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Research Brief

Digital Textbooks

Question: How are digital textbooks currently being used, and with what effect? What is the future of digital instructional materials?

In a Nutshell

Despite their growing popularity, digital alternatives to conventional textbooks are stirring up controversy. With the introduction of tablet computers, and the growing trend toward "cloud computing" and "open source" software, the trend is accelerating because costs are coming down and free or inexpensive materials are becoming more available. Evidence is also starting to mount that this new technology can have a positive effect on student learning, although teachers will require training and professional development to integrate it effectively into their teaching.

Summary of Findings:

Bob Wise, former governor of West Virginia and current president of the Alliance for Excellent Education (http://www.all4ed.org/), in a webinar presentation entitled "The Online Learning Imperative: A Solution to Three Looming Crises in Education," describes the three major crises in K-12 education in the United States -- teacher shortages, state budget shortfalls, and low student achievement. He then explains how technology and online learning can lead the U.S. education system out of them.

Two elements of this presentation are not surprising: (1) Bob Wise is an advocate of improved achievement through technology and promoted it vigorously while governor; and (2) Wise expresses a growing hope among educators that technology will allow schools to cope with the tremendous diversity of the American student population. What *is* surprising is that the free webinar was sponsored by Pearson – one of the oldest and largest publishers of education materials (aka "textbooks") in the world.

Because of the newness of the most promising technologies, organized, systematic research on educational effectiveness is scarce. However, journalistic and anecdotal reports of the move (some say the "inevitable move") toward the use of digital textbooks and other instructional materials in place of traditional "analog" textbooks focus on three driving forces:

- **Economic** – anticipated long-term cost savings for school districts and states

- **Technology Development** – anticipated improvements in digital, hand-held technology
- **Instructional Effectiveness** – theoretical alignment between the capacities of digital technology and the way in which the "digital generation" acquires information and learns.

BI and AI

Most of the literature on the use of digital technology as a full replacement for textbooks can be divided, roughly, into "*Before iPad*" and "*After iPad*," or the appearance of Apple's iPad and other newly evolving competing products from a dozen manufacturers. (As of March, 2010, iPad held 92% of the tablet market, so it is used here as shorthand for "tablet computing device." With the appearance of iPad 2 in early 2011, Apple's hold on the popular market has continued to tighten. However, among educators, the lack of Flash video compatibility and the absence of a USB port on the iPad have made other brands more competitive in school markets.)

Before iPad, digital textbooks consisted largely of regular, hard-copy textbooks downloaded to a digital device of some kind – a laptop computer, digital "reader" (Amazon's Kindle or Sony's Reader, etc.), Netbook, or similar device. Most of these were electronic editions of published books, sometimes loaded as a "pdf" file that allowed students to read, on the screen of a light weight device, the same material to be found in a 9 pound textbook. Because some of these devices were not color-compatible, the graphics found even in their printed counterparts were not always available to students.

With the advent of devices such as tablet computers (e.g., iPad) that capitalize on the interactive power of Web 2.0 (the ability of the user to interact with the material, rather than just read it), the power of digital media content became more fully apparent to educators and publishers. The "textbook" could now integrate all kinds of capacities – sound, video, networking, communicating, searching, graphics, presentation, photo-sharing, word-processing – the list is nearly endless. As a result, the conversation has shifted away, somewhat, from "digital textbooks" to multi-function "digital media" as a replacement for traditional textbooks.

Criticisms

Despite the obvious promise of digital technology tools, they are not without critics. The primary criticism of these new kinds of "textbooks" include:

Aggravating the Digital Divide. Some educators are concerned that the use of even more technology will exacerbate the digital divide that already exists in schools – the difference in access to technology between affluent and less affluent schools and

students. Any program that requires the use of technology that may not be widely available to all students as seen as further advantaging those who are already advantaged and hobbling those with fewer resources to spend on technology. Even if the school provides basic technology in the form of iPads or digital readers, students may not have access to fast internet connections at home or other technology (cameras, scanners, etc.) that enhance their ability to perform critical learning tasks.

