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The Digital Native Debate in Higher Education: A Comparative Analysis of Recent Literature

Le débat sur les natifs du numérique dans l'enseignement supérieur: une analyse comparative de la littérature récente

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Abstract

More than a decade after Prensky's influential articulation of digital natives and immigrants, disagreement exists around these characterizations of students and the impact of such notions within higher education. Perceptions of today's undergraduate learners as tech-savvy "digital natives" (Prensky, 2001a), who both want and need the latest emerging technologies in all learning situations, continue to dominate the discourse in educational technology research and practice. Popular yet controversial conceptions of digital natives continue to be embedded within the assumptions of several contemporary research studies on student perceptions of emerging technologies, seemingly without regard for a growing body of evidence questioning such notions. In order to promote critical discussion in the higher education community considering potential directions for further research of these issues, especially within the Canadian context, the purpose of this review of recent literature is to analyze key themes and issues emerging from contemporary research on the Net generation as digital natives.

Résumé

Plus d'une décennie après la célèbre distinction de Prensky entre les natifs et les immigrants du monde numérique, un désaccord important existe à propos de ces caractérisations des élèves et de leur impact dans l'enseignement supérieur. Le discours dominant dans la recherche et la pratique des technologies de l'éducation perpétue une représentation des étudiants d'aujourd'hui comme étant des «natifs du numérique» hautement qualifiés (Prensky, 2001a), désirant et requérant à la fois les dernières technologies dans toutes les situations d'apprentissage. Ces conceptions populaires mais controversées continuent à être au coeur de plusieurs hypothèses de la recherche contemporaine sur les perceptions des élèves à l'égard des nouvelles technologies, et ce, au mépris d'un nombre croissant de preuves contraires. Afin de promouvoir la discussion critique dans la communauté de l'enseignement supérieur, laquelle s'est engagée dans une réflexion sur les orientations possibles pour des recherches plus poussées sur ces questions, en particulier dans le contexte canadien, cette revue de la littérature récente a pour but d'analyser les

principaux thèmes et problèmes issus de la recherche contemporaine sur la génération de l'Internet ou des natifs du monde numérique.

Keywords: Digital natives, Net generation, higher education, undergraduate students, educational technology

Mots-clés: natifs du monde numérique, Génération Internet, enseignement supérieur, étudiants universitaires de premier cycle, technologie éducative

Introduction

When it comes to understanding the technology needs, preferences, and uses of today's undergraduate learners, often termed the Net generation or Millennials, there is a clear and apparent struggle occurring within higher education. At the heart of this struggle is a growing debate regarding notions of such students as "digital natives," as purported by futurist Marc Prensky (2001a, 2001b). Ten years after Prensky's influential articulation of digital natives (a new generation of young students, embodying technical savvy) and digital immigrants (older generations of educators, lacking technical savvy), there remains disagreement concerning the validity of such characterizations and the implications of such notions. Proponents of digital native ideas argue that education communities must quickly respond to the unique technology needs and traits of Net generation students (Howe & Strauss, 2000; Prensky, 2001a; Tapscott, 1998). However, in regards to technology needs and aptitudes, critics of digital native notions argue that in actuality there is much variation both within and between generations (Bennett, Maton, & Kervin, 2008; Jones, Ramanau, Cross, & Healing, 2010). Despite the popularity of the digital native discourse and the emerging research examining such conceptions in practice, few sources have considered the many sides of this debate as they might apply to the Canadian context. Given that, until recently, there was a dearth of research either supporting or refuting these generational claims, the purpose of this article is to map recent developments in this digital native debate in higher education by conducting a comparative analysis of a growing body of contemporary research. The purpose of this review and analysis of the literature is to identify key themes emerging from new evidence on the digital native and the Net generation broadly, and to initiate discussion in the higher education community by considering potential directions for further research that might explore such issues in the Canadian context specifically.

