DIGITAL TEXTBOOKS
WHAT'S NEW?

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The Promise and Challenge of Digital Textbooks for K-12 Schools: The Case of Florida's Statewide Adoption

La promesa y el desafío de libros de texto digitales para las escuelas K-12: el caso de la adopción en todo el Estado de la Florida

A promesa e o desafío de libros de texto dixitais para as escolas K-12: o caso da adopción en todo o Estado da Florida

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Abstract: *The textbook is the single most defining source of instructional content in U.S. public schools. In the current challenging economic climate, school administrators are looking for ways to control rising textbook expenditures by shifting paper to digital textbooks. In this chapter, we explore a range of digital textbook formats and applications and weigh their potential benefits and pitfalls. Florida, the first U.S. state to pass a mandatory digital textbook law, provides a context in which to examine many of these factors. We conclude with recommendations for school administrators and educators, with particular attention to the leadership role the school librarian can play in digital textbook implementation, management, and innovation.*

Keywords: *digital textbook, e-reader, school libraries, school librarians*

Resumen: *El libro de texto es la fuente más definitoria del contenido educativo en las escuelas públicas de los Estados Unidos. Durante el período actual de dificultad económica, los administradores escolares están buscando maneras de controlar el aumento de los gastos de libros de texto por el cambio de libros de papel para libros digitales. En este capítulo, exploramos una amplia gama de formatos de libros de texto digitales y aplicaciones, y medimos los posibles beneficios y riesgos. Florida, el primer estado de los E.U. que ha aprobado una ley que requiere el uso de los libros de texto digitales, proporciona un contexto en el cual se puede examinar muchos de estos factores. Concluimos con recomendaciones para los administradores escolares y los educadores, con especial atención a la función de liderazgo que el bibliotecario escolar puede jugar en la implementación digital de libros de texto, la gestión y la innovación.*

Palabras clave: *libro de texto digital, lector de libros electrónicos, bibliotecas escolares, bibliotecario escolares*

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Digital textbooks will soon be part of every classroom in the United States. This trend accompanies an imperative for schools to facilitate 21st century learning in which educators prepare students to learn and live productively in a global society where accurate and current information is a meaningful part of everyday learning. School librarians, especially those in Florida, can be key players in the successful implementation of digital textbooks to foster a sensible, balanced solution for educators and learners.

In U.S. public schools, textbooks are important supports for a number of teaching and learning activities. Textbooks help to standardize the material teachers present in content areas; ensure that classroom content is aligned to mandated curricula; provide a focal point for instructional activities; support pedagogical approaches; and give structure to homework. As technology and the Internet have gained presence in classrooms, instructional materials and activities have become digitally rich and the use of digital textbooks is rapidly gaining ground in education at all levels.

Despite a projected decline in enrollment, Florida spent $209.2 million USD on instructional materials for its public schools, making it the fourth highest spender behind California, Texas, and New York (Mickey & Meaney 2011). Currently, in many districts across the state, students and teachers access digital versions of their current textbooks (Surdin, 2009). With the passing of Florida legislation not only allowing school districts to use textbook funds to purchase digital content and other online educational resources (Manzo 2009), but a mandate by the 2015-16 school year to spend at least 50 percent of their textbook budget on digital materials, the nation will increasingly look to Florida to take the lead in the process of digital textbook adoption (Mardis, et. al. 2010).

In this chapter, we explore various types of digital textbooks and weigh the benefits and drawbacks of each format for U.S. elementary and secondary schools in the state of Florida. We examine the advantages and challenges of the growing use of digital textbooks and make recommendations for school librarians' roles in the digital textbook implementation process.

Textbooks and U.S. Public Education

The textbook is the single greatest driver of the classroom experience in U.S. public schools (Greaves & Hayes 2008; Schmidt, McKnight, & Raizen 1997; Tulley & Farr 1985) and the ways in which teachers and students interact with the information contained in textbooks is a key definer of the learning experience.