Cost. The largest consumers of state-adopted educational textbooks (California, Texas, Florida) spend just over $100 per student per year on textbooks. That varies from year to year based on the adoption cycle, but, in 2007, the last year for which data are available, California spent approximately $633 million on textbooks for their 6.25 million students. At that rate of spending, it would be difficult to purchase digital technology for all students and supply it with the necessary learning materials. Given the potential life-span of a handheld device, it would need to be replaced several times during the students' K-12 years, and, compared with a thick textbook, these devices are somewhat more fragile and likely to be damaged in the normal life activities of a child or adolescent.

Teacher Training and Re-Training. Current teachers would need extensive training and professional development to make the kinds of instructional changes required to use digital technology and maximize its potential benefits. Although the devices themselves can be purchased for as little as $400 or $500 each (and probably less under a large-scale purchase contract), the tablet itself is just a portion of the expense. For example, in Hillsborough County (Tampa), Florida, supplying 1000 students in two inner city middle schools with iPads actually cost the district $900,000, including the devices and the teacher training required to use them effectively.

Band-Width and Infrastructure. Many schools, and even some regions of the country, lack the infrastructure needed to support digital devices as a primary information source for students. Schools that do not have sufficient capacity on their servers to adequately "host" a thousand kids trying to get online would face costly upgrades and improvements. This problem is complicated in some regions where high speed, internet accessible cable is just not available, and the only service that students can use is very slow dial-up.

Restrictive Computer Use Policies. Existing policies in many districts forbid students from using hand-held and other digital devices to access the Internet. Other districts restrict student access with firewalls and other filters that make Internet access difficult if not impossible. The switch to digital devices would require a major overhaul of many district policies and even some state laws regarding cell phone or hand-held device use in schools.

Pandering to Popular Culture and Student Inattentiveness. Some critics believe that using digital technologies is a form of capitulation to the dominance of popular media and all of its problems – including fueling students' tendency toward distraction and

undisciplined lack of focus. These technologies encourage the kind of multi-tasking that, in the view of some educators, keeps students from concentrating on a specific intellectual task for extended periods of time.

Uncertain Outcomes. At present, there are no large-scale, systematic, controlled studies of the effects of using digital technology on student achievement. There is some evidence that it improves attention, time on task, engagement and curiosity – the "mediators" of achievement – but no firm evidence yet on enhanced student performance.

Strengths and Advantages

Advocates for digital technology use in schools have equally strong feelings and arguments as do the critics and detractors.

Closing the Digital Divide. Ironically, advocates say that hand held digital technology actually helps to close the digital divide between rich and poor students and schools. A recent Pew Research Center study suggests that less affluent students are more likely to have access to hand-held technology (cell phones, smart phones) than they are to computers. By some estimates, as many as 90% of urban youth have access to hand-held technology, but less than 40% have the same access to high quality computers.

Cost. The cost of technology is dropping precipitously, and, as more competitors enter the field, the cost of text materials will drop as well. Also, "cloud computing" and the trend toward "open source" software and resources will virtually eliminate the cost of providing software and content information for students. (See Project Gutenberg in the References section of this brief.)

Curriculum Alignment and Updating. Because of tremendous publishing costs, textbooks can be updated and adopted on a long cycle – usually every 10 years. In some fields, 10 years is an eternity. Digital resources can be updated, quite literally, every day – or at least very frequently –
and at very little cost. Also, materials can be customized to meet state or common core standards. Digital textbook initiatives in Florida (http://www.palmcenter.fsu.edu/documents/digitaltextbooks_whitepaper.pdf) and California (http://www.clrn.org/fdti/) provide online, digital textbooks that are clearly aligned with state standards.

Individualization of Instruction. For the first time, individualization of instruction, tailored specifically to student needs, is possible in a classroom setting. Teachers can assess a student's skill level, provide high quality, interactive instructional materials that are matched to that student's needs, and assess the student's progress individually. Instruction can also be matched to student learning styles, interests, and other abilities.

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Future Workforce Demands. Many futurists say that most of the routine tasks we perform can be either automated or outsourced. The real demands of the 21st Century workplace involves critical and creative thinking, problem solving, project management, production, and information creation and utilization. Interactive technologies allow for all of these skills to be developed, including the creation of products that are useful and focused on real world applications and problems.