Origins of Digital Native Discourse

Conceptions of the digital native began to take shape in the late 1990s and early 2000s, when a growing number of publications began describing an urgent need to recognize and adapt to the characteristics of a new generation of students. In his influential yet controversial writings, Prensky (2001a) defines digital natives as a young generation of learners who have grown up immersed in new digital technologies. At the turn of the twenty-first century, Prensky (2001a), Tapscott (1998), Howe and Strauss (2000), and others began the digital native discussion by arguing that this new generation is unique because these young people have always known a world with the Internet and computers; therefore, they claim that these young students think and act differently than previous generations. Although Prensky himself does not define the

parameters of this age group, he does equate digital natives directly with the Net generation, which broadly includes "students who were born in the 1980s and later" (Oblinger & Oblinger, 2005, p. 1.2). There are slight discrepancies between scholars regarding the precise start and end dates of the generation in question, however. For instance, Carlson (2005) states that Millennials are born between approximately 1980 and 1994 (p. 1), while Tapscott (1998) sees the Net generation as an "echo" from the boomers occurring from 1977 until 1997 (pp. 21-22). Still others such as Howe and Strauss (2000) maintain that Millennials are "born in or after 1982" (p. 4). Regardless of these slight differences, it should be understood that concepts of the digital native, the Net generation and Millennials have greatly influenced each other, and that these terms overlap and can be used interchangeably (Jones et al., 2010, p. 723).

While Prensky (2001a) appears to have coined the term *digital natives*, over the last decade several other key thinkers have contributed to building popular constructions of a new generation of digital learners. Given these definitions of key terms related to the Net generation, Millennials, and digital natives, it is valuable to consider a brief chronology of early and significant contributions that impacted digital native discourse.

A Brief Chronology: The Net Generation, Millennials and Digital Natives

In *Growing Up Digital: The Rise of the Net Generation*, Tapscott (1998) made early contributions to ideas of the Net generation as a tech-savvy force when he wrote the following:

> This wave of youth coincides with the digital revolution which is transforming all facets of our society. Together these two factors are producing a generation which is not just a demographic bulge but a wave of social transformation… And at this moment, tens of millions of N-Geners around the world are taking over the steering wheel. This distinction is at the heart of the new generation. For the first time ever, children are taking control of critical elements of a communications revolution. (pp. 22-26)

To Tapscott, the advent of the Net generation is nothing short of a digital-generational revolution transforming society. This new generation purportedly thinks differently, has strong self-esteem, and has a personality that accepts diversity, curiosity, self-reliance, and assertiveness (Tapscott, 1998, pp. 85-87). Tapscott (1998) links the need for educational adaptation to the knowledge economy, wherein the Net generation will support human capital exchanges and "knowledge work" through networks (p. 127). To address what he sees as a crisis in education, he argues for collaborative, interactive learning that replaces didactic "broadcast learning," the traditional transmission of information from teacher to learner (p.129). Tapscott ultimately writes about the Net generation with a sense of urgency, advocating for recognition of the educational changes that must quickly adapt to what he sees as the needs of a uniquely technology-driven group.

The Millennial revolution

At the beginning of the new millennium, other authors began to reflect the same key themes that Tapscott (1998) articulates. In *Millennials Rising: The Next Great Generation,* Howe and Strauss (2000) excitedly anticipate the great benefits of what they call "the coming Millennial revolution" (p. 59). They also see Millennials as team-oriented collaborators and frequent technology users who "show a fascination for, and mastery of, new technologies" and innovations (p. 10). At approximately the same time, Frand (2000) describes the "information-

age mindset" (p. 16) of a new generation of students. In his EDUCAUSE review, he lists numerous learner traits, including the following student preferences and habits:

- Computers are not technology;
- Internet is better than TV;
- Reality is no longer real;
- Doing rather than knowing;
- Using Nintendo (i.e., gaming) over logic;
- Multitasking is a way of life;
- Typing is used rather than handwriting;
- Staying connected is important;
- Zero tolerance for delays;
- Consumer/creator is blurring. (pp. 16-22)

These traits underscore an investment analogy that argues for the value of coming educational changes: "Until the nature of the educational relationships change in the classroom and at the institutional level, we will not realize the full value of the computer, communication, and information technology investments that we are making today" (Frand, 2000, p. 24). The economic themes in these writings echo elements of Tapscott's (1998) argument relating the Net generation to the knowledge economy. More broadly, characterizations of Millennial students with unique wants and needs in both educational and economic contexts are similarly used as a rationale for rapid, transformational changes in education.