Textbook adoption is most often considered a statewide activity; all states mandate some sort of state-level review of materials used in the classroom (Hitchcock, Hendricks, Johnson, Christensen, & Siller 2010; Tulley 1989). State level textbook adoption was formed in response to widespread practices in the early years of public education when children used the books available in their own homes. For the most part, textbook adoption processes are long-standing, often dating back to Civil War Reconstruction because "Southern states...did not want their children to read the Yankee version of what that conflict had been all about" (Mathews 2005 ¶10). As Figure 1 suggests, in the U.S. South, textbook adoption remains an important guide to pthe public education experience.

Figure 1. Map of current textbook adoption states

Once graded instruction became standard practice in public schools, teachers and parents demanded uniform instructional materials. By 1925, textbook adoption had become a state level activity in over half of the states and this

adoption approach has remained stable in ensuing years (Follett 1985). Table 1 lists the current textbook adoption states depicted in Figure 1.

Table 1. Textbook Adoption States

Alabama	Georgia	Louisiana	Oklahoma	Texas
Arkansas	Idaho	Mississippi	Oregon	Utah
California*	Indiana	New Mexico	South Carolina	Virginia
Florida	Kentucky	North Carolina	Tennessee	West Virginia

**California adopts textbooks for grades K-8 only.*

It should be noted that not every state takes the same approach to textbook adoption. While Texas fully funds the costs of textbook adoption, most states only provide a per-pupil allocation to districts for the purchase of instructional materials. Utah and Oregon do not provide funds for the purchase of recommended textbooks and in Indiana, parents pay a textbook rental fee to school districts. Regardless of the funding scheme used in an open territory state, statewide adoption from a core adoption state provides a de facto endorsement of a textbook, making it more likely to be used in other states.

In many instances, districts are given some discretion over some of the materials selected. While historically, this process tended to result in disjointed curriculum at odds with state curriculum goals, effective technical assistance to aid local adoption of curricular materials and this technical assistance has evolved (Dole, Rogers, & Osborn 1987). Therefore, state-level positions on instructional materials have an overriding influence even in states that promote local control.

Publishers not only benefit from statewide textbook adoption, the real benefit to publishers is in replacement cycles. Publishers' profits often follow textbook replacement cycles in core adoption states, with replacement years for science, reading, and mathematics accounting for most textbook sales. Adoption states generally adopt textbooks on a six-year cycle which contributes to fluctuations in industry sales performance. However, economic challenges have led many states to extend their textbook replacement cycles, drastically reduce the funding available for textbook and supplementary materials purchases, or look for low cost alternatives like digital learning resources.

In public schools in the United States, textbooks are important supports for a number of teaching and learning activities. Textbooks help to standardize the material teachers present in content areas; ensure that classroom content is

aligned to mandated curricula; provide a focal point for instructional activities; support pedagogical approaches; and give structure to homework. And, with the movement to common core curriculum state standards (CCSS) in mathematics and English/Language Arts by almost all U.S. states, the interest in pairing high quality standardized learning materials with high quality curriculum is growing (Samuels 2012) despite the current mismatch between CCSS-linked textbooks (International Reading Association Common Core State Standards (CCSS) Committee 2012; Jobrack 2012).

Momentum is Growing for Digital Textbooks

As technology and the Internet have gained presence in classrooms, instructional materials and activities have become digitally rich and the use of digital textbooks is rapidly gaining ground in education at all levels. With an industry average of almost $56 million in wholesale sales in the U.S. in 2009 (Maneker 2010), the trend towards digital books is strong. While colleges and universities have moved headlong into digital textbooks as a means to reduce costs for students, K-12 education is also increasingly considering digital textbooks.

