The digital natives as learners: Technology use patterns and approaches to learning

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ABSTRACT

This study investigated the claims made in the popular press about the "digital native" generation as learners. Because students' lives today are saturated with digital media at a time when their brains are still developing, many popular press authors claim that this generation of students thinks and learns differently than any generation that has come before, but the evidence to support these claims is scarce. This study used a survey to gather data on the technology use of university freshmen, the degree to which they identified with the claims being made about their approaches to learning, and the productiveness (in terms of focused attention, deep processing, and persistence) of their approaches to learning. Valid surveys were received from 388 freshmen at a large Midwestern land grant university. A factor analysis was used to identify meaningful patterns of technology use, and descriptive statistics, analysis of correlations, and extreme group *t*-tests were used to explore the relationships between technology use patterns and learning characteristics. The findings indicate some positive correlations between use of digital technology and the characteristics ascribed in the popular press to the digital native learners, and negative correlations between some categories of technology use and the productiveness of student learning behaviors. Overall, however, the small to moderate relationships suggest a less deterministic relationship between technology and learning than what the popular press writers claim.

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1. Introduction

Because students' lives today are saturated with digital media (Rideout, Foehr, & Roberts, 2010) at a time when their brains are still developing, several popular press authors suggest that media use has profoundly affected students' abilities, preferences, and attitudes related to learning. They claim that "digital natives" (often defined as those born after 1980) have a distinctive set of characteristics that includes preference for speed, nonlinear processing, multitasking, and social learning, allegedly developed through immersion in digital technology during childhood and adolescence when neural plasticity is high (Prensky, 2001a, 2001b, p. 442, 2001c; Rosen, 2010). Some worry that the new generation of students may be incapable of deep learning and productive work (Bauerlein, 2008), while others take an optimistic view of the skill set these learners are developing but claim that educators are failing them by not adapting instruction to their needs (Prensky, 2001b, p. 442, 2001c; Rosen, 2010; Tapscott, 2009, p. 368). All of these popular authors deliver their claims with urgency and an insistence that educators must respond *today*.

Many academic researchers have criticized the popular claims about the digital natives based on the lack of empirical evidence supporting them (Bennett & Maton, 2010; Bennett, Maton, & Kervin, 2008; Enyon, 2010; Helsper & Eynon, 2010; Jones & Healing, 2010). The popular press writers make broad recommendations for changes in the school systems and curricula, supporting their claims mainly with anecdotal evidence or proprietary data that is not available for scrutiny (see Tapscott, 2009, p. 368). Nevertheless the claims influence the thinking of educators and administrators making decisions about technology investment and curriculum design (Jones &

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Healing, 2010). They may also lead instructors to make unsupported assumptions about their students' mastery of educational technology and therefore neglect to teach students the skills they need for academic success (Buchanan & Chapman, 2009; Guo, Dobson, & Petrina, 2008).

Despite the shortcomings of these popular press claims, the possibility that children who grow up immersed in digital media think and learn differently from those who grew up with printed text has intuitive appeal, and research on neural plasticity has shown that our brains do indeed change in response to our repeated experiences (Ebner, 1996; Maguire, Woollett, & Spiers, 2006). Since neural plasticity can lead to either adaptive or maladaptive changes (Nelson, 1999), these characteristics could manifest themselves in ways that are productive for learning, as suggested by Prensky (2001b, p. 442, 2001c), Rosen (2010), and Tapscott (2009, p. 368), or in ways that interfere with learning, as suggested by Bauerlein (2008), Carr (2010, p. 276), and Small and Vorgan (2008). Thus, the field of education needs more empirical study on whether and how technology immersion is associated with behaviors and attitudes related to learning.

