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Digital Textbooks: The Next Paradigm Shift in Higher Education?

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In recent years, college instructors have begun to abandon traditional approaches to instruction, which merely transfer knowledge from faculty to students, for cutting-edge strategies, which allow students to construct their own learning. This change in instructional strategy has also brought about a change in the tools which are used for instruction. As students gain more control over their learning, they also want to have more control over the tools that guide their learning. In many ways, the traditional textbook is no longer satisfying the needs of today's students. Consequently, students and faculty members are beginning to look for an alternative. Digital textbooks provide promise, but will they replace their print counterparts? The following article attempts to answer this question by exploring the evolution of textbooks from medieval times to the present day. The authors suggest that digital textbooks have a promising future in higher education.

American colleges and universities are in the midst of a shift in educational philosophy which has its roots in the constructivist movement of the 1970s but has gained considerable momentum in recent years (Warrick, 2001). This shift from an "instruction paradigm" to a "learning paradigm" (Barr & Tagg, 2000, p. 198) is occurring as the result of a mismatch between "what we say we want of higher education and what its structures

provide" (Barr & Tagg, 2000, p. 200). Unlike the "instruction paradigm," a teacher-centered approach, which endured throughout the 19th and 20th centuries and is, arguably, still pervasive in higher education today, the "learning paradigm" focuses on the needs of students (Barr & Tagg). For more than 20 years, the "learning paradigm" has been the focus of educational literature, yet true constructivist pedagogy has not been widely adopted in the college classroom (Yilmaz, 2008). Although it is difficult to change a paradigm which has dominated in classrooms for centuries (Boggs, 1995-1996), "there is a vocal and active group of supporters of the learning paradigm" (Schuyler, 1997, ¶8). More and more instructors are beginning to abandon traditional approaches to instruction, which merely transfer knowledge from faculty to students, for cutting-edge strategies, which allow students to construct their own learning. This change in instructional strategy has also brought about a change in the tools that are used for instruction (Williams, 2003). As students gain more control over their learning, they also want to have more control over the tools that guide their learning. In many ways, the traditional textbook is no longer satisfying the needs of today's students (Barack, 2006). Consequently, students and faculty members are beginning to look for an alternative. Digital textbooks provide promise, but will they replace their print counterparts? To answer this question, it is necessary to take a look at the history of textbooks.

THE HISTORY OF TEXTBOOKS

To understand the current context of textbook use, it is important to consider the textbooks used throughout history and their influence on modern textbooks. The discussion begins with the earliest surviving Chinese mathematics textbook, the *Chou-pei Suan-ching*, which dates from the Han dynasty (ca. 200 B.C.E.-200 C.E.) (Mendez, 2001). Another early textbook is Euclid's *Elements*, from 300 B.C.E., which Mendez described as the most enduring textbook in Western mathematics. It is estimated that one in seven manuscripts have survived from ninth-century Carolingian workshops to the present day (Cisne, 2005; "The Life and Death," 2005). Cubberley (1948) described "the great textbooks" used throughout the early Middle Ages as abridged compendiums that were in manuscript form (p.162). Research shows that medieval manuscripts have influenced today's textbooks. "Similarities between the approaches found in today's school mathematics textbooks and in their medieval counterparts do not represent a mere coincidence but are partly due to particularities of the history of the formation

of the modern school textbooks” (Volkov & Freiman, 2006, p. 3). One example shared by Volkov and Freiman is J. Kepler’s (1571-1630) medieval mathematics textbooks, which exerted influence on textbooks published in the late 19th to early 20th centuries and in the modern period.

During the Renaissance, the printing press made texts more readily available and contributed to the textbook’s use as a learning tool (Engelhardt, 1944; Hall-Quest, 1920). According to John Locke (1989), the schoolbooks used in England in the mid-17th century included the Horn Book, Primer, Psalter, Testament, and Bible. Two textbooks found in Colonial America were the hornbook and the *New England Primer* (Hall-Quest, 1920; Roser, Hoffman, & Carr, 2003; Venezky, 1987). A hornbook is described as a paddle-shaped piece of wood, just a few inches across, with a card of print tacked to it containing letters, syllables, and the Lord’s Prayer. A thin sheet of transparent horn protected the letters from smudges (Roser et al., 2003). The *New England Primer* was published between 1685 and 1690, and along with the hornbook, propagated religious teachings (Reynolds, 1976). Early textbooks, according to Reynolds, differed in format from modern textbooks. They were smaller, with small print and few illustrations, charts, and graphs.

To continue Reynolds’ (1976) account of the evolution of textbooks in early America to the present day, the 1700s brought newer editions of the *New England Primer* that reflected patriotism. After the American Revolution, this early textbook faded away to be replaced by more appealing ones, such as Noah Webster’s *Elementary Spelling Book*. This textbook emphasized patriotic and moralistic sentiments. McGuffey’s graded readers, which sold an estimated 12 million copies between the years 1820-1920, emphasized the values of hard work and thrift. Early botany and zoology textbooks appeared in the first half of the 1800s. In the 20th century, basal readers and learner-centered textbooks were in use. Graded reading textbooks then became associated with grade levels (Roser et al., 2003).