The rise of digital natives

Following the dissemination of the above-mentioned works, the terms *digital native* and *digital immigrant* emerged to build upon early conceptions of Net generation learners. While reflecting many of the above-mentioned characteristics, notions of the digital native largely originate with Prensky's (2001a, 2001b) two-part article, "Digital Natives, Digital Immigrants." According to Prensky (2001a), digital native students receive information at a rapid pace, prefer graphics to text, enjoy using networks, demand instant gratification and rewards, and embrace randomized hypertext and gaming experiences over static or linear work (pp. 3-4). The digital native generation is comprised of "all 'native speakers' of the digital language of computers, video games and the Internet" (p. 2). In addition this digital language of technology, Prensky argues that those divided into either digital native or immigrant categories must recognize which perspective they hold: "Do we see the future through the eyes of a cyber immigrant or a cyber native?" (2001a, p. 3). Prensky ultimately advocates for the language and perspectives of natives over all else, and formulates a call to action, urging immigrant educators to "stop their grousing" and quickly adapt new methodologies that meet the educational needs of cyber natives (p. 6). In the second part of his article, Prensky (2001b) describes how digital natives both think and act differently – indeed, he claims that their brains are physically different as a result of information technologies. Such arguments build upon notions of the Net generation and Millennials previously presented, but add new elements that distinguish between digital natives and digital immigrants as inherently or biologically unique or superior.

Language of technology: Creating a new architecture

After these initial publications, a growing number of works continued to propel discussion of this new student generation in higher education in important and influential ways. Many works from EDUCAUSE, for example, draw directly on the digital native and Net generation themes, including notably Seely Brown's (2002) and Oblinger's (2003) contrast of Millennial learners to other generations. Seely Brown's (2002) discussion of what he calls "digital learners" echoes Prensky, particularly when he makes the link between language and technology:

> For today's students, ICT is not so much a tool as it is a way of life…A framework, or architecture, that unifies these traditionally separate infospheres to produce a new form of a learning ecology—an active place where the virtual and the physical seamlessly and synergistically coexist—is necessary. Today's generation of students communicates in a language that many academics don't yet understand. It's an ever-evolving language of interpretation and expression, an interactive approach to learning, creating, and responding to information through a complex montage of images, sound, and communication. (pp. 80-81)

Seely Brown invokes ideas of a learning or knowledge ecology, rather than the knowledge economy that Tapscott (1998) and others reference. Like Prensky, Seely Brown (2002) relates emerging shifts to a new language that digital students are bringing to universities – one that he claims educators largely fail to understand. Themes of language and technology – or, perhaps language as technology –are ones that Prensky and Seely Brown both bring to the fore.

Technological and economic trends: Net gen students as customers

In another oft-cited work, Oblinger (2003) draws heavily on both Howe and Strauss' (2000) and Frand's (2000) conceptions of Millennials as tech-savvy, collaborative, multi-tasking students with distinct learning styles and needs. Like Tapscott (1998) and Frand (2000), Oblinger (2003) contrasts the technology aptitudes of learners and educators in higher education (pp. 38-39), while also tying ideas of Millennials to technological trends and economic models. She argues that "customer-service expectations" are one of the clear reasons why higher education institutions must respond to the needs and wants of their Millennial student "consumers" (p. 42). Following this work, Oblinger and Oblinger's (2005) collection, *Educating the Net Generation,* continued to bring forth authors purporting these ideas of the Net generation and Millennials. These later sources often built upon early conceptions of the needs and wants of learners that are a part of a new generation in schools today.

Key Themes Originating in Digital Native Discourse

As this brief chronology demonstrates, several key themes emerged from the literature around the beginning of the twenty-first century. From an analysis of the literature reviewed above, eight dominant digital native claims persist as underlying assumptions often embedded within contemporary higher education research and practice.

Eight dominant digital native claims

The following eight dominant claims argue that today's undergraduate students are unique as a result of digital immersion, and are based on the following perceived needs to recognize and adapt to digital natives who are:

1. *Possessing new ways of knowing and being.* A persisting claim within digital native discourse is that there is an urgent need for educational institutions (administrators, educators) and parents to recognize and adapt to digital native learners who possess new learning styles or different ways of knowing and being. This viewpoint sees current problems with education as a part of old ways of schooling (i.e., old ways of being and knowing), often associated with digital immigrants (Frand, 2000; Howe & Strauss, 2000; Prensky, 2001a; Oblinger, 2003; Seely Brown, 2002; Tapscott, 1998).

2. *Driving a digital revolution transforming society.* Another dominant claim is that there is a pressing need to acknowledge and accept a digital revolution transforming society. Many argue that this revolution is especially evident within and important for higher education (Frand, 2000; Howe & Strauss, 2000; Oblinger, 2003; Oblinger & Oblinger, 2005; Prensky, 2001a; Tapscott, 1998).

3. *Innately or inherently tech-savvy.* Within digital native discourse, students are seen as innately or inherently tech-savvy, desiring and using digital technology in all arenas, as opposed to older educators who lack tech-savvy (Frand, 2000; Howe & Strauss, 2000; Oblinger, 2003; Oblinger & Oblinger, 2005; Prensky, 2001a, 2001b; Seely Brown, 2002; Tapscott, 1998).

