
☐	☐	☐	☐	☐	☐	☐	☐	☐

12. Do you feel digital/media technology devices should be used more often in your formal learning?

☐ Yes ☐ No

Why (please comment)?

_____

_____

_____

_____

13. Given the Internet activities listed below: a) indicate which ones you engage in (select all that apply); b) indicate as a percentage the amount of time you spend engaging in the activity (the percentages should add up to 100%); and c) rank the activities in terms of the ones you prefer to engage in? For example, ☐ social networking; 40%; 3rd

☐ I don't use the Internet

Activity	Percent Engagement	Ranking
☐ social networking (e.g., connecting with others through Facebook, Twitter, Skype, instant messaging, etc.)		
☐ emailing		
☐ searching for and/or gathering information (e.g., using search engines, reading web pages and/or online news, etc.)		
☐ non game-based entertainment (e.g., watching YouTube videos, listening to radio, watching on-demand TV shows, etc.)		
☐ gaming (e.g., playing individual, Internet-based games and/or playing massive multi-player online games)		
☐ collaborating (i.e., working with a team or community to create content on a blog, wiki, Google docs, etc.)		
☐ learning (e.g., completing formal learning activities and/or tasks individually or in a group; connecting to the school's course management system)		
☐ working (e.g., completing tasks for paid or volunteer work)		
☐ other (please specify) _____		

14. Given the Internet activities listed below: a) indicate which ones you engage in (select all that apply); b) indicate as a percentage the amount of time you spend engaging in the activity (the percentages should add up to 100%); and c) rank the activities in terms of the ones you prefer to engage in? For example, ☐ watching online; 40%; 5th

☐ I don't use the Internet

Activity	Percent Engagement	Ranking
☐ reading online (e.g., web pages, online documents, online newspapers, etc.)		
☐ writing online (e.g., contributing to wikis, blogs, discussion forums, online documents; commenting on blogs, Facebook posts, etc.)		
☐ watching online (e.g., YouTube videos, on-demand TV shows, news videos, etc.)		
☐ listening online (e.g., online radio, podcasts, etc.)		
☐ interacting online (e.g., playing online games, working through online tutorials)		
☐ collaborating online (i.e., social networking, instant messaging, working on group projects)		
☐ other (please specify) _____		

15. Given the Internet activities listed below: a) indicate which ones you engage in (select all that apply); b) indicate as a percentage the amount of time you spend engaging in the activity (the percentages should add up to 100%); and c) rank the activities in terms of the ones you prefer to engage in? For example, ☐ consuming content; 45%; 1st (i.e., most preferred activity)

☐ I don't use the Internet

Activity	Percent Engagement	Ranking
☐ consuming content (e.g., reading web pages, online news articles, online documents; watching videos, on-demand TV shows; listening to online radio, podcasts, etc.)		
☐ producing content (e.g., contributing to blogs, wikis, discussion forums; tweeting; commenting on blogs and/or Facebook posts; creating web pages; uploading digital images or videos, posting to Facebook, etc.)		

16. Specify how you like/prefer to use the Internet for learning (formal or informal learning)?

☐ I don't like to use the Internet for learning

☐ I like to use the Internet for learning in the following ways:

_____

_____

_____

_____

_____

_____

17. Rate your perceived mental effort in performing the following tasks (i.e., the energy you expend to concentrate on doing these tasks):

a) Reading (text in a book, magazine, journal or newspaper article for 10 minutes)

Very, very low mental effort Very, very high mental effort

1	2	3	4	5	6	7	8	9
☐	☐	☐	☐	☐	☐	☐	☐	☐

b) Reading (text on a computer screen. For example, an ebook, blog or Web page for 10 minutes)

Very, very low mental effort Very, very high mental effort

1	2	3	4	5	6	7	8	9
☐	☐	☐	☐	☐	☐	☐	☐	☐

c) Writing (text on paper with a pen or pencil. For example, writing a journal for 10 minutes)

Very, very low mental effort Very, very high mental effort

1	2	3	4	5	6	7	8	9
☐	☐	☐	☐	☐	☐	☐	☐	☐

d) Writing (text on a computer screen in a word processor. For example, writing a journal for 10 minutes)

Very, very low mental effort Very, very high mental effort

1	2	3	4	5	6	7	8	9
☐	☐	☐	☐	☐	☐	☐	☐	☐

e) Watching (a 10 minute instructional video)

Very, very low mental effort Very, very high mental effort

1	2	3	4	5	6	7	8	9
☐	☐	☐	☐	☐	☐	☐	☐	☐

f) Listening (to a 10 minute instructional podcast)

Very, very low mental effort Very, very high mental effort

1	2	3	4	5	6	7	8	9
☐	☐	☐	☐	☐	☐	☐	☐	☐

g) Interacting (with online content requiring input for 10 minutes. For example, an online tutorial)

Very, very low mental effort Very, very high mental effort

1	2	3	4	5	6	7	8	9
☐	☐	☐	☐	☐	☐	☐	☐	☐

h) Collaborating (with others online for 10 minutes. For example, working on a group project)

Very, very low mental effort Very, very high mental effort

1	2	3	4	5	6	7	8	9
☐	☐	☐	☐	☐	☐	☐	☐	☐

Appendix B: Focus Group Interview Questions Guide

1. Tell me about the digital/media technology devices you own and/or use.
    a. Why do you use these devices?
    b. How much and how often do you use these devices?
    c. How much and how often do you use these devices for learning?
    d. What are your favourite devices? Why?

