Research Article

New Terms for the Educators' Digital Lexicon

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In 2001 Prensky introduced the terms "digital immigrant" and "digital native". While some may argue these terms are now considered historical, we argue that they are and remain culturally significant and historically timeless. As such we use them to frame our discussion here as it relates to the introduction of new terms salient to higher education. Currently the educators' digital lexicon is insufficient to address educational success. The authors present terms augmenting the educators' digital lexicon. The authors propose terms expanding the digital lexicon including another class of learner – the digital Neanderthal and terms for educators to consider including digital concordance, digital discord, digital disruption, and digital dissonance. These terms are a result of members of each digital class not considering their learners. Unless instructors adopt learning theories amenable to appropriate classes of learners in the digital landscape, they will be barriers to learning instead of facilitators. If students are taught without regard to their digital demographic, educators will lose a vital opportunity to engage students regardless of their digital demographic. Administrators must also consider the faculty digital demographic when implementing technical innovations as this demographic may impact its success or failure. The authors are unaware of other work highlighting or conceptualizing this new class of learner or educator. Further, to our knowledge we are unaware of the concepts presented here being presented elsewhere. The consideration of these concepts is critical to the success of students today in the future and our educational institutions.

Introduction

In 2001 Prensky coined the terms "*digital immigrant*" and "*digital native*" (Prensky, 2001a) discriminating between contemporary students growing up in the digital age and those predating

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them. The early 2000s represented the first generation of students to grow up with new technology, often now referred to as smart technology, having spent their lives surrounded by and using the tools and toys of the contemporary digital age (Prensky, 2001a). As Prensky posited, the distinction is important because as a result of a continuous immersion in this environment contemporary students process and think in a fundamentally different way than their parents, and now perhaps their grandparents (Prensky, 2001a, 2001b). The discussion in this paper is drawn from the lived experiences of the authors decades of higher education experience primarily within innovative technology specific to medical, nursing, and other clinical disciplines. The health professions are particularly relevant when it comes to the rapid and often exponential system changes found within digital paradigms. As such there is a continual need to examine and develop vocabulary to address challenges inherent to the disruptive nature of change, digital change that accompanies even the most positive paradigm shifts to teaching, learning and patient care.

So where is the line of demarcation defining the difference between the digital immigrant and digital native? This is a challenging line to define because as technology available to support the learning process advances that line of demarcation moves. When these terms were first applied to clinical education, particularly in the context of game and simulation-based teaching and learning *it was often said if one remembers using the rotary phone, and certainly the pre-cell phone era, one is a digital immigrant.* Later, the narrative changed to *if you remember the time a cell phone was just a cell phone and not a multi-function internet enabled smart device, one is probably a digital immigrant.* In the end, the demarcation and categorization of who belongs to which group, digital immigrant versus digital native seems more matter of adaptability rather than a fixed point in time. By this we mean those struggling to adapt to and leverage new and evolving technology (the digitally illiterate) versus those who embrace it. From this perspective the notion of who are or remain digital immigrants versus who are digital natives represents more of a continuum and philosophy rather than a binary designation. Defining forever classes or categories existing within the digital paradigm is impossible because the very nature of innovation, particularly in digital ecosystem exists within a constant state of digital disruption. Given the discourse of how to define what it means to be a digital immigrant versus native, and what that means within a social, academic, or healthcare community, the notion of a continuum of where people fit into a *digital ecology* is probably more accurate because familiarity or comfort with digital technologies is not the same as expertise within the contemporary digital ecology (Selwyn, 2009; Stoerger, 2009).

In 2009 Prensky introduced the term *digital wisdom*, which seems address the perspective of adaptability (Prensky, 2009). Prensky defines digital wisdom as, "*... a twofold concept, referring both to wisdom arising from the use of digital technology to access cognitive power beyond our innate capacity and to wisdom in the prudent use of technology to enhance our capabilities.*" (emphasis added) (Prensky, 2009). Presky describes President Obama as someone who has digital wisdom when in the 2008 election then candidate Barak Obama digitally connected with potential voters, constituents, and contributors. To this end, the line of demarcation may be impossible to define or rather less relevant to define. Instead, how one comes to leverage technology to drive understanding and outcome, particularly in the context of teaching, learning, and healthcare is much more relevant or salient to professional development and our ability to teach, guide, and mentor today's learners and care for sick populations.