4. *Multi-taskers, team-oriented, and collaborative*. Net generation students are often said to be multi-taskers, team-oriented, and collaborative (Frand, 2000; Howe & Strauss, 2000; Oblinger, 2003; Prensky, 2001b; Tapscott, 1998).

5. *Native speakers of the language of technologies.* Purported as native speakers of the language of technologies, digital natives are often seen as having unique viewpoints and abilities, especially regarding their unique aptitude for the language of technology (Prensky, 2001a, 2001b; Seely Brown, 2002).

6. *Embracing gaming, interaction, and simulation.* According to digital native claims, gaming, interaction, and simulation (i.e., multi-linear, visual, virtual environments) are both embraced by and well-suited to the Net generation (Frand, 2000; Oblinger, 2003; Prensky, 2001a, 2001b; Seely Brown, 2002; Tapscott, 1998).

7. *Demanding immediate gratification.* The Net generation is often portrayed as demanding immediate gratification, with short attention spans and no tolerance for delays (Frand, 2000; Oblinger, 2003, Prensky, 2001a, 2001b). However, even some digital native proponents dispute this argument, such as Tapscott (1998).

8. *Reflecting and responding to the knowledge economy.* Proponents of digital native notions often present a strong relationship between needs of the Net generation and the knowledge economy (i.e., students as consumers, demanding customer satisfaction),

> specifically within the context of the Information Age (Frand, 2000; Howe & Strauss, 2000; Oblinger, 2003; Tapscott, 1998).

As the above outlined key claims from the literature show, just as characterizations and definitions of the Net generation, digital natives, and Millennials have become interchangeable and have influenced one another, the claims made by authors supporting notions of digital natives often overlap and share commonalities. Indeed, as we will see in the following section, these themes have been interwoven in many subsequent discourses within the field of educational technology. With this understanding of the claims made by those who propelled early characterizations of Net generation digital learners in mind, it is valuable to further examine the recent evolution of this discourse on digital natives.

Digital Native Discourse Today

The impact of notions surrounding digital natives, and the continued use of sources such as those listed above, likely cannot be understated. One need only do a quick Google search to see the popularity of these topics. For example, a search for "digital native" within Google scholar for articles (excluding patents) between 1999-2011 returns approximately 199,000 scholarly hits, while a similar search for "Net generation" returns about 674,000 items. A brief search within the Proquest Education Journals database reveals that Prensky's (2001a) seminal article has been cited in 535 individual documents since the year 2005. These popular yet controversial conceptions of Net generation students as digital natives have clearly influenced subsequent research. However, as the examples provided in the following section demonstrate, higher education research (particularly within the field of educational technology) frequently reflects constructions of digital natives that are criticized as largely unsupported by empirical or theoretical evidence (Bennett et al., 2008). Despite critiques regarding a lack of critical analysis or evidence, ideas of digital natives have gained exposure in the media, and have been taken up in higher education conference programs and workshops (Hargittai, 2010; Jones & Czerniewicz, 2010). In these ways, digital native discourse continues to hold influence within the realm of higher education broadly, and the field of educational technology specifically.

Digital Native Assumptions in Contemporary E-learning Research

Although criticism of digital native discourse has emerged, dominant ideas of the Net generation as digital natives can be seen in the discourse within higher education, and can become embedded within the assumptions of contemporary research on student perceptions of emerging technologies at institutions both globally and locally. Since early digital native notions continue to appear unquestioned in several recent research studies, it is pertinent to ask whether such assumptions are adequately acknowledging and addressing new findings on digital native constructs. Indeed, several recent studies on digital learners continue to incorporate early authors such as Prensky, but may fail to adequately consider current research painting a more complex picture of Net generation students. For example, in introducing his research on Thai undergraduate learner perceptions of mobile learning technologies, James (2011) cites Prensky to state that higher education students such as those in the study "can be characterized essentially as *digital natives*" (emphasis in original, p. 182). Similarly, Kruger's (2010) study of student perceptions of online learning technologies at the University of Johannesburg in South Africa are based around constructions of undergraduate learners as digital natives:

> The large percentage of students who are also referred to as digital natives (term used by Marc Prensky (2001) for people who are native speakers of the digital language) and who are comfortable and familiar with modern ICTs, should be taken into account while ICTs for educational purposes are integrated and embedded optimally and innovatively in the learning environments and fabric or core systems of HEIs [higher education institutions]. (p. 189)

Here, Kruger not only builds assumptions of digital natives into the study, but also advocates for the uptake of digital natives theories in higher education institutions in general. In a North American context, Kumar (2009) from the University of Florida also builds notions of digital natives into a research study on undergraduate perceptions of Web 2.0 in higher education. Likewise, Patterson's (2009) article on virtual library classroom tools at the University of Victoria in Canada relies on Prensky's notion of digital natives and Tapscott's conception of the Net generation. These recent examples from contemporary research illustrate the ways in which some higher education researchers continue to incorporate conceptions of students as digital natives into their studies from the outset, rather than questioning and seeking further recent evidence regarding early constructions of digital natives.