State laws, many of which have been rewritten to include digital content as an acceptable use of state textbook funding, will serve as catalysts that spur the transition to digital textbooks. Already, major advancements in, and support for, digital textbooks have occurred in Indiana, Virginia, West Virginia, California, Texas, and Florida. Representatives of the U.S. Department of Education, the Federal Communications Commission, and a members of the instrucitonal materials and educational technology industry joined together as the Digital Textbook Collaborative and in 2012 produced the *Digital Textbook Playbook* which lays out many of the justificaitons for school administrators and policymakers to move to digital textbooks. The *Playbook* also hints at some possible challenges that will need to be addressed.

In an effort to chart these challenges and associated tasks to effecting a transition to digital textbooks, the State Educational Technology Director's Association (SEDTA) is currently surveying their members in attempt to form a coalition that will identify and work to overcome policy and practice barriers to pursue the use open digital content. This is part of their broader strategy to rethink textbook and traditional instructional materials policies and practices in a digital age (Fletcher, Schaffhauser, & Levin 2012).

However, the move to digital textbooks may mean more than a format change for large textbook publishers. To offset the costs of acquiring and maintaining

equipment, districts are increasingly focusing on open digital content. Open content is comprised of high quality free resources that may have been created with grant funded or by a vested organization. Educators are free to use, adapts, and in many instances, combine them for various learning applications. Open content comes in a range of file formats from java applets, interactives, simulations, videos, audio clips, images, and text-based files. The Open Educational Resources (OER) movement has been growing in the United States for a decade with projects like the National Science Digital Library (http://nsdl.org) and the OER Commons (http://oercommons.org) that aggregate the descriptions of the resources, also known as metadata, into searchable digital libraries (Mardis 2003; Mardis & Hoffman 2006). Users search the repositories and locate the OERs through links embedded in the metadata records.

This collision between old and new ways of learning presents a range of challenges for school systems. This policy and literature analysis will explore the extent to which schools are ready and the key areas likely to affect the impending digital textbook adoption in Florida.

Theoretical and Conceptual Perspectives

Two main perspectives have guided the examination of technology adoption in schools and therefore underpin this exploration of digital textbook adoption in Florida. Organizational adoption theories concern "top down" adoption that is instituted and promoted by state government or school or district administration. User adoption theories concern bottom up or end user-based facets of technology use and integration. Often, these theories are not mutually exclusive. In many situations, aspects of organizational adoption interrelate with dimensions of user adoption. In this section, the two areas will be explored separately, but in the literature and policy analysis, theories will often be presented in an integrated way.

Theoretical Base in Organizational Adoption

Diffusion of Innovations theory (Rogers 2003) posits that an innovation must be widely adopted in order to be sustained within an organization. Regardless of the rate of adoption, an innovation can be sustained when it reaches critical mass. The rate at which an innovation is adopted depends upon its progress through adopters. According to Rogers (2003), adopters fall into four categories: innovators, early, early majority, late majority, and laggards. This theory is helpful when looking at digital textbook adoption because it can help to explain the rate at which educators are able to integrate digital resources into their instructional strategies and the rates at which technology and library personnel are able to master chosen digital textbook approaches in order to lead or support others.

Digital Divides theory (Mardis, Hoffman, & Marshall 2008) builds on the idea of technology access "haves" and "have nots" with three additional levels: skills, policy, and motivation. These additional levels allow the examination of technology adoption to encompass both the individual and organization units of analysis. According to this theory, if one of the four quadrants of divide (access, skills, policy, and motivation) is not supported in an adoption, then the adoption will not be successful. In the case of digital textbooks, of course, user access to equipment and resources is important, but user skills and professional development, organizational policies that enable and support technology use, and user motivation to adopt the technology are equally as important.

Theoretical Base in User Adoption

The Apple Classrooms of Tomorrow (ACOT) model (Apple Computer 1995) emerged from longitudinal research that was centered on changes in teacher and student behavior that result from ubiquitious access to technology and digital learning resources. Educators who participate in adoptions experience entry, adoption, adaptation, appropriation, and invention phases of personal transformation. While the findings from 10 years of classroom technology infusion included phases very similar to those reported by Rogers (2003), in ACOT, professional development and organizational support are key but only insofar as these forces are driven by the technology users' personal experiences. In the case of Florida's digital textbook adoption, many implementations will rely on educators' commitment to making it work.