2. Tell me about the digital/media technologies you use.
    a. Why do you use these technologies?
    b. How much and how often do you use these technologies?
    c. How much and how often do you use these technologies for learning?
    d. What are your favourite technologies? Why?

3. How has the Internet impacted your learning?

4. Describe your ideal learning environment.

5. Describe for me how you acquire and construct knowledge?

6. Describe how you like/prefer your learning to be evaluated.

7. Tell me about your reading habits.
    a. What do you read?
    b. How much and how often do you read?
    c. Do you enjoy reading?

8. Tell me about your writing habits.
    a. What do you write?
    b. How much and how often do you write?
    c. Do you enjoy writing?

9. Tell me about how you interact with others (either socially or for learning).
    a. Face to face
    b. On the Internet?
    c. What is your preferred way of interacting with others? Why?

10. Tell me about how you collaborate with others (either socially or for learning).
    a. Face to face
    b. On the Internet?
    c. What is your preferred way of collaborating with others? Why?

11. In your opinion, how much mental effort (i.e., the energy you expend to concentrate on doing something) does it take to:
    a. read something (text on paper or on a digital device screen)
    b. write something (on paper or electronically)
    c. watch something (on TV or on a computer)
    d. listen to something (radio or podcast)
    e. interact with others online
    f. collaborate with others online
    g. Watch and read at the same time
    h. Watch and listen at the same time
    i. Listen and read at the same time?

12. Which of the above do you prefer? Why?

13. Tell me about how your instructors use digital/media technology in their courses.
    a. In your opinion, is the use of digital/media technology by instructors effective? Why or why not?
    b. Can you give me an example of when the use of digital/media technology in a course was effective? Why was it effective?
    c. Can you give me an example of when the use of digital/media technology in a course was not effective? Why was it not effective?

14. What advice would you give instructors who are thinking of incorporating digital/media technologies in their courses?

Appendix C: Participant Interview Questions Guide

1. Tell me about the digital/media technology devices you own or use.
    a. Why do you use these devices?
    b. How much and how often do you use these devices?
    c. How much and how often do you use these devices for learning?
    d. What are your favourite devices? Why?

2. Tell me about the digital/media technologies you use.
    a. Why do you use these technologies?
    b. How much and how often do you use these technologies?
    c. How much and how often do you use these technologies for learning?
    d. What are your favourite technologies? Why?

3. How has the Internet impacted your learning?

4. Think of a time when you wanted to learn something new. How did you go about learning it?
    a. What technologies did you use (if any)? Why (or why not)?
    b. If you could go back and do something differently (related to your specific learning example) what would it be (if anything)?
    c. What resource do you wish was available to you when you were learning your new topic (if any)?

5. Tell me about your reading habits.
    a. What do you read?
    b. How much and how often do you read?
    c. Do you enjoy reading?

6. Tell me about your writing habits.
    a. What do you write?
    b. How much and how often do you write?
    c. Do you enjoy writing?

7. Tell me about how you interact with others (either socially or for learning).
    a. Face to face

    On the Internet?

    b. What is your preferred way of interacting with others? Why?

8. Tell me about how you collaborate with others (either socially or for learning).
    a. Face to face

    On the Internet?

    b. What is your preferred way of collaborating with others? Why?

9. What are your preferred ways of learning something?
    a. If you were given a choice to (1) watch video about a topic, (2) listen to an audio recording about a topic, or (3) read about a topic, what would you choose? Why?
    b. How would you rank each of the choices? Why?
    c. What combinations of choices would you use? Why?
    d. What other ways of learning something would you use? Why?

10. Describe for me how you acquire and construct knowledge?

11. Tell me about how your instructors use digital/media technology in their courses.
    a. In your opinion, is the use of digital/media technology by instructors effective? Why or why not?
    b. Can you give me an example of when the use of digital/media technology in a course was effective? Why was it effective?
    c. Can you give me an example of when the use of digital/media technology in a course was not effective? Why was it not effective?

12. What advice would you give instructors who are thinking of incorporating digital/media technologies in their courses?