The term digital wisdom also applies to the terms the authors introduce into the digital lexicon, the digital Neanderthaland digitally illiterate. The authors springboard off of theory established by Prensky (2001a, 2001b), Bauman (Bauman, 2016; Bauman et al., 2014, 2017; Breitkreuz et al., 2021), and Mishra (2006) in suggesting these novel terms. The digitally illiterate individual struggles to thrive in the contemporary teaching and learning ecosystem because they lack the skills to fully participate in a continually evolving environment which includes digital facets at every turn. Somebody who is digitally illiterate lacks the tech stack to integrate into the digital world competently and confidently, but given time, and opportunity may develop enough skill to be become a very competent digital immigrant (Keçi & Qosja, 2021). The *digital Neanderthal exists as the nexus or intersection of digital illiteracy and the* unwillingness to, or lack of capacity to achieve or embrace digital emigration. *Digital emigration* is the act of moving from one digital state to another. One who cannot, will not, or is incapable of digital emigration is a digital Neanderthal.

Some may feel the term digital Neanderthal is inappropriate, as they feel it is demeaning or insulting. However, the term is based on the historical and anthropological definition of neanderthal. Monnier (2012) suggests Neanderthals excelled at making stone tools and hunting animals and Finlayson (2004) suggests Neanderthals had an inability to adapt. This is the context of the digital Neanderthal – highly intelligent individuals who refuse to adapt or have the inability to adapt. Further the term was crafted in a manner to deliberately raise eyebrows. In short it is not and was never meant to be subtle. The authors argue that the pace of digital disruption has already surpassed the historical

lexicon and pedagogy. To advance the discussion of the role of technology in higher education and healthcare we can no longer afford to be subtle.

It boils down to choice – the digital illiterate haven't learned to used technology, the digital Neanderthal chooses not to or is incapable of doing so. The digital Neanderthal is a "step beyond" the digital illiterate. Within the context of Prensky's digital immigrant-digital native paradigm and distinction among the digital population, the authors postulate the population of digital Neanderthals and digitally illiterates have been neglected. Digital Neanderthals and digitally illiterate exist on opposite ends of the non-binary continuum than the savviest digital native. The digital Neanderthal and digital illiterate populations have been largely unrecognized, ignored and even forgotten. We argue that these populations are important, and it is time and vital to academic success and professional development to formally recognize the digitally illiterate and digital Neanderthal as important markers in the digital continuum.

How do the digital illiterate and digital Neanderthal relate to Mishra & Koehler's Technological, Pedagogical, and Content Knowledge (TPACK) framework (Mishra & Koehler, 2006)? TPACK is one of the leading theories regarding education technology and education technology integration. As technology becomes more central to the lives of students of all ages educational practice suggests teachers must implement some form of technology in their classroom, but many instructors face difficulties in doing so (Mishra & Koehler, 2006). The TPACK framework breaks knowledge down into technological knowledge, pedagogical knowledge, and content knowledge. Digital illiterates and digital Neanderthals possess pedagogical knowledge and content knowledge; however, both groups lack technological knowledge. In the case of the digital illiterate, they need to be educated on how to deliver the content using digital means. In the case of the digital Neanderthal they have no desire or are incapable of learning to deliver the content digitally – even given sufficient time and resources. In other words, despite or perhaps in spite supportive professional development opportunities and even various incentives the digital Neanderthal will not embrace educational technology.