The present study is a step toward testing the theoretical assumptions implicit in the popular press literature and gathering data to either support or challenge those assumptions. It addressed the possible connection between technology use and learning by asking university students to report their frequency of use of a variety of technologies, their habits and typical behaviors when learning about topics that interest them, and the productiveness of their learning behaviors. The goal was to investigate (1) the actual technology use of the participants, (2) the extent to which they saw themselves has having the digital native characteristics claimed for their generation, (3) the extent to which they saw these characteristics as being productive or nonproductive for learning, and (4) the relationships between patterns of technology use, learning habits and behaviors, and the productiveness of those behaviors. Data from this study provide one view of how the digital natives themselves see their technology use and approaches to learning, which may in turn provide an empirical basis for both curriculum design and additional research.

2. Background

The popular press claims regarding a distinctly "digital native" set of learning habits and behaviors are based on the assumption that immersion in digital technology during childhood and adolescence, when neural plasticity is high, habituates certain behaviors that affect the way the digital natives think and learn. This section provides a brief discussion of neural plasticity, the actual technology use of the digital native generation as shown by empirical research, and a summary of the specific claims being made in the popular press about the learning characteristics of the digital natives.

2.1. Neural plasticity

Popular press writers rely heavily on neural plasticity as a basis for both the optimistic and pessimistic claims about the new digital learner. Neural plasticity refers to the process where training in specific skills leads to the development and strengthening of the neural circuitry used in performing those skills, while neural circuitry that is not used eventually degrades (Kleim & Jones, 2008). Prensky (2001b, p. 442, 2001c) claims that the intensity with which many young people play video games and use other digital technology results in exactly the kind of training that can profoundly affect the development of their young, highly plastic brains, resulting in superior visual skills, hand-eye coordination, and ability to monitor multiple processes and react quickly to unexpected events. Small and Vorgan (2008) also discuss the effects of digital immersion on young, highly plastic brains, but caution that it may be overdeveloping certain regions of the brain while neglecting others. In particular, they are concerned that gaming and other digital activities appear to suppress activity in the frontal lobe, the brain region responsible for planning, abstract thinking, and perspective-taking. They fear that the hours spent on the computer instead of reading books might be developing the temporal lobe at the expense of the frontal lobe, leaving a generation of students unable to think deeply and reflectively, control impulses, or feel empathy for others.

Some researchers have urged caution in the use of the neural plasticity argument as support for the assertion that the digital natives are different from previous generations. Smith (2011) points out that neural plasticity is involved in *all* learning, not just learning from technology, and studies such as the often-cited study of London cab drivers (Maguire et al., 2006) demonstrate that measureable physical brain change also occurs in adult learners. While brain science research has demonstrated specific and rapid changes unique to adolescence, the direct link between observable physical brain change and adolescent behavior is not yet clear (Blakemore & Choudhury, 2006; Giedd, 2004; Steinberg, 2005). Thus, while many of the popular press authors rely heavily on neural plasticity as a basis for their claims, academic researchers caution that our knowledge of neural plasticity alone is not enough to explain learning or to support prescriptive advice for teaching (Bruer, 1998). Despite the possible over-extension of the concept of neural plasticity and its implications for the digital native generation, however, the undoubted existence of neural plasticity is a reason for concern that immersion in digital technology from a young age *could* alter brain structure.

2.2. Technology use

Popular press writers often describe the digital natives as being naturally fluent with a variety of digital technologies, but recent research has challenged this characterization. Kennedy, Dalgarno, et al. (2008) and Kennedy, Judd, et al. (2008) compared the technology use of university students (mostly under age 25) to university faculty (mostly over age 25). Though they found small differences between the two groups on *some* categories of technology use, they did not find a stark difference where younger people embraced all types of technology and older people avoided it. Guo et al. (2008) also studied self-perceptions of information technology competence among university students ranging in age from 20 to over 40 and found no significant differences between age groups.

Studies suggest that while use of digital technology for basic communication is common among digital natives, very few create text, audio or video content or play computer games. Kennedy, Judd, Dalgarno, and Waycott (2010) looked at the technology use patterns of students from three Australian universities and found that only 14% of them could be classified as "power users" who used a wide variety of technologies with any frequency. The remaining groups used a restricted range of technologies centered mostly on basic mobile phone features and basic web use (e.g., sending email or looking up information), with very few using technology for gaming, multimedia content