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Optimizing Learning With Digital Readers

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University freshman participated in this study to determine the difference in learning gains when using a digital reader rather than a traditional textbook in a participatory learning environment. The findings indicate that a combination of focused reading and participatory instruction result in increased learning, thus, challenging traditional instructional tools and delivery models. The researchers distinguish between digital users and digital learners and discuss the importance of using technology as an authentic and relevant learning tool and of teaching students to monitor metacognitive functions to suit context.

Keywords: higher education, digital readers, technology, metacognition

Optimizing Learning With Digital Readers

Thomas Kuhn's seminal work *The Structure of Scientific Revolutions* (1996) notes that knowledge depends upon the culture of a discipline, and it does not rely on adherence to specific definable methods. He further stipulated that a paradigm shift—a landmark change in ingrained thinking—will not occur until and unless a critical mass within the discipline is willing to make the shift. It is time for educators to make a marked shift in thinking when considering their students, how they learn, and how they perceive technology.

Higher education purports the tacit assumption that students are "drifting through college without a clear sense of purpose" (Arum & Roska, 2011) rather than considering the ways in which 21st century students think, learn, and communicate. Education should no longer rely on computer-supported learning (Pea, 1994) but embrace instead technology that is at the tips of students' fingers. Instead of relying on the computer lab or the computers-on-a-cart configuration, educators should systematically and purposefully develop ways of integrating technology into the very essence of their content area lessons, thus mirroring the ways in which students engage both in learning and socializing. Embedding new technologies and methodically implementing them in the classroom in ways which hold authenticity and relevance for the student is one way to close the gap between how educators think students should learn and how students actually learn.

Focusing on technology as a new literacy (Wilber, 2010) makes sense in the wake of accusations that student literacy is declining (National Endowment for the Arts, 2007). An examination of meaning making as an outcome of utilizing digital literacy for learning gains is at the core of this study.

Research Question

The purpose of this study was to determine if there is a significant difference in learning in the classroom setting when using a digital reader rather than a traditional textbook. A brand name, high-end digital reader was

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selected for this study because of its limited access to the Internet and the researchers' opinions that limiting such access would ground student focus on reading to understand specific information rather than surfing the Web to synthesize information. In this way, the disequilibrium that exists when trying to work with digital books in a non-linear format (Dalton & Proctor, 2010) would effectively be minimized.

A secondary purpose for this study centered on using technology in a participatory manner. In order to make meaning from digital text, students would have to "participate effectively in the affairs of their community in a collaborative effort to achieve a common (end)" (John Dewey Project on Progressive Education, 2002). Thus, this article focuses on the research question: Is there a difference in student learning gains when using a digital reader with participatory instruction versus a traditional textbook and a less participatory delivery model?

Related Literature

Research on the digital practices of college-age students has not been well documented (Wilber, 2010), although some literature concerning the personal use of technology by college students is emerging (Terkle, 2011). The literature cited here is not intended to be an in-depth discussion of the extant literature, rather, its purpose is to touch on the literature that is pertinent to the present study.

Much of the work concerning technology that has been accomplished at the post-secondary level concerns itself with students' attitudes toward specific technological brand names, participation with online learning contexts, and the concept of sustainability (Mentch, 2009; Wilber, 2010). Other works have been concerned with the type and number of electronic devices varying types of students use and for what purposes (Jones, 2003).

Bonk (2009) linked the use of advancing technologies to major changes in teaching and learning and posits that these technologies support enhancing the roles of teacher and learner. Teachers, acting as guides, tutors, and mentors should no longer impart learning to students. Technological learning at its best is purposeful, self-directed, and immediate, rendering the student a participatory, collaborative learner (Borgman, 2007; Davidson & Goldberg, 2009). Additionally, a participatory approach to reading with digital media renders interaction with text deeper and less cursory than does passive reading or scanning of texts supplemented by teacher lecture (O'Connor, 2009).

While traditional reading is on the decline, digital reading is on the rise (National Endowment for the Arts, 2007). Evidence suggests that students of all ages spend more than four hours online daily (Rideout, Roberts, & Foeehr, 2005). Reading text largely mirrors periodical publications (Weigel & Gardner, 2009). The fact that virtually every educational or recreational book can be digitized lends support to investigating the effects of traditional versus digital texts on teaching and learning (Bonk, 2009).

