Digital Learners: How Are They Expanding the Horizon of Learning?*

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Abstract

Young learners today are not growing up at the foot of the family radio or spend a good portion of their childhood glued to the television while Sesame Street and Mr. Rogers disseminated information in a constant stream as did previous generations. Rather, this generation of young learners continues to spend many out-of-school hours in a digital world composed of cell phones, MP3 players, computers, and video gaming. This very simple beginning is changing the horizon of learning. The primary purpose of this article is to examine the components of digital learning and the impact these components bring to the relationship of learners to their learning experience. Further, instructional and curricular modifications are discussed addressing the trend of expanded learning, evaluation of that learning, and the possible impact on the educational system, students, educators, and trainers across the nation and throughout the world.

NOTE: This module has been peer-reviewed, accepted, and sanctioned by the National Council of Professors of Educational Administration (NCPEA) as a scholarly contribution to the knowledge base in educational administration.

1 Evolving Literacy for Digital Learners

Literacy in the 20th century has expanded from an emphasis on comprehending page text and listening to lectures to include a wider, more encompassing tool set, requiring more activity-based competencies. Though previously didactic learning was the mainstay in the classroom, it has since been recognized that other learning styles may be more suited to the online learning experiences and that the expansion of learning may begin early on. Prensky (2001) claims that "digital natives" having had exposure to technology from

*Version 1.2: Jul 11, 2008 2:58 pm -0500
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an early age, now may have brains that are wired differently. In this claim, information is processed in a random access manner, rather than linear, yielding to a simple "stepping stone" effect in lieu of the winding "sidewalk-model" of thinking. Though in either case, this is still considered logical thinking. Youth have now added robust multi-tasking to their learning skill set. In support of this adaptation, a 2003 survey of 1,065 U.S. parents requesting information concerning computer usage found that computer usage generally began in the parent's lap by age two and by age three, children could control the mouse, load a CD, and turn on the computer (Calvert et al., 2005). This suggests that students are learning to incorporate digital tools about the time they are acquiring and incorporating language and verbal skills yielding the incorporation of these skills early on.

Beyond comprehending text and early computer skills, learners must be competent in image and screen navigation in order to perform as fully literate (Brown, 2000). Twenty-first century literacy demands the ability to use technology, including visuals and audio segments to enhance personal learning and to communicate more effectively with others (Looney, 2005). Literacy now encompasses more than mere reading and comprehending thoughts from text. Computers, DVD players, cell phones, game consoles, and iPODs (Apple Computer) are now the norm in students' pre-and post-school day activities. Choices abound within the video game world. Though these claims are not yet universally understood and accepted, initial research into new literacies promotes the notion that a different skill set is required for building competencies online. The repeated findings of "no significant difference" between online and traditional course offerings in the broad spectrum indicate that the act of learning may be changing to incorporate this expanded instructional style (Bernard, Abrami, Lou, & Borokhovski, 2004; Bernard, Brauer, Abrami, & Surkes, 2004; Clark, 2001; Russell, 1999; Smith, Clark, & Blomeyer, 2005).

The United States National Research Council found in a two-year study that youths require a level of control over their learning in order to make needed transfers of information (Huffaker & Calvert, 2003). Similar to researching on the Web, students would prefer to follow multi-topics in multi-logical directions much like brainstorming techniques and lateral thinking introduced by Edward DeBono (1967)[1][1] rather than being fed a constant unidirectional message. These learners preferred a speed which Prensky deems "twitch speed" translating to hit it hard and fast, and then proceed. Additionally, "digital natives" appear to prefer graphics first with text to support unclear content rather than the "digital immigrant" method of illustrations to augment text (Prensky, 2001). The idea that information is fluid and informed by multiple inputs which may be updated instantaneously when discovery occurs is not a foreign concept to 21st century learners. Brown dubs these learners "bricoleurs"[2][2] evolving from a term first used by Claude Levi-Strauss (Brown, 2000, p. 14). Bricoleaurs have the ability to take some small piece of information and then use it to create something meaningful for themselves.