The Concerns Based Adoption (CBAM) model (Hall & Hord, 1987, 2001, 2006) proposes that learning brings change, and that supporting people in change is critical for learning to be effective. CBAM illustrates the ways in which educators progress personally and professionally through their careers. Fuller (1969), Fuller and Bown (1975), Mardis (2007, 2013), Rutherford and Hall (1990) affirmed a concerns-based model for teachers' and school librarians' careers in which three stages occur. In their views, the three stages can be described as: concern for self-image; concern for instructional tasks; and concern with instructional impact. These stages develop along an outward trajectory from self to impact. CBAM is deceptively uncomplicated. Teachers' acceptance of change is influenced by a range of personal and environmental factors that not only influence the pace at which educators develop, but also influences their decisions to stay in the profession and their local schools.

Digital Textbooks: A Boon to Learning?

The interest in and growth of digital textbooks can be attributed to several perceived advantages for learners. Some possible advantages are obvious: digital textbooks are compact and light, making them easy to transport and store; many have search, highlight, and note-taking features convenient for studying and quick reference; content can be updated instantaneously; and digital textbooks are immediately available anytime, anywhere. Digital textbooks are also appealing for the ways in which they support learning, teaching, and technology integration as well as their potential to enhance the health and welfare of children.

Digital Textbooks Support 21st Century Skills

There have been major changes in teaching and learning styles in today's digital world and in the way students engage with materials. Digital technology has transformed how our students communicate and should influence the way teachers teach. Differentiation of instruction demands that teachers adopt a more interactive approach to delivering content through the use of multimedia and collaboration. This approach to delivering content will help to keep students motivated and engaged in learning.

Digital textbooks increase opportunities to learn. The use of digital textbooks can help teachers avoid wasted instruction time due to the distribution and collection of textbooks, students with forgotten or lost textbooks and incomplete

homework. The convenience of the online format means that the student textbook is always at hand.

Digital textbooks can provide access to a wealth of information that is readily retrievable from the Internet. Digital texts can make access to information expeditious and mobile, and convenient for students who have been absent. The appeal of this convenience can be seen in higher education where many universities have provided digital textbooks to students. Princeton University began selling textbooks usable on Amazon's Kindle in 2008 (Taylor 2008). This move was so wildly popular that just one year later, in the Fall 2009 semester, Amazon partnered with Princeton and five other universities to provide new students with the devices (Williamson 2010). Other examples of digital textbook adoption have shown that whether in K-12 schools or higher education, users appreciate the convenience of digital textbooks because they use digital resources for the majority of their work (JISC 2009).

Rather than just providing versions of traditional textbooks, many companies are striving to provide schools with textbook reading devices that allow digitally-enhanced interactive functionalities. Publishers, anxious to provide schools with enticements for children to read their books, often offer companion websites that are graphically-rich and able to engage readers in numerous ways. Along with the content on the page, children can access online videos and games, win prizes, and engage in safe social networking (Lowman 2010).

Digital Textbooks Can Promote Good Teaching

While print textbooks are designed to support multiple state standards, forcing teachers to dissect and analyze the pages of textbooks to create lessons pertinent to their local needs (Schachter 2009), teachers can use digital textbooks and materials to receive customized curriculum to complement and extend their state's standards. Though information is ever-changing and can be quickly outdated in print textbooks, students using digital textbooks can access news about current events and link to information and media that enriches a learning encounter. And, teachers are encouraged to collaborate with one another to select complementary online resources and to update and refine classroom content.