13. Describe your ideal learning environment.

14. Describe how you like/prefer your learning to be evaluated.

Appendix D: Informed Consent Form

Date: _____

Study Name: New Epistemologies in a Digital Age: Ways of Knowing Beyond Text-Based Literacy in Young, Adult Learners within an Ontario College Context

Researchers: Kevin Pitts (Doctoral student)

Dr. Ron Owston (Thesis supervisor)

Sponsors: York University Graduate Program in Education

Purpose of the Research:

The purpose of this proposed study is to expand our knowledge of the effects of digital media and technology on the learning processes of young adults. The findings will help 1) determine how a technology-rich, Web-saturated environment shapes young, adult learners' ways of knowing, and 2) guide the future design, development, and delivery of college curricula.

The research will be undertaken to fulfill the requirements for my Doctor of Philosophy degree in education at York University and will be conducted under the supervision of Professor Owston.

I extend an invitation to you to participate in the study freely and willingly. No incentives will be offered.

What You Will Be Asked to Do in the Research:

You will be asked to complete an in-class paper-based survey, and participate in an in-class focus group session during the semester. In addition, you may also be asked to be observed in-class interacting with course content on a computer, and/or be interviewed by the researcher.

It is anticipated that the survey will take about 30 minutes to complete and the focus group session will take about 30 minutes. If you participate in the observation activity

(i.e., be observed interacting with course content on a computer), it is expected to take 30 minutes to complete. If you agree to be interviewed, the interview is expected to take 30-60 minutes.

Risks and Discomforts:

I do not foresee any risks or discomfort from your participation in the research. No responses will be judged in any way. All information collected will be kept confidential and secure, accessible only to my thesis supervisor and me, and no individual or course will be identifiable in any reporting of the findings. Pseudonyms will be used for participants and for course descriptions.

A safe, secure, open, on-campus location agreed to by you will be sought to conduct the focus group sessions (if not done in-class) and the one-on-one interviews.

Benefits of the Research and Benefits to You:

Your participation will help inform the field of education, help me to fulfill the requirements of a Doctor of Philosophy degree in education, and help me to prepare for future research.

Voluntary Participation:

Your participation in the study is completely voluntary. Your decision not to volunteer will not influence the nature of your relationship with the researchers, York University, or any other group associated with this project either now or in the future.

Withdrawal from the Study:

You can stop participating in the study at any time, for any reason, if you so decide. Your decision to stop participating, or to refuse to answer particular questions, will not affect your relationship with the researchers, York University, or any other group associated with this project either now or in the future. In the event you withdraw from the study, all associated data collected will be immediately destroyed.

Confidentiality:

All information you provide by participation in this study will be held in confidence and will be securely stored in a locked facility (i.e., in a locked file cabinet in my office – room 1035 in the Technology Enhanced Learning building at York University/[redacted]). Where possible, digital data will be kept secure by encryption. All stored data will be accessible only to my thesis supervisor and me. The data will be analyzed and the subsequent findings published in a doctoral dissertation. The findings may also be disseminated in presentations at relevant professional conferences and publications. No respondents or courses will be identifiable in any reporting of the findings. The data will be kept for a period of 3 years, after which they will be destroyed (written notes and transcripts will be shredded; digital data and audio recordings will be erased/deleted). Confidentiality will be provided to the fullest extent possible by law.

Questions About the Research?

If you have questions about the research in general or about your role in the study, please feel free to contact me either by telephone at (416) 491-5050, extension 3462 or by e-mail (Kevin_Pitts@edu.yorku.ca), or my supervisor Dr. Ron Owston by telephone 416-736-5019 or e-mail (rowston@edu.yorku.ca). You may also contact the Graduate Program Office in the Faculty of Education by telephone 416-736-5018 or e-mail (gradprogram@edu.yorku.ca).

This research has been reviewed and approved by the Human Participants Review Sub-Committee, York University's Ethics Review Board and conforms to the standards of the Canadian Tri-Council Research Ethics guidelines. If you have any questions about this process, or about your rights as a participant in the study, please contact the Sr. Manager & Policy Advisor for the Office of Research Ethics, 5th Floor, York Research Tower, York University (telephone 416-736-5914 or e-mail ore@yorku.ca).

The research has also been approved by the Research Ethics Board at [redacted]. Questions can be directed to [redacted]

Legal Rights and Signatures:

I,_____, consent to participate in *New Epistemologies in a Digital Age: Ways of Knowing Beyond Text-Based Literacy in Young, Adult Learners within an Ontario College Context* conducted by Kevin Pitts under the supervision of Dr. Ron Owston, Thesis supervisor. I understand the nature of this project and wish to

participate. I am not waiving any of my legal rights by signing this form. My signature below indicates my consent.

☐ I hereby agree to complete a print-based survey as described above.

☐ I hereby agree to participate in a focus group session as described above.

☐ I hereby agree to be observed interacting with digital course materials on a computer as described above.

☐ I hereby agree to participate in an interview as described above.

To be filled out by the Participant:	**To be filled out by the Principal Investigator:**
Name of Participant	Name of Principal Investigator
Signature of Participant	Signature of Principal Investigator
Date	Date

Please keep a copy of this consent for your records.