Brown further notes that today's adolescents have moved their preferences for knowledge acquisition from non-ownership or semi-ownership to self-ownership, from linear to multi-linear or lateral, and from becoming unresponsive when they do not understand to "lurking then trying" (Brown, 2000). Perhaps most importantly, "digital natives" are network builders, reaching out for both information and for social contact. With access to anyone, anytime, anyplace at the end of a computer, cell phone, or Blackberry (Research in Motion Limited), these students are better than ever before at building a community of learners naturally. (Brown, 2000).

"The new science of learning, as advocated by the National Research Council and the National Academy of Science, recognizes the importance of allowing children to take control of their own learning experiences [Bransford, Brown & Cocking, 1999]" (Huffaker & Calvert, 2003, pp. 325-6). The terms "active learning" describes the learner taking an active role in the learning process, "metacognition" is defined as the student monitors and regulates their own learning, and "transfer of knowledge" as learners apply information learned to multiple settings and tasks, are now a part of the educational vernacular (Huffaker et al.). Digital gaming may bring all of these elements into play (Gee, 2005.)

Calvert, Rideout, Woolard, Barr, and Strouse (2005) suggest that when young children spent time with the computer, it most often involved game play. Though "digital immigrants" may profess gaming to be a

[1] http://www.edwdebono.com/debono/lateral.htm
[2] http://ieeexplore.ieee.org/iel5/9280/29473/01336156.pdf?arnumber=1336156

waste of time, James Paul Gee demonstrates that good games contain multiple elements of current learning theory. Good games provide players with stimuli and allow responses, positively reinforcing players and providing motivation for repeated response. This is indicative of behaviorism and operant conditioning.

Research into areas such as, internal locus of control, problem solving strategies, visual and divided attention, and spatial abilities demonstrates the impact of action video gaming on cognitive abilities. Blumberg and Sokol (2004) found that older children and children who described themselves as frequent video game players tended to rely more heavily on internal strategies such as reading instructions or trial and error than external strategies such as asking for help or watching someone else play when learning a new game than did younger children and those that did not play video games. The most frequently used internal strategy was trial and error, thereby driving a strong need for logical and intuitive interface designs for good programs. Greenfield, Dewinstanley, Kilpatrick, and Kaye (1994) indicate that strategies employed by video game players may transfer to other areas that require split attention. Green and Bavelier (2003) provide evidence that action-game training led to greater performance improvement in visual attention to multiple fields which switch rapidly, leading to detectable effects on new tasks within a short time period. (p. 536). Though when students are assessed for both static and dynamic spatial ability, gaming led to significant improvement in dynamic spatial skills in specific subjects. (p. 26). To cap off these findings, Crawford (2006) notes that there is a tendency for positive multi-tasking ability differences in those that complete online courses verses those that do not, suggesting that those who complete online courses have a higher level ability.

Dickey (2005) found that in the evolution of video game development, programs have moved from a player outside the game to a player inside the game format. Though online gaming communities have broadened access to this engaging construct, the educational community has yet to embrace it on a wide scale.

The North Central Regional Educational Laboratory (NCREL) described online reading comprehension as utilizing a different skill set compared to traditional print comprehension. Though traditional comprehension encompasses the ability to locate and filter materials, and share the findings, online reading comprehension has added to these skill sets the ability to navigate through systems, to evaluate, to synthesize information and then to communicate findings in new formats. (Leu, Castek, Hartman, Coiro, & Henry, 2005)

Added to online comprehension ability, recent cognitive research notes a new understanding of the way memory functions. Multiple studies, such as Mayer and Moreno's (1998) investigation on split-attention, demonstrates that memory has both a visual and an auditory component. In this particular study, findings indicated that multi-media presentations with both visual and auditory components can improve retention.