Congruence with Contemporary Learning Behavior. Digital technology is the way that 21st students learn. They are accustomed to finding information, using that information to solve problems or answer questions, and moving on to other topics, problems and questions. Conventional schooling is based on the notion that information is doled out in measured amounts and at about the same rate for everyone by the teacher. This is a huge disconnect with the way contemporary students are accustomed to using information and creating knowledge.

Promising Outcomes. We can repeat, verbatim, the same statement used by the critics: At present, there are no large-scale, systematic, controlled studies of the effects of using digital technology on student achievement. There is evidence that it improves attention, time on task, engagement and curiosity – the "mediators" of achievement – but no firm evidence yet on enhanced student performance. Some advocates argue that this is a result of the fact that we are using standardized tests to measure the wrong things – that new assessments are needed to track the new learning made possible by digital technology.

Final Word

The debate over the use of digital media to replace conventional textbooks will continue to rage for some time. Simultaneously, the costs of the technology will come down, more districts will experiment with it, and the evidence for and against its use will mount. In the typical style of American education, it is unlikely that there will be a "big bang" moment when all of us convert to the use of digital technology in our schools as a replacement for traditional instructional materials. Instead, we will continue to do what David Tyack and Larry Cuban say we have always done: we will continue "tinkering toward utopia."

References

California Learning Resources Network, Digital Textbook Initiative. Retrieved from the Internet, May 10, 2011: http://www.clrn.org/fdti/

Lenhardt, A. (2010). *Teens, Cell Phones and Texting*. Report. Pew Internet and American Life Project. Retrieved from the Internet, May 2, 2011: http://pewresearch.org/pubs/1572/teens-cell-phones-text-messages

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Mardis, M., Everhart, N., Smith, D., Newsum, J. and Baker, S. (July, 2010). *From Paper to Pixel: Digital Textbooks and Florida Schools*, Tallahassee, FL: Partnerships for Advancing Library Media (PALM) Center, The Florida State University. Retrieved from the Internet, May 11, 2011: http://www.palmcenter.fsu.edu/documents/digitaltextbooks_whitepaper.pdf

Project Gutenberg invented eBooks in 1971 and now offers more than 33,000 free titles that can be downloaded to a computer, Kindle or other digital device. This includes most of the "classics" studied in school literature classes as well as other helpful materials.
http://www.gutenberg.org/wiki/Main_Page

Tyack, D. and Cuban, L. (1995). *Tinkering Toward Utopia: A Century of Public School Reform*. Cambridge, MA: President and Fellows of Harvard College. http://www.amazon.com/Tinkering-toward-Utopia-Century-Public/dp/0674892836

Resources

Comprehensive Reports of Research and State Adoption of Digital Textbooks

From Paper to Pixel: Digital Textbooks and Florida Schools, by Mardis, M., Everhart, N., Smith, D., Newsum, J. and Baker, S. (July, 2010).
http://www.palmcenter.fsu.edu/documents/digitaltextbooks_whitepaper.pdf

A comprehensive report on the use of digital textbooks in the State of Florida, one of the nation's largest textbook adoption states. This is especially good in laying out the pros and cons of digital textbook use.

California Learning Resources Network, Digital Textbook Initiative.
http://www.clrn.org/fdti/

A comprehensive resource that shows how digital textbooks currently available are aligned with California's state standards and benchmarks.

Internet and American Life Project – Research Reports
http://pewresearch.org/topics/internetandtechnology/

The Pew Research Center is a nonpartisan "fact tank" that provides information on the issues, attitudes and trends shaping America and the world. It does so by conducting public opinion polling and social science research; by analyzing news coverage; and by holding forums and briefings. It does not take positions on policy issues.

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Edutopia, from the George Lucas Foundation, is a tremendous source of research-based teaching practices, including the best advice on integrating digital technologies in the classroom. Free and online at http://www.edutopia.org/.