A Gap in the Digital Lexicon

Learning theories such as Bauman's Layered Learning Model have been proposed to explain how faculty and other instructional staff who find themselves somewhere in the chasm separating digital immigrants and natives can actively and effectively engage contemporary digital natives (Bauman, 2016; Bauman et al., 2014, 2017; Felszeghy et al., 2019). In other words, how the temporal immigrant

can engage the temporal native through wisdom, rather than brute force. Contemporary or temporal digital natives come to our institutions with a host of expectations of how educational materials may be presented and made accessible (Bauman, 2012, 2016; Bauman et al., 2018). This construct moves beyond the provision of downloadable PDFs within a contemporary learning management system. Rather the how and why of availability and presentation must address the anytime, anywhere perspectives of the modern digital era to include the everchanging ecosystem of digital portability and data visualization. Students are no longer relegated to vetted high quality learning materials steeped in text, lecture, and video. The contemporary or digital native looks for and demands the full spectrum of knowledge transfer through tools such as digital applications and game-based learning, as well as virtual and mixed reality educational interventions. If educators fail to meet these expectations, we risk alienating the very populations we are charged with mentoring. The new educational paradigm sees the savviest teachers as guides who can leverage their digital wisdom to help students determine what must be committed to memory and what can and should be accessed and carefully vetted electronically among the vast amount of unfettered content continuously available to students (Prensky, 2010, 2012).

Prensky defines digital natives as "…students [who] are all 'native speakers' of the digital language of computers, video games and the Internet." suggesting digital immigrants are "Those of us who were not born into the digital world but have, at some later point in our lives, become fascinated by and adopted many or most aspects of the new technology…" (Prensky, 2001a). However, the authors posit this categorization ignores a substantial aspect of the population, those who are not willing or capable of interfacing with technology, technology that is rapidly changing and evolving. Those ignored or forgotten are those who despite multiple attempts, and possible dire consequences, have not and will not change their behavior to accommodate and leverage new technologies into their lives.

This distinction is important for mainly two reasons. The first distinction occurs when temporal digital natives are being taught by digital Neanderthals or digitally illiterates. The second distinction occurs when digital Neanderthals or digitally illiterates are being taught by temporal digital immigrants or natives using contemporary digital pedagogy. Anecdotal evidence suggests digital Neanderthals or digitally illiterates may be resistant to change in the face of implementation of digital curricular evolution. For example, a faculty composed of digital Neanderthals or digitally illiterates might be less likely to implement adoption of tablet or slate computers on campus or embrace the implementation of game-based teaching and learning activities as adjuncts to the curriculum, let

alone a technique to deliver core content. Likewise, the digital Neanderthal as student may find it difficult if not impossible to engage and embrace unfamiliar digital learning platforms such as learning management systems, let alone educational tools and techniques such as game-based learning and simulation, particularly when these experiences embrace completely novel technology such as virtual and augmented reality and artificial intelligence. The authors suggest this disconnect has negative effects on learning. This paradigm represents what the authors term as *digital discord*. The authors propose digital discord as a mismatch in the pedagogy among teachers and learners. (Conversely, *digital concordance* would be a match in terms of digital ecology – digital immigrants teaching digital immigrants or digital Neanderthals caring for digital Neanderthals.) It is this digital discord that is disruptive to the learning and healthcare processes.

An additional reason it is important to be able to identify digital discordance is the impact it can have on health professions education and ultimately patient outcome. Being a digitally literate clinician means embracing and understanding the concept of digital wisdom within one's practice. Digital literacy moves beyond the ability to navigate the electronic medical record. Medical and health professions educators must be in the position to not only provide guidance for their students, but also provide strategies to their students about they might engage patient populations who are spread across the digital continuum.

Consequences of Digital Discord

Technology continues to evolve rapidly without regard to the population it serves. For example, it is now commonplace for patients to be sent home for extended cardiac monitoring with technology such as the MCOT telemetry patch system (Malvern, PA USA). However, these systems are more often designed from a data collection perspective without careful user interface and user experience consideration from either the patient or the clinician perspective. Is it reasonable to assume that all clinicians forced to adopt such technology may be digital immigrants capable of embracing this medical technology, or all patients needing such technology may not be digital Neanderthals?