2 Summary and Analysis

Analysis of the body of research attempting to unmask the mysteries of the shift in education since the dawn of the digital age points toward both curricular and instructional impact. To place all of this into perspective, five themes running through research have evolved. These themes suggest that digital learning is being injected into story time and all other portions of very young children's learning through computers and computer games. Learning is expanding to include high doses of visual and auditory interactive materials. Good computer games provide good learning opportunities to enhance transferability and retention of content, and learners want to maintain control over their own learning. The young learner seems to be accepting the digital learning at an expanded rate of speed which suggests that digital learning is highly compatible with these young learners' learning style. These five themes impact the curriculum and the instruction.

Curricular Impact

A new type of literacy relying less on text, but requiring integration of images in the form of both graphics and video will be necessary for students to communicate effectively. Literacy no longer encompasses only what is taken in from presented material, but also includes the production of materials, such as the products yielded through Bloom's Synthesis Level.[3][3] Written English language has evolved into two completely competing genres, the formal language of business and school, and the abbreviated and initialized version utilized in text messaging and other digital formats.

[3] http://www.center.k12.mo.us/edtech/blooms/synthesis.htm

Educators have acknowledged the optimal time for learning content may be an internal process tied to individual development. Giving students a choice in how and when they learn content should also be considered within the curriculum. Information synthesis from multiple sources is required with evaluation leading to the production and communication of original thoughts. Though these skills have long been valued at the graduate study level, the sheer volume of new information [4][4] produced daily requires acquisition at a very early age.

Instructional Impact

The preponderance of random-access processes to discover information through multiple topics in multi-logical directions has rendered the more traditional instructional method of linear presentation dull and not at all motivating. Further, students accustomed to having their hands on the controls, so to speak, utilizing mostly the trial and error method of learning may feel that a traditional classroom is much like waiting in line for their turn at the wheel. Applying the theory of good gaming design to instruction with the learner being provided appropriate stimuli and allowed responses, and with reinforcement, both positive and negative immediately following each step could prove to be more motivating, thus more effective. Instruction delivered in such a manner that it places the learner inside the lesson rather than outside more closely aligns with digital natives' thinking.

Since memory has been found to have both visual and auditory components (Mayer & Moreno, 1998), multimedia enhanced instruction should improve retention. Emphasis on image and sound over text alone will more closely mimic the inputs most students receive outside of the classroom. The multi-dimensional nature of the digital world lends itself to network building. Social networks encompass a significant part of the world of an ever-increasing number of students at younger and younger ages. Harnessing the skill for reaching out to others may provide the ability to build informational networks with experts outside the classroom.

3 Suggestions/Practical Advice

Curricular suggestions. A review of scope and sequence for various subjects at various educational levels will reveal an emphasis on subject area information to be delivered to students within a particular timeframe. References to page numbers in texts that were probably outdated at time of publication (particularly in the areas of science and world events) guide teachers to curricular decisions that vary little from the same format utilized in schools since the industrial revolution. A response that would more closely take into account the curricular analysis herein would focus on process skills, incorporating a kind of "twitch speed" for learning. A scope and sequence that would determine information management, evaluation, and synthesis skills to be taught in a developmentally appropriate sequence would be a first step in changing traditional practice.

Game players are encouraged to place themselves within the action, to be producers rather than consumers, to take risks, solve problems, think systemically and laterally, and perform to reach competency, providing the opportunity to self-select levels of difficulty, get additional information on demand and reward levels of solutions (Gee 2005). Most importantly, multiple studies have demonstrated that the influence of video game play has altered the way individuals learn.

Subject area content should be outlined in overarching themes that allow for integration across disciplines and flexible timeframes for discovery. Students should be challenged to investigate provocative, age appropriate questions that motivate them to inquire and research for the answers and then communicate what they have found with others. The ability to quickly identify relevant sources of information and to synthesize this information into appropriate solutions is a critical skill for student to master if they are to succeed in an information-rich environment.