Countering Dominant Conceptions of Digital Natives

Criticism of digital native theories

In response to prevalent Net generation notions and the influence that such characterizations of students have had within higher education research, there has been growing criticism of digital native theories. Bayne and Ross (2007) provide strong criticism of what they see as a dangerous binary opposition of native/immigrant, relating digital native discourse to no less than "hierarchical violence" (p. 2). Kennedy et al. (2007) also presented preliminary results from a large cross-institutional study of over 2,500 undergraduate learners in Australia, which showed that, contrary to popular belief, the use of web 2.0 technologies amongst these learners was actually quite low. Given that their results showed "greater diversity in frequency" of technology use in these students, they urged further research and critical examination of popular digital native and Net generation claims (p. 517). But perhaps one of the most frequently cited sources of criticism is Bennett et al.'s (2008) article, where the authors argue the following points:

> Grand claims are being made about the nature of this generational change and about the urgent necessity for educational reform in response. A sense of impending crisis pervades this [digital native] debate. However, the actual situation is far from clear.… We argue that rather than being empirically and theoretically informed, the debate can be likened to an academic form of a 'moral panic'. (p. 775)

Bennett et al.'s analysis of recent research evidence concludes that there may be "as much variation *within* the digital native generation as *between* the generations" (emphasis in original, 2008, p. 779). The authors highlight the lack of evidence relating to other key digital native themes, including a general dearth of evidence supporting claims that Net generation students possess unique multitasking traits, gaming abilities, and learning styles (pp. 779-780). Similarly, research evidence from Margaryan, Littlejohn, and Vojt (2011) did not "support popular claims that young people adopt radically different learning styles" (p. 429). These research studies

assert that mismatched or misleading arguments inform digital native claims, urging scholars to approach digital native discourse with caution.

Student diversity and variation

Following the continued proliferation of digital native discourse without a strong body of evidence, several scholars conduct a critical examination of the digital native in subsequent research pieces. Echoing both Kennedy et al. (2007) and Bennett et al. (2008), Jones et al.'s (2010) study of undergraduate learners at five institutions in England showed that student technology use did not fully correspond to expectations of the Net generation as digital natives (p. 722). Rather, they note "significant variations" in technology use amongst Net generation students (p. 722). Helsper and Eynon (2010) also demonstrate that "breadth of use, experience, self-efficacy and education are just as, if not more, important than age in explaining how people become digital natives" (p. 504). Selwyn (2009) brings forth a similar critique of digital native and Net generation constructs, and through a comprehensive review of the literature found that "young people's engagements with digital technologies are varied and often unspectacular – in stark contrast to popular portrayals of the digital native" (p. 364). Further criticism of the prevalent digital native discourse related to technology skills and usage also appears in Jones and Healing (2010), who concluded through their study of agency and choice of Net generation undergraduate students that "the picture is more complex than the equation of exposure to new technologies and a generational change of attitudes and capacities" (p. 344). These researchers investigate common claims made of the Net generation as digital natives, and argue for a more nuanced understanding of digital learners rather than a monolithic grouping of characteristics according to generation.

Socio-economic status and the digital divide

Further research evidence shows that socio-economic factors may be equally or more significant than age in the digital domain. For instance, Brown and Czerniewicz (2010) argue that age is not an important determinant, and suggest that digital native attributes are essentially those of a "digital elite" contributing to the digital divide (p. 357). In contrast to Kruger's (2010) reinforcement of digital natives, their research of South African university students underscores the importance of having access to and experience with using information and communications technologies (ICTs), rather than generational factors (Brown & Czerniewicz, 2010, p. 357). Furthermore, even when controlling for basic web access, Hargittai's (2010) study found socio-economic status, including race and gender, to be a significant factor and an important predictor of technology skills, abilities, and habits (p. 92). In all of these examples, the common findings brought forth in the recent research evidence counters common constructions painting all of today's undergraduate students as inherently tech-savvy digital natives.