Both educators and students, in attempting to navigate successfully from print technology in the world of books to utilization of new literacies, such as those found on digital readers, find themselves in unexplored territory. Moving students from a linear, stable environment to a less linear space (Dalton & Proctor, 2010), such as that offered by digital readers, becomes challenging for educators who are vested in ensuring that students make meaning from reading using digital text. Students, on the other hand, possess a plethora of technological skills that are finely honed and updated through daily use of social networking, texting, and smart phone use (Terkle, 2011). Educators must find a point at which embedding digital technologies in teaching and learning for the purpose of meaning-making and students' recognition that technologies can be used to learn authentically naturally converge.

Research Methodology

Sample

The study was conducted at a medium-sized, public comprehensive university on the eastern seaboard of the United States. Two classes, one experimental class and one control class of undergraduate students, participated in the study. Students in the experimental class received the digital reader in place of a traditional textbook, while students in the control class used a traditional text. The study took place during one 16-week semester.

The experimental class (N = 27) was taught by a doctorate level professor who has been teaching the course for four years, while the control class (N = 27) was taught by a master's level adjunct faculty member who is in her second year of teaching the course. Both instructors have similar teaching styles and used the same syllabus for this study.

The social science text selected for the study was used solely by the two classes involved in the research. The text was chosen not only for its content but also for the similarity of its appearance to the digital text. Neither the hardcopy nor the digital texts were in color, and charts and graphs throughout the text were sparse. Thus, both the hardcopy and the digital texts' appearances were considered equivalent reading tools and not limitations to the study. Additionally, students were using the digital reader in the same way and for the same purposes, rendering it with a neutral tool.

The digital text was loaded onto the digital readers by a graduate assistant prior to the beginning of the semester. Students in the experimental section were asked not to purchase a textbook while students in the control section were instructed to buy the textbook which corresponded to the course. Students in both sections were given a pre-test on the course content on the first day of class prior to beginning instruction.

Instrumentation

The instrumentation chosen was designed to gauge students' familiarity with digital readers, to determine students' overall reading achievement, to establish how much learning took place over the course of the semester using the digital readers, and to triangulate data. Student surveys, "SAT®" verbal scores, and a pre-/post-test of the course content were used as data collection instruments. Additionally, students kept digital reader journals in which a series of prompts given at various points during the semester were answered. The prompts began with garnering information about perceptions of digital readers and segued into questions designed to monitor students' increasing familiarity with and use of the reader technology as well as students' development as digital learners over the course of the semester.

Delivery Model

In order to ensure student engagement with the text and in recognition of the fact that completion of outside reading assignments could not be guaranteed, classroom sessions of both the experimental and control classes were designed, so that students would actively use the digital reader or the traditional textbook to search for information in order to both construct meaning and gain content knowledge. Thus, traditional lectures were abandoned in favor of heterogeneous groupings. A series of grouping strategies (modified Meyers-Briggs, Six Thinking Hats of Edward De Bono, etc.) were used to form fluid student groups throughout the semester. Groups were then given prompts related to information in the digital text which they had to find and read before effectively translating the content to their peers. Additionally, group members had to contribute an individual public performance which in some way reflected their interaction with and understanding of the digital text.

Study Limitations

The study was limited to a small sample of students ($N = 27$) and took place over a 15-week period of time in a single college course. While the results indicate learning gains, there are possibilities for much future research. Such research should broaden the size of the participant group and lengthen the time of the study as well. It would be beneficial to expand the scope of the study to examine whether the digital reader or the participatory learning made the most significant impact on student learning gains. Finally, it would be of great value to use the digital tool in a manner which is more consistent with how students are using digital media in authentic ways rather than mimicking reading that is typically done with a traditional text.