Professional development with teachers should focus on their ability to manage and evaluate both information and students in the process of acquiring this information. Since most teachers are still of the digital immigrant generation, they use digital media for information gathering rather than production. Many are not comfortable with the skills of online researching and most are extremely lacking in the ability to evaluate the validity of the information gathered. Digital immigrants attended school when written materials were

[4] http://www.lps.k12.co.us/schools/arapahoe/fisch/didyouknow/didyouknow.ppt#260

generally peer reviewed before publication; therefore the assumption was that if it was written it was true. Few understand that anyone can put anything on the web even if it is not creditable. Students must be taught how to filter what they see online or hear through other media channels for reliability and validity.

Teachers must also be taught how to evaluate student products. Students, more adept at multimedia tools than their instructors, can often create phenomenal productions largely devoid of any depth of purpose. Instructors must be trained to get beyond the glitz of the package to the content and push students to achieve both.

Instructional suggestions. Traditional instruction where content is delivered by any means then reiterated to the instructor for evaluation provides a linear flow from teacher to student and back. A model that places the student in a more active role of both learner and instructor would more closely align with the multi-dimensional digital world to which most learners have now become accustomed and foster the filtering of information for validity and reliability. The teacher provides a stimulus, which the student then begins to investigate using various structured methodologies, such as frequent feedback that spurs students along the right path or steers those who stray back on track thus allowing the learner to utilize the internal strategy of trial and error. Guided peer review at designated stages of completion complements the need to network. Publication of exemplary works to a wider audience whether it is the local community or the World Wide Web offers a reason to monitor product quality. Most importantly, evaluation should take place throughout the entire learning process and should not be limited to the completion of a rubric at the project's end.

4 Conclusion

The manner in which students are taught will not truly change until the manner in which we teach and evaluate students change. Multiple studies suggest moving students from consumers of information to producers of information. This, above all else is the key to engaging digital learning. However, until teachers are trained to expect and accept content gathered through social networks with emphasis on teaching students how to check validity and reliability of the web, the full power of the digital natives can not be released or expanded. Teachers must allow students to publish broadly then promote peer and expert outside evaluation. Digital immigrant teachers will require support and training before they feel competent to allow students the freedom to explore their full digital capabilities. The Digital Opportunity Measuring Stick 2005 [5][5] confirmed that the majority of America's high school students are "digital natives" (Lazarus, Wainer, & Lipper, 2005). Research demonstrates that these new learners come to school with budding skills in new forms of literacy, possessing different strengths in cognitive ability, and finding motivation in different forms than did their predecessors. These new learners are instructed by teachers who, for the majority, spent childhoods engulfed in television programs that fed information for consumption, rather than interaction, omitting the choices and short snippets that lead to further discovery. New and different learning styles are evolving into new learning theories, new literacy, and new types of learners which research confirms are cognitively impacted by digital experiences. This will surely require educational facilitators to revisit and ultimately expand the horizon of educational content and delivery.

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[5] http://cjtc.ucsc.edu/docs/dd_highlights.pdf

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Active Website

1.Edward DeBono (1967) http://www.edwdebono.com/debono/lateral.htm[6]

2.Bricoleurs http://ieeexplore.ieee.org/iel5/9280/29473/01336156.pdf?arnumber=1336156[7]

3.Bloom's Synthesis Levels http://www.center.k12.mo.us/edtech/blooms/synthesis.htm[8]

4.Shift Happens http://www.lps.k12.co.us/schools/arapahoe/fisch/didyouknow/didyouknow.ppt#260[9]
http://thefischbowl.blogspot.com/2007/03/over-two-million-served.html[10]

5.Digital Opportunity Measuring Stick 2005 http://cjtc.ucsc.edu/docs/dd_highlights.pdf[11]

[6]http://www.edwdebono.com/debono/lateral.htm
[7]http://ieeexplore.ieee.org/iel5/9280/29473/01336156.pdf?arnumber=1336156
[8]http://www.center.k12.mo.us/edtech/blooms/synthesis.htm
[9]http://www.lps.k12.co.us/schools/arapahoe/fisch/didyouknow/didyouknow.ppt#260
[10]http://thefischbowl.blogspot.com/2007/03/over-two-million-served.html
[11]http://cjtc.ucsc.edu/docs/dd_highlights.pdf