The complexities of being connected

Examining digital native notions with a critical eye does not necessarily mean rejecting all Net gen claims outright. Rather, it involves careful examination of the complexities associated with such claims, and an awareness of assumptions and values that may need to be further questioned or revisited. To this end, in *Alone Together,* Turkle (2011) explores digital natives and critically examines what is lost and gained for generations experiencing new technologies. Although she acknowledges the significance of technology, her analysis presents a different picture of today's

youth: "Today's young people have a special vulnerability: although always connected, they feel deprived of attention" (p. 294). In regards to common multitasking claims, she questions whether multitasking is really beneficial when multitaskers do not, in fact, perform better or more efficiently as a result (p. 163). Furthermore, her examples illustrate how multitasking with devices such as mobile technologies happens across generations. Ultimately, she presents the following call to action:

> To move forward together—as generations together—we are called upon to embrace the complexity of our situation. We have invented inspiring and enhancing technologies, and yet we have allowed them to diminish us…. When we are at our best, thinking about technology brings us back to questions about what really matters. (p. 295)

Turkle's work on generations and technologies presents a more detailed, complex picture of generational-technology issues that urges us to revisit the values affected by and reflected in such technologies.

Examining the Canadian Context

Canadian dialogue on digital natives

In Canada, several prominent educational technology experts and e-learning researchers have discussed the Net generation. Friesen (2006) points to government and sociological research, as well as his own experience in Canadian higher education settings and abroad, to demonstrate the importance of socio-economic factors such as gender and class, rather than age, in determining student technical usage, abilities, and participation. Friesen contrasts several Net generation myths with reality through an examination of evidence, emphasizing how "it is important to address significant inequalities in use, understanding, and facility associated with these new technologies, rather than simply painting all students with the same brush" (2006). Similarly, Siemens (2007) critiques digital native/immigrant concepts and the abundance of such assumptions appearing at some Canadian e-learning research and practitioner conferences. Rather than seeing age as a determinant, Siemens argues for a renewed focus on the contexts of technologies, including peer influences, urging e-learning communities to recognize the lack of evidence supporting such concepts and to remain critical of outdated digital native notions that do not provide a compelling way forward. In contrast to both Siemens and Friesen, Downes (2007) largely aligns the Net generation with popular technologies like Google in his article on the search engine. Although he presents several arguments both for and against notions of digital natives, Downes ultimately seems to reinforce popular Net generation ideas when he states that socio-economic factors in the digital divide do not apply to popular, ubiquitous technologies such as Google. These examples demonstrate not only engagement with digital native concepts in Canada, but also the various perspectives concerning digital native notions from Canadian e-learning thinkers.

Recent evidence concerning digital natives in Canada

Despite these critiques of digital natives in Canada, there appears to be little research on the digital native discourse in a Canadian context. Taking on this issue, some researchers have conducted recent studies on digital natives within Canadian post-secondary institutions. Guo, Dobson, and Petrina (2008) conducted a study of over 2,000 pre-service teachers at the

University of British Columbia, finding that "there was not a statistically significant difference with respect to ICT competence among different age groups" (p. 235). Another Canadian research team recently conducted a study of digital learners at the British Columbia Institute of Technology (BCIT). Observing that popular notions of Millennials were being used as the foundation for pedagogical and technological developments, Bullen, Morgan, Belfer, and Qayyum (2009) investigated learner traits and preferences as compared to digital native conceptions. They note that both physical and technical infrastructure appear to be important issues, but concluded the following:

> Students rarely identified a technology as a need…if their basic needs were not being met, technology was not a focus of their concerns…. One of the more significant findings of this study is that communication preferences of BCIT students are not age or generation related. While there seems to be a general student technology toolkit across BCIT programs, their use was driven by other factors such as the student and instructor dynamic within a course or program, the technical requirements of the discipline, and the affordances that a tool provided within a given context. (pp. 9-10)

Bullen et al.'s (2009) analysis within this Canadian polytechnic environment demonstrates the points that Siemens (2007) and Friesen (2006) present in their critiques: that context and the educational and social factors behind technology usage can be more important than age. In a subsequent Canadian study, Bullen, Morgan, and Qayyum (2011) concluded that "the post-secondary students at the institution in question use a limited set of ICTs and their use is driven by three key issues: familiarity, cost, and immediacy" (p. 1). Gabriel, Campbell, Weibe, MacDonald, and McAuley (2012) also studied first year learners at a Canadian university, finding that "discrepancies between the expectations of students and professors regarding the use of digital technologies within the classroom setting provides evidence for the need of an enhanced kind of professional development" (p. 12). These research findings from various contexts ultimately counter monolithic characterizations of native and immigrant generations in post-secondary environments, and illustrate the importance of further research regarding these nuances in different Canadian settings.