“Modern American textbooks are a creation of the second half of the 19th century when the common school movement created a large market for textbooks, and new canals and roads allowed national distribution of materials at low cost” (Venezky, 1997, p. 529). The extensive use of textbooks was documented as early as 1931 by William C. Bagley (Altbach, Kelly, & Petrie, 1991) and, according to Cronbach (1955), is “at the center of the present-day educational scene...Only the teacher—and perhaps a chalkboard and writing materials—are found as universally as the textbook in classrooms from the first grade through college” (p. 3). Yet other forms of learning materials were conceived as early as 1944 when Engelhardt predicted,

“Modern technological science will continue to make available machines and devices that will assuredly step-up the speed and volume of learning” (¶1). This prediction was a forecast of the digital textbooks yet to come.

TEXTBOOKS: FACTS AND FIGURES

Reynolds’ (1976) analysis of the development of textbooks identifies a recurring theme; these learning materials reflect the priorities of the nation. This assertion is supported by Roser and colleagues’ (2003) description of marketing decisions made by publishers. “Perhaps from the beginning, publishers of school texts, fighting for a market share, swayed with the times. For example, the early McGuffey readers, prepared for a post-Civil War southern market, avoided mention of Abraham Lincoln and slavery” (p. 273).

In light of the need for textbooks to present timely and accurate information, the costs associated with their use tend to be high. Depending on the subject, a single elementary textbook can range in price from \$30 to \$100 (California Performance Review, 2007). At the college level, a new textbook costs an average of \$102.44, while the average cost of a used book is \$64.80 (Orchowski, 2004). According to Orchowski, these prices reflect an increase of 33% since 1998. Bartlett (2005) elaborated, “A full-time college student at a four-year college spends almost \$900 annually on textbooks, or about 26% of the total cost of tuition and fees” (p. A45). The costs at two-year institutions are similar, according to Bartlett, except the purchase of books represents a larger chunk—72%—of their college costs.

A student’s preference for purchasing new or used textbooks seemingly relates to cost and availability of the textbooks that are required by their courses. The role of the publisher in the used textbook market is nonexistent, since publishers only sell new textbooks and materials (Textbookfacts.org, n.d.). Additionally, publishers and authors receive no money from the sale of used books and play no part in determining the amount of money students receive when selling used books. The “Frequently Asked Questions” link from Textbookfacts.org explains that book stores and book dealers profit from the sale of used books. This profit is shown in the way retailers mark up used texts at a higher percentage than new texts—50% for used, 33% for new, on average, which results in margins of 23-33%, according to the Government Accountability Office.

The costs associated with textbooks are not just financial. There are concerns about the negative impact textbooks have on student health. Ital-

ian researchers have found that more than a third of middle-school children carry loads on their backs in excess of 30% of their body weight (Seppa, 2000). The average backpack load for sixth-graders studied in Italy was 20 pounds, which equaled 22% of their body weight. The researchers' previous findings had indicated that "more than 60% of children in this age group had experienced back pain more than once due to heavy loads" (Seppa, p. 31). The researchers compared the rates of back pain in these children to those seen in adults. To offset the negative physical effects resulting from carrying heavy textbooks, it is recommended that 10% of body weight should be the cutoff for the safe use of backpacks for all grade levels (Moore, White, & Moore, 2007).

DIGITAL TEXTBOOKS

Those students who wish to save money (and their backs) by choosing digital, rather than traditional, textbooks can access eBooks through CD-ROMs/DVDs, databases, or websites. McGraw-Hill was one of the first publishers to provide enhanced versions of their textbooks on CD-ROM (Guernsey, 2000). It wasn't long before other publishers followed. Today there are too many digital textbook publishers to count; and, as technology has improved, so have the quality and variety of their eBooks. Digital textbooks that used to include just text now offer students a more personalized, interactive multimedia experience (Williams, 2003). In fact, some publishers have agreed to work with colleges and universities to design textbooks specific to their courses.

One of the first collaborations of this kind took place in 2000 when Vital Source Technologies and seven dental schools, including the College of Dentistry at New York University, the University of Texas Health Science Center, the dental school at the University of Buffalo, the dental school of Boston University, the University of Medicine and Dentistry of New Jersey, the University of Florida at Gainesville, and the United States Navy Postgraduate Dental School, worked together to put four years of textbooks, course syllabi, handouts, and images on one DVD (Guernsey, 2000). This was "the first time that digital content...completely replaced books for all students in a school" (Guernsey, ¶5).