Findings

Survey Data

Student surveys designed to collect demographic information and student familiarity with digital readers were given to the experimental group during the first class meeting. Survey results indicated that the experimental group consisted of 27 students, 23 females, and four males. Out of the 27 students, two were black and 25 were white. Most students were either freshmen or sophomores who intended to major in education ($N = 18$). The remaining seven students intended to major in nursing ($N = 2$), social work ($N = 3$), history ($N = 1$), or criminology ($N = 1$), or had not yet decided on their major ($N = 2$).

Survey responses yielded limited student experience with digital readers ($N = 3$). The brand of digital readers with which students were familiar was "Sony®" ($N = 2$), and one student reported using the "Kindle application®" on the "iPhone®". These results were surprising given that "students' uses of technology for personal purposes are much more widespread than for academic or college-driven purposes" (Wilber, 2010, p. 559).

SAT Verbal Scores

The number of possible points on the SAT verbal is 800. In 2008−2009, the National Center for Education Statistics (2011) reported an overall mean SAT verbal score of 501. The mean SAT verbal score for the experimental class using the digital reader was 512. The mean SAT verbal score for the control class which used the traditional text book was 526. Both the experimental and control classes' scores are above the mean reported by the National Center for Education Statistics (2010). The researchers interpreted this score to mean that the students in both classes were capable readers.

Pre-/Post-test

Students in both the experimental and control class took a 45-question pre-/post-test based on the content of the social science course. Administered by a graduate assistant on the first and last day of classes, the average pre-test scores were 46% and 47% respectively. There was no significant difference in the pre-test scores between the experimental and control classes.

Post-tests were administered in a whole class setting by the same graduate assistant in the regular classroom setting. The average post-test score for the experimental class was 85%, evidencing an average gain of 39%. The control class, on the other hand, scored an average of 58% on the post-test, gaining 11%.

Journal Responses

Students were given a series of writing prompts weekly during the 16-week semester. Initially, prompts centered on perceptions of the digital reader and yielded information similar to findings of previous studies. Over time, prompts became more focused on how students learn using the digital reader as well as their

perceptions of themselves as digital learners.

Themes which emerged from journal responses include but are not limited to efficiency of using the digital reader in a classroom setting; the relevancy of focused readings to the content of the class; and the focus on reading for specific information. Students reported that reading with a digital reader was more efficient than reading with a traditional textbook. They reported that:

> When reading the required material (they) felt like (time) goes by so quickly compared to reading a textbook. When (they) read textbooks, (they) normally look to see how long the chapter is so (they) can prepare (themselves) for the next hour to read. (They) report working with the digital reader is a different story: (they) do not even look to see how long a chapter is because (they) know it will only take (them) 20-30 minutes to complete the assigned reading. (In the journal response)

Students also reported that looking for specific points that "were relevant to what we (were) learning rather than taking notes on every possible thing" was a direct outcome of using the digital reader. Other students added that they "feel more confident with searching for specific information, but also (that the) digital reader made (them) focus on what (they) were looking for". Based on this feedback, the researchers feel that the digital reader served part of the purpose for which it was chosen—namely that it required students to focus on the information in front of them rather than information that was available through flipping pages or following hyperlinks.

Summary and Discussion

The researchers believe that the gain of 39% made by the experimental class over the 11% gain made by the control class may be attributed to two distinct classroom phenomena: the use of digital readers with limited access to the Internet and participatory learning and collaboration in the classroom. Focused reading using a digital reader eliminated "the opportunity to explore and switch topics… tempting readers to hop from point to point, distract(ing) them from their original task" (Weigel & Gardner, 2009, p. 38). Using the digital reader to control for the "grasshopper mind" (Papert, 1994) (flipping pages, following hyperlinks, etc.) most likely contributed to larger gains in student learning.

A second phenomenon, participatory learning, is believed by the researchers to have contributed to larger student gains in the experimental classroom. Responsibility for student learning through peer interaction and shared responsibility during class time rendered avoidance with the digital text nearly impossible to achieve. While both classrooms engaged in participatory learning, the researchers believe that the combination of digital reading and participatory culture resulted in learning which was "self-directed and immediate" (Bonk, 2009). Student roles shifted from passive recipients of knowledge to "searchers of relevant knowledge in an environment that support(ed) the creation and sharing of creations" (Jenkins, 2009).