Following these preliminary findings regarding the Net generation in Canadian post-secondary settings, other Canadian practitioners and private firms have also begun to challenge mainstream digital native messages. For instance, in her April 2011 contribution to the Canadian magazine *University Affairs,* Mazar advocates for a reigning in of digital native myths, noting that although usage of technologies has increased, stereotypes of the Net generation are damaging to undergraduate learners who are assumed to inherently possess technology abilities and skills. In a recent report on e-learning in Canadian higher education published by the firm Higher Education Strategy Associates (HESA), Rogers, Usher and Kaznowska (2011) challenge traditional assumptions painting undergraduates as digital natives. The authors note that there has been little research asking so-called digital natives what they themselves think about their own preferences regarding learning technologies (p. 1). In response to a similar report recently published by Parker, Lenhart, and Moore (2011) on e-learning in higher education in the United States, Rogers et al. critique the Pew Research Center survey for not collecting data on student perspectives. Rogers et al. (2011) present quantitative results from their online survey of 1,370 undergraduate learners at degree granting institutions across Canada, and make the following conclusions from their data analysis:

> These do not quite sound like the views of the "digital natives" we have heard so much about. Far from preferring to be immersed in a digital world of self-directed learning, students seem to still have an enormous desire to learn directly from a "sage on the stage." The advantage they see in e-learning resources is that they give them the freedom to make occasional mistakes – missing class, forgetting a textbook at home, etc. – with less fear of falling behind. However, while this all provides grounds for suspicion with respect to glib claims about digital natives, there is not enough evidence here to dismiss the notion entirely. (pp. 17-18)

While further research on these claims is needed, initial information from the Rogers et al.'s HESA report highlights that, though there are substantial impacts of digital technologies in higher education settings, a more careful examination of the reasons why learners may value some technologies over others is needed. Undergraduate learner perspectives on educational technologies cannot be assumed or taken for granted. Taken in conjunction with the criticism of digital native notions from Friesen (2006), Siemens (2007), and Bullen et al. (2011), the findings reported by Rogers et al. (2011) underscore the need for further contemporary Canadian research that informs theory and practice, and that investigates whether and how undergraduate learners see value in emerging technologies in different learning contexts. As the digital native debate continues in Canada and beyond, the evidence to-date demonstrates that there is by no means clear confirmation of undergraduate students' learning and technology needs and preferences in different contexts.

New Directions for Digital Native Discourse

In spite of new evidence and emerging critiques, those originating ideas of the Net generation as digital natives, including Prensky and Tapscott, appear to be reaffirming and even building upon their previous definitions of generational characteristics rather than discarding of them. In a recent interview regarding updates to his original work on the Net generation, Tapscott reportedly asserts that, while today's digital natives have made technology a necessary and natural part of their day-to-day communications, the problem is with "older people who don't 'get it'" (Devaney, 2010, p. 1). Indeed, Tapscott's (2008) latest book, *Grown Up Digital: How the Net Generation is Changing Your World,* largely reasserts the same message as his earlier work on the same topic: older generations of parents and educators must quickly recognize and adapt to the unique and revolutionary characteristics of the Net generation. Similarly, Prensky (2009) recently conceded that the digital native/immigrant distinction is becoming less relevant, but he still demonstrates a desire for widespread acceptance of what he sees as beneficial technological enhancements in all settings. He articulates a need to create "a new set of distinctions" between technological haves and have-nots, but views technological enhancements (such as digital implants, and abilities to mine/store data) as a requirement for what he calls "digital wisdom" (p. 1). Thinkers like Prensky and Tapscott continue a discourse of distinctions that contrasts those who possess certain technologies and technological abilities with those who do not.

Alternative Typologies: Understanding the Nuances of Undergraduate Learners

Rather than working to prove or disprove notions of digital natives, some authors advocate for completely reformulating, retesting, reframing, and reimagining our understanding of digital

learners in younger generations. Bennett and Maton (2010) emphasize the importance of critically examining the determinisms that are embedded in discourses like those within digital native constructs when they state the following:

> Thus, while it may be argued that some have moved on from simple conceptions of an age-based divide, an undercurrent of technological determinism persists in debates.… claims made about young people and their technology experiences [require focus], because it is these claims that are driving the debate about educational change. (p. 322)

Acknowledging the importance of understanding modern-day technology impacts, Bennett and Maton integrate contemporary findings and analyses to illustrate an urgent need to move beyond the current debate involving digital natives as it currently exists. The authors advocate not only for conducting further inquiry into apparent differences in student technology access and abilities, but also for changing the nature of the debate from one of opposing distinctions to one that is both research driven and theoretically informed.