Digital textbooks enable differentiation. All teachers have an imperative to differentiate their instruction to meet the needs of all learners, but often they lack the resources and skill to do so (Gable, Hendrickson, Tonelson, & Van Acker 2000). Digital textbooks provide support for students with various learning needs

through flexibility and multimedia. Those students who have low vision or who are physically unable to hold a book or turn pages may find a digital textbook easier to use and read. Students who are easily distracted can take advantage of the multimedia capabilities of the digital textbook to stay active and focused. This variety of supports is particularly helpful to English Language Learner (ELL) students, a student population that has more than doubled in the past 15 years from approximately 2 million to well over 5 million students, or about 150% (Waters 2007). Students can use video and audio to augment the text, thus increasing the likelihood they will grasp concepts.

Digital Textbooks Can Promote Improved Technology Integration

Schools must show a return-on-investment with technology expenditures and digital textbooks help schools demonstrate the need for more and better technology and Internet connectivity (Lewin 2009). Adoption of digital textbooks may serve as an impetus for schools to invest in 1:1 computing because all students will require a device to access learning materials. Schools that already have 1:1 laptop initiatives can maximize their investment in latptops by also using digital textbooks. In schools where 1:1 computing is mature, teachers already have the skills they need to integrate digital content into their instruction (Drayton, Falk, Stroud, Hobbs, & Hammerman 2010). The combination of laptops and textbooks proved effective in digital textbook forerunner, Forney Independent School District (Texas), where teachers integrate technology seamlessly. 1:1 computing environments are uniquely suited for digital textbook adoption because ready access to digital content may already be ingrained in school culture (Greaves Group & Hayes Connection 2008) and is part of the vision of almost all school administrators (Project Tomorrow 2010).

Digital Textbooks Can Make Financial Sense.

Billions of dollars are spent on print textbooks every year. Florida, California and Texas, accounted for more that $1.1 billion in textbook spending in 2009 (Baumann 2010). The National Association of College Stores stated the average price of a new textbook for the 2008-2009 school year as $64; the price of a used textbook as $57 (Riddle & Traylor 2010), though some textbooks can cost close to $200. As textbooks become more readily available in multiple formats, the difference in cost between the various formats can be quite significant.

While school districts vary, new textbooks for the K-12 curriculum are typically replaced every 5-6 years in each subject area (Tulley & Farr 1985). Textbooks must be replaced in order to obtain current information, particularly in the subject areas of health, science and social studies. Student textbooks in use today, perhaps adopted in 2005, will not contain information about President Barrack Obama's first day in office in 2009, Hurricane Katrina in 2005, or the downgrade of Pluto from planet to dwarf planet in 2006. Schools using digital textbooks can receive updated information by the publisher, without having to replace the entire textbook series (Reynolds 2010).

Digital textbooks improve local control over curriculum. The textbook industry currently functions as an oligopoly in which a few companies control the market. In some instances, these companies are not operating in the best interests of the school districts and work to perpetuate the perception that their content is superior to any open content that may be available. They offer different pricing to different districts and force districts into replacement schedules and format limitations. Locked into long term relationships with textbook publishers based on long-standing replacement procedures and schedules, many states have been resetricted to only review publishers' offerings rather than a wide range of material in a variety of media (Thevenot, 2009).

Slick marketing campaigns, promises of convenience, and a familiar publisher's representative can sell textbook adoption committees on adopting a new series. As a result, large textbook producers continue to get larger and guard their market share fiercely. The ways in which textbooks are actually used in the classroom are studied infrequently or linked to student outcomes. So, in many ways, the ultimate impact of textbook adoption committees' decisions is never seen and classroom shortcomings might be attributed to any number of other factors (Follett 1985).

The tension between textbook rigor and textbook appeal is decades old and seemingly unresolvable. Efforts to standardize adoption of rigorous instructional materials have been blamed for constraining learning and narrowing curriculum. Even when curriculum developers and teachers are given the option to choose in-depth instructional materials over more visually appealing, engaging materials, they choose the less challenging content (Dutch 2005). On the other hand, the elimination of state-level controls, whether in favor of local control or no control, threatens to leave educational resources subject to the vagueness of community funding, local priorities, and socioeconomic variations among districts and students (Tulley & Farr 1985).