The schools involved in this project provided several rationales for their decision to go completely digital. First, software searching capabilities made it possible to find information quickly and see connections between concepts more easily. Second, health-science textbooks are extremely expensive

to print. Because it costs even more money to include color photos, illustrations, and diagrams, most health-science textbooks are printed in black-and-white. Transforming these books to a digital format allowed color to be added at no additional charge. Another reason the dental schools decided to go digital was because some publishers estimate that 50% of students are buying used editions of textbooks or no textbooks at all. Vital Source Technologies found that only 10% of the students in all seven dental schools were purchasing the textbooks their professors listed on course syllabi. In 2000, a dental student paid as much money for the Vital Source DVD as he/she would have paid for textbooks. However, DVD updates were included in the purchase price, and the DVD's portability was very appealing to students who didn't want to carry heavy textbooks around campus or transport them between home and school (Guemsey, 2000).

Soon after the dental school DVD was developed, other colleges and universities began working with publishers to design digital textbooks that worked with their curricula. CD-ROM and DVD versions were soon replaced with digital textbook databases and websites which were easier to update (Crawford, 2006). In 2005, Souza and Bingham conducted a study which integrated technology into upper-level undergraduate courses on human evolution and history at the State University of New York at Stony Brook. They worked with Rothman Media to create online digital textbooks that included lectures, interactive questions and answers, images, animations, and glossaries. Student and faculty feedback was positive.

Digital textbooks can be easily added to and revised on an ongoing basis. Thus, they represent a tool that accretes power and value year after year. The digital textbook becomes shaped increasingly to address real areas of student difficulty—ultimately enhancing student learning and satisfaction to an extent probably not achievable with any other currently available approach. (Souza & Bingham, 2005-2006, p. 197)

Besides digital textbooks that are designed through a collaborative effort between universities and publishing companies, there are also digital textbooks that can be accessed through databases and websites for free or for a fee. Freeload Press is a digital textbook publisher that provides free

textbooks to students by allowing companies to place advertisements on their website. When students visit the website to download textbooks, they are asked to provide information to the advertisers. The information that a student provides is shared with the advertisers in aggregate only, unless he/she grants permission to share personal identifying information by checking a notification box (Freeload Press, 2008). Textbook Revolution also provides digital textbooks free of charge to students while encouraging them to review the books they find and share them with their professors (Textbook Revolution, 2008).

Other websites, such as CourseSmart (2008) and DigitalTextbooks.com (2009), formerly Universal Digital Textbooks, provide access to college textbooks for a fee. However, most digital textbooks are less expensive than their print counterparts. In 2005, when bookstores first began participating in the Universal Digital Textbook Program, eBooks were sold at 33% off the list price (Reid, 2005). Today, a student can download a digital textbook for 40-50% less than the cost of the print version (Carey, 2007). Despite the great savings, searching capabilities, portability, ease of update, and digital enhancements that most eBook publishers provide, digital textbooks only make up about 2% of college bookstore sales in the United States (Carey, 2007). In the late 1990s, some supporters of eBooks predicted that print books would become obsolete by 2001 (Crawford, 2006). Today, those supporters are wondering what went wrong.

Unfortunately, there are several reasons digital textbooks have not caught on. First, students cannot give their digital textbooks to friends or sell them back to bookstores or used textbook dealers when they are finished using them. Passwords to online books expire, and some publishers, such as McGraw-Hill, use safeguards that prevent more than one user from having access to a downloaded eBook at one time. These safeguards also prevent the subscriber from accessing the textbook from different computers. Therefore, students who pay to download an eBook to their dorm-room computer will not be able to access it from home or from any other computer on campus (Carlson, 2005). Second, digital textbooks require technology and software that students may not have access to (Cavanaugh, 2002). Finally, and most importantly, “despite advances in displays and the current promise of e-ink/e-paper, most people still find paper books easier to read” (Crawford, 2006, p. 44). “There’s nothing like being able to open a book and study—even when there are no computers or power outlets around” (Carlson, p. A35).

Still, in the eBook market, digital textbooks have the best chance of being successful. Crawford (2006) asserted that transforming heavy, expen-

sive, hard-to-update print textbooks into portable, less expensive, easy-to-update digital textbooks makes more sense than trying to replace mass-market paperbacks. Furthermore, students with special needs, ESL students, and students with different ability levels benefit greatly from the features that digital textbooks have to offer such as large font, text-to-speech, and interactivity (Cavanaugh, 2002). Mark Greenberg, the chairman of Atomic Dog Publishing, claims that “the real value of digitization is the interactivity, not the readability” (Carlson, 2005, p. A36). Greenberg also believes that the future holds a combination of print and digital textbooks for the classroom (Carlson, 2005). Whether digital textbooks completely replace their print counterparts remains to be seen. However, eBooks provide faculty with innovative tools that help them meet the needs of their students in ways that were never before possible. For this reason, it seems as though digital textbooks have a promising future in today’s movement toward a “learning paradigm” in higher education.

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