Reframing the digital learner

In addition to addressing this gap in rich theoretic notions of digital learners, other researchers have begun to plot alternative typologies and Net generation types. For example, in their study of Australian university students, Kennedy, Judd, Dalgarno, and Waycott (2010) argue that we might see beyond the digital native/immigrant dichotomy by understanding "four distinct types of technology users: *power* users (14% of sample), *ordinary* users (27%), *irregular* users (14%) and *basic* users (45%)" (emphasis in original, p. 332). While there may be promise in considering new types of learners that do not rely solely on digital native constructs, clearly the complexity of Net generation and digital native notions require more than technology usage types and frequencies alone. Complex aspects of learner, administrator, and educator experiences and the perspectives that reflect and inform those experiences must be considered when reframing and reworking existing digital native constructs. White and Le Cornu (2011) attempt to reframe digital native distinctions by reworking the native/immigrant typology to instead include a visitors/residents continuum, an analytical framework that considers tools and places that inform and reflect the motivations behind using technologies. While White and Le Cornu's efforts with visitors and residents do provide a potential alternative to the traditional native/immigrant binaries, further research of this and other theoretical continua needs to be conducted in practice. However, these works do reveal the many possible alternatives to digital native discourse, and such possibilities may pave the way for further theoretical and empirical studies that build rich, nuanced, contextualized, and authentic understandings of undergraduate learners and technologies in higher education.

Conclusion

Perceptions of today's undergraduate learners as tech-savvy digital natives still appear as a dominant discourse within higher education research and practice, both locally and globally. An analysis of the literature demonstrates that the following eight dominant yet controversial claims concerning digital natives continue to paint Net generation students in higher education as: 1) Possessing new ways of knowing and being; 2) Driving a digital revolution transforming society; 3) Innately or inherently tech-savvy; 4) Multi-taskers, team-oriented, and collaborative; 5) Native speakers of the language of technologies; 6) Embracing gaming, interaction and

simulation; 7) Demanding immediate gratification; and 8) Reflecting and responding to the knowledge economy. Despite a growing body of recent evidence challenging such notions of students as digital natives, these ideas remain influential. As a learner and practitioner who (to some) may also be considered a part of the Net generation, I do see important and well-warranted educational innovations occurring with the use of emerging technologies. However, by mapping the key digital native arguments shaping higher education technology research and practice over the past decade, I am advocating for further discussion and analysis of the varied themes that continue to form the many facets of this debate, particularly as they apply to Canadian contexts.

Much of the criticism regarding the digital native debate underscores a lack of research that authentically maps not only the rapidly shifting technology developments, but also the emergent nature of the perceptions and viewpoints informing the learner, educator, and researcher assumptions and beliefs underlying such debates. Questions remain regarding how we might reframe and reconsider new typologies or constructs around student technology uses, values, and needs, including the following:

- What is the role of the language in both informing and reflecting our perceptions of and experiences with emerging technologies in education, to which Prensky (2001a) and Seely Brown (2002) allude?

- If there is a new teaching and learning ecology, as Seely Brown (2002) states, how can we authentically understanding and engage with this ecology beyond the binaries of digital native/immigrant?

- Rather than simply considering technology usage and digital emergences, how might we further understand the various perceptions, values, and perspectives informing discursive debates regarding learning and technology across generations?

These questions relate to a need for further exploration of the digital native debate across various contexts, and further consideration of what is lost or gained when conceptions of Net generation students continue to be embedded within contemporary research and practice. By further considering such questions, we might endeavor to move beyond the digital native debate toward other authentic understandings of today's learners.

As contemporary research begins to expound upon key digital native claims, there is clearly an opportunity for new research that informs theory and practice by investigating whether and how undergraduate learners see value in emerging technologies within their own diverse learning contexts. To this end, perhaps Canadian researchers will endeavour to further investigate what so-called Net generation students see as important by asking them about their technology needs and values directly. As Turkle (2011) reminds us, by moving forward together, our thinking about technology can bring us back to what matters. By pushing beyond the digital native debate, we may create and utilize rich, alternative typologies and theoretical frameworks that better inform and reflect the complexity of higher education technology issues facing generations today.

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