Implications

The roles of learning institutions, the teacher and the student continue to rapidly change. Much of the change may be attributed to the sheer volume of information available as a result of continuous advances in technology which pervade all aspects of daily life. The result of these advancing and available technologies is a blurring of the distinction between who is considered a learner and who is considered an educator as well as the lines between home-learning and school-learning (O'Connor, 2009).

Technology savvy students arrive at universities and find themselves faced with antiquated delivery

models and outdated or inaccessible technology. In many cases, computers reside in outdated computer labs, are housed on carts and are controlled by faculty, or are only available at certain times of the day. In the digital reader study, technology was made readily available to students who had access to the reader around the clock.

Typically across universities, professors engage in an hour long lectures supplemented by out of class readings as the preferred pedagogy. Oftentimes, assigned readings are skimmed or ignored by students who find them irrelevant to material covered during class time. In the digital reader study, students used technology to make meaning of digital text because they were required to not only synthesize information, but also to evaluate and analyze information. Furthermore, they were required to create ways of translating learned information to peers who had not read the same digital text. The higher level thinking skills used in this manner require a low degree of task automaticity and yield a deeper understanding of the text as evidenced by greater learning gains. The researchers consider students who make meaning from digital text students who "learn digitally".

In contrast, students who use digital technology to accomplish such activities as texting, surfing the Internet, or socializing employ identification, application, and synthesis skills in a broad, less disciplined way. Students who regularly engage with digital text in this manner do so with a high degree of task automaticity. These students can be classified as "digital users", but in truth, they may not be digital learners.

Figure 1 illustrates the differences in the two modes as well as the constructs each type of digital integration involves.

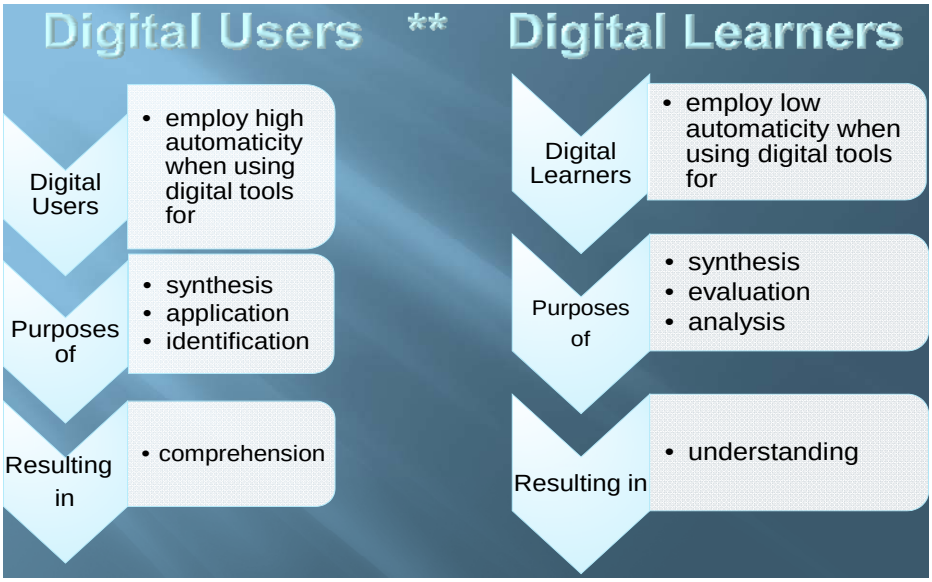

Figure 1. Approaches to manipulating digital text.

This distinction in manipulating digital text is important to note, both for students and for educators. Students should possess the metacognitive awareness that enables them to differentiate between tasks requiring a high amount of automaticity and those which require deeper focus and interaction with text. Students who possess this ability will be able to adapt continuously as context shifts, thus becoming the more successful learners.

Educators, in the role of digital mentors, should then help students recognize specific learning contexts and teach self-monitoring of cognitive processes for purposeful and directed learning experiences. Additionally,

they must create frequent learning opportunities for students to deeply interact with digital text. Doing so will provide relevant learning opportunities for students as well as the potential for greater learning gains. Additionally, educators who use digital texts model for students believe the fact that technology can be an authentic learning tool rather than simply an adjunct source of information.