Much in the same way a faculty of predominately digital Neanderthals or digitally illiterates often fails to meet the expectations of digital natives, digital discord occurs when there is a mismatch of pedagogy and technology solutions being used to deliver the curriculum. Similarly, digital discord can occur in the healthcare. Digital discord may be even more pronounced and frustrating and when digital Neanderthals or digitally illiterates find themselves in a student, learner role or patient that

requires them to embrace contemporary technology and pedagogy without accommodation that is completely unfamiliar to them. In the case of patient education, discordant presentation of learning materials upon discharge from the hospital may lead to catastrophic consequence. The importance of appropriate learning theory selection, technology selection and integration strategy must be considered based on the population of learners or patients being engaged.

The digital Neanderthals or digitally illiterate *are unlikely to be able to accept pedagogical approaches or technological applications outside their* familiar educational a perspective. Regardless of the instructor, the Neanderthal or illiterate cannot frame contemporary pedagogical or healthcare philosophy. While the immigrants may be capable of straddling both educational and healthcare eras, ignoring contemporary learners' and patients' preferences as it relates to innovative technology means we are failing to leverage the digital ecosystem to its potential. Synergy among pedagogy and technology only occurs when instructional designers, faculty, and healthcare technology developers carefully tailor instruction to avoid digital discord and promote digital concordance. In other words, digital concordance represents the positive synergistic effect that occurs when technology and pedagogy are carefully and thoughtfully selected to promote effective knowledge transfer, understanding and behavioral change within the context of the curriculum or healthcare objectives.

Conclusions

In this essay the authors have recommended new terms be added to the digital lexicon Prensky introduced nearly 20 years ago: digital Neanderthal, digital illiterate, digital discord, and digital concordance. Instructors should promote digital concordance by tailoring their instruction to their audience. For example, we advocate embracing contemporary pedagogy that supports digital technology when engaging today's traditional college students. However, we hope that teachers will not abandon traditional instructional methods when engaging populations of digital Neanderthals. As technology continues to evolve, teachers will need to constantly evaluate what pedagogical technological best practice looks like. Further, because we acknowledge that the digital native-digital Neanderthal paradigm is a non-binary continuum we urge teacher's, academic and healthcare technology developers, and healthcare educators to take a layered learning approach to learner engagement. Failing to do so may only frustrate the learner and teacher resulting in negative educational and healthcare outcomes.

Further the authors acknowledge that there remains a death of empirical studies that specifically address the perils and pitfalls associated with even the most positive aspects of digital evolution. As such we offer this paper as a starting point for discussions leading to empirical investigation to either support or refute our suppositions.

Glossary Terms

Bauman's Layered Learning Model (BLLM): An educational model conceptualized to support the integration of technology, digital technology into contemporary teaching and learning practice. BLLM urges educators and course designers to scaffold knowledge transfer for learners using a multimodal approach. The model is not and should not be seen as a replacement for traditional learning, but rather as an adjunct to assist students in meeting their expectations as to how knowledge is made available and presented to them (Bauman, 2016; Bauman et al., 2014, 2017; Breitkreuz et al., 2021).

Digital concordance: The positive synergistic effect that occurs when technology and pedagogy are carefully and thoughtfully selected to promote effective knowledge transfer, understanding and behavioral change within the context of the curriculum or objectives. Contextually this occurs when educational designers, teachers, and students share the same digital paradigm.

Digital discordance/discord: A mismatch in the pedagogy among teachers and learners. Contextually this occurs when educational designers, teachers, and students do not share the same digital paradigm.

Digital illiterate: Lack of skills to fully participate in a continually evolving digital ecosystem, an environment which includes integrated digital operational facets.

Digital disruption: A process that involves a paradigm shift that is the result of digital attributes associated with digital innovation or novel use of digital technology that leads to effects on domains or systems (Baiyere & Hukal, 2020; Skog et al., 2018).

Digital Neanderthal: The *digital Neanderthal exists as the nexus or intersection of digital illiteracy and the* unwillingness to, or lack of capacity to achieve or embrace digital emigration. The Digital Neanderthal is a step beyond digital illiteracy in that the Digital Neanderthal cannot or will not acclimate or immigrate into the ever-changing digital ecosystem.

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EBB coined the term "digital Neanderthal" and GEG proposed the idea of a manuscript. GEG composed the first manuscript draft. Both authors contributed to subsequent revisions of the manuscript. Both authors have read and agreed to the published version of the manuscript.

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