THE Journal, Technology Horizons in Education describes innovations, new practices and new products for schools. Free and online at http://thejournal.com/Home.aspx

Articles, Reports and Anecdotal Evidence

Publishers Invest in Inkling, Producer of Digital Textbooks by Josh Keller
The Chronicle of Higher Education, March 23, 2011, 3:01 am
http://chronicle.com/blogs/wiredcampus/embargoed-publishers-invest-in-inkling-producer-of-digital-textbooks/30525

An exploration of the growing trend toward digital textbooks in higher education and how they are starting to replace conventional publications.

Digital Textbooks Scroll Schools into New Era by Amy Hetzner
Milwaukee *Journal Sentinel*, January 15, 2011.
http://www.jsonline.com/news/education/113828984.html

Examination of how the Pewaukee (WI) schools are using digital textbooks and how they are affecting student learning.

Digital Textbooks: Three Reasons Why Students Aren't Ready by Josh Catone
Mashable.com, August 17, 2009.
http://mashable.com/2009/08/17/digital-textbooks/

A very interesting contrarian view of digital textbooks and their potential use in K-12 schools. This is a BI (before IPad) article, so some things may have changed.

In a Digital Future, Textbooks are History by Tamar Lewin
New York Times, August 8, 2009.
http://www.nytimes.com/2009/08/09/education/09textbook.html

Also BI, this article describes the California Digital Textbook Initiative and how it is being used in several districts in the state.

Goodbye Wheelie Backpacks: Digital Textbooks Will Dominate Over Paper Ones Soon by Kit Eaton.
Fast Company, March 16, 2011.
http://www.fastcompany.com/1739420/digital-textbooks-will-dominate-over-paper-ones-soon-is-the-iPad-to-thank

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Social learning platform Xplana has been analyzing the digital textbook market, and has concluded that in the U.S. the education publishing market has is reaching a tipping point: Within seven years, digital textbooks will dominate over print.

In Some Classrooms, Books Are a Thing of the Past by Ashley Surdin
The Washington Post, October 19, 2009.
http://www.washingtonpost.com/wp-dyn/content/article/2009/10/18/AR2009101802360.html

The textbook-free classroom is by no means the norm, but it may be someday. Slowly, but in increasing numbers, grade schools across the country are supplementing or substituting the heavy, expensive and indelible hardbound book with its lighter, cheaper and changeable cousin: the digital textbook.

The Future of Textbooks: eBooks in the Classroom by Wendy Woudstra
Publishing Central, 2006.
http://publishingcentral.com/articles/20030813-68-4409.html?si=5

Definitely BI, this article provides a thoughtful analysis of the future of digital textbooks based on early studies of their use and potential.

Electronic Textbooks? You Bet by Knowledge@Wharton
Forbes.com, March 5, 2010.
http://www.forbes.com/2010/03/05/electronic-textbooks-iPad-entrepreneurs-technology-wharton.html

A very thoughtful and thorough analysis of how digital textbooks are growing in popularity and how prices are coming down.

Schools See Rising Scores with iPads
eSchool News, May 9, 2011
http://www.eschoolnews.com/2011/05/09/schools-see-rising-scores-with-iPads/

Very early results from a project using IPads in California show promising trend in student achievement.

Kineo: Like an iPad, but Made for Students by Dennis Pierce
eSchool News, February 4, 2011
http://www.eschoolnews.com/2011/02/04/kineo-like-an-iPad-but-made-for-students/

Brainchild describes its new Android-based tablet as a low-cost, secure alternative to Apple's product, designed specifically for younger kids. It allows teachers to pre-program the sites that are available to students.

Oregon District Says ipods Fire Up Kids for Learning
eSchool News, January 5, 2011.
http://www.eschoolnews.com/2011/01/05/ore-district-says-ipods-fire-up-kids-for-reading/

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Oregon's Canby School District is fully embracing digital technology for instruction and is making great use of the ubiquitous ipod.

Five Ways Readers are Using iPads in the Classroom
eSchool News, May 27, 2011.
http://www.eschoolnews.com/2011/05/27/five-ways-readers-are-using-iPads-in-the-classroom/

This is a great collection of practices from eSchool News readers about how they are using this popular device in their classrooms to promote reading.

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