Using a digital reader for focused learning is but a minor step on a very long journey to optimize learning in a technologically advanced world. The challenge to educators now becomes further development of utilizing digital devices in authentic learning experiences.

References

Anderson-Levitt, K. (2003). *Local meaning, global schooling: Anthropology and world culture theory*. New York: Palgrave MacMillan.

Arum, R., & Roksa, J. (2011). *Academically adrift: Limited learning on college campuses*. Chicago: University of Chicago Press.

Bonk, C. J. (2009). *The world is open: How web technology is revolutionizing education*. Available in Amazon Kindle Books.

Borgman, C. (2007). *Scholarship in the digital age: Information, infrastructure and the Internet*. Available in Amazon Kindle Books.

Darling-Hammond, L. (2010). *The flat world and education: How America's commitment to equity will determine our future*. New York: Teachers College Press.

Dalton, B., & Proctor, C. (2010). The changing landscape of text and comprehension in the age of new literacies. In J. Coiro, M. Knobel, C. Lankshear, & D. Leu (Eds.), *Handbook of research on new literacies* (pp. 297-324). N. Y.: Routledge.

Davidson, C. N., & Goldberg, D. T. (2009). *The future of learning institutions in the digital age*. Available in Amazon Kindle Books.

Guskey, T. (2000). *Evaluating professional development*. Thousand Oaks, C. A.: Corwin Press, Inc..

Jenkins, H. (2009). *Confronting the challenges of participatory culture*. Available from Amazon Kindle Books.

John Dewey Project on Progressive Education. (2002). *A brief overview of progressive education*. Retrieved August 25, 2011, from http://www.uvm.edu/~dewey/articles/proged.html

Jones, S. (2003). *Let the games begin: Gaming technology and entertainment among college students*. Retrieved August 25, 2011, from http://www/pewinternet.org/reports/toc.asp?Report=93

Kuhn, T. (1996). *The structure of scientific revolutions* (3rd ed.). Chicago: University of Chicago Press.

Lawless, K., & Shrader, P. (2008). Where do we go now?: Understanding research on navigation in complex digital environments. In J. Coiro, M. Knobel, C. Lankshear, & D. Leu (Eds.), *Handbook of research on new literacies* (pp. 267-296). N. Y.: Routledge.

Mentch, M. (2009). *Amazon Kindle DX pilot summary of results* (Abstract). Case Western Reserve University.

O'Connor, P. (2009). *Close reading, associative thinking, and zones of proximal development in hypertext*. Retrieved November 29, 2010, from http://www.academiccommons.org

National Endowment for the Arts. (2007). *To read or not to read: A question of national consequence* (Research paper No. 47). Washington, D. C.: Author. Retrieved October 1, 2010, from www.nea.gov/research/ToRead.pdf

Papert, S. (1994). *The children's machine: Rethinking school in the age of the computer*. N. Y.: Basic Books.

Pea, R. (1994). Seeing what we build together: Distributed multimedia learning environments for transformative communications. *Journal of the Learning Sciences, 3*(3), 285-299.

Princeton University. (2010). *The E-reader pilot at Princeton, fall 2009*. Retrieved from http://www.princeton.edu/ereaderpilot

Rideout, V., Roberts, D., & Foeehr, U. (2005). *Generation M: Media in the lives of 8-18 year olds*. Menlo Park, C. A.: Kaiser Family Foundation.

Terkle, S. (2011). *Alone together: Why we expect more from technology and less from each other*. N. Y.: Basic Books.

Digest of Education Statistics, 2011 (NCES 2012-001, Table 153). (2011). U.S. Department of Education, National Center for Education Statistics.

Weigel, M., & Gardner, H. (2009). The best of both literacies. *Educational Leadership, 66*(6), 38-41.

Wilber, D. (2010). College students and new literacy practices. In J. Coiro, M. Knobel, C. Lankshear, & D. Leu (Eds.), *Handbook of research on new literacies* (pp. 553-581). N. Y.: Routledge.