Digital content has the potential to offer better material and the expanded range of content (Ezarik 2005) while preserving the best practices of collaborative decision-making on quality content. With some digital textbook companies, students and teachers will have the ability to create custom textbooks in which they add chapters from a variety of selected books, other relevant articles and resources, and even their own materials (Fiorello 2010).

Digital Textbooks May Protect Children's Health and Safety

The Accreditation Council for Occupational Therapy Education (ACOTE) recommended that a child not carry more than 15% of his or her body weight (Hoffman 2009), yet studies have consistently found that children are carrying up to 18.4 pounds, or 17% or more of their body weight in backpacks ("Backpacks for Kids: Backpack, Child Products, School" 2008)! Bookbags with textbooks that are too heavy or are worn incorrectly can cause physical harm for children and teenagers. In addition to poor posture, damage can be done to muscles and joints, leading to back, neck and shoulder pain (American Academy of Pediatrics 2010; Dale 2004), back strain and altered gait (Forjuoh, Schuchmann, & Lane 2004) and scoliosis and abnormal curvature of the spine (Sebastian 2006). The U.S. Consumer Product Safety Commission projected more than 13,260 injuries related to backpacks were treated at hospital emergency rooms, doctor's offices, and clinics in 2000 (Dale 2004). A study of backpack use and back pain in 1122 children showed 74.4% of them were classified as having back pain associated with the use of backpacks (Sheir-Neiss, Kruse, Rahman, Jacobson, & Pelli 2003). Digital textbooks would decrease the physical burden placed on students who use print textbooks. They are also accessible to students online at home or at school, eliminating the need to transport heavy print textbooks in their backpacks for use to do homework assignments.

Digital textbooks can protect the environment. A transition to digital textbooks may also have environmental benefits. The report, *Environmental Trends and Climate Impacts: Findings from the U.S. Book Industry (*Borealis Centre for Environment and Trade Research 2008) included estimates of environmental factors of publishing including high energy use and pollution related to printing and transporting books, deforestation, and other costs related to textbook production, disposal, and recycling.

The Challenges of Digital Textbook Adoption

Despite possible advantages, a move to digital textbooks poses many challenges. The cost of hardware and software licenses as well as updating the technology infrastructure and bandwidth capacity of schools is costly. Putting a laptop or other e-reader device in the hands of every student could cost millions of dollars. The executive director of the Association of American Publishers, Stephen Driesler, conceded that "it is likely to be funding, not logistical issues" that will prevent the adoption of digital textbooks in schools (Colin 2005) and many parents and educators feel if a child does not have a traditional textbook, then learning cannot be taking place (Baker 2005). For now, the financial savings and educational advantages of digital textbooks remain aspirational and may pose hidden costs for learning, teaching, and implementation.

Digital textbooks may compromise comprehension and engagement. A decade of research has consistently supported the conclusion that children "perceive Web text reading as different from print text reading" (Sutherland-Smith 2002, 664). Digital media does not promote in-depth reading (Liu 2009). The reading of fixed text is the dominant form of reading in non-digital environments, but multimedia digital textbooks require a different kind of reading across interactive layers consisting of visual clues, hypertext, digital paper, and "image, audio or even ideogram" (Thomas 2005 ¶3). This balance of focal and peripheral attention while reading digital media is not easily accomplished (Liu 2009). And, despite improvements in e-reader devices, users read 20-30% more slowly; use more effort; and are more tired than when reading on paper (Aamodt 2009). Perhaps the greater reading effort required by digital texts explains why many students have remarked that digital textbook user interfaces do not seem designed for sustained reading (JISC 2009) and that they prefer to use them for shorter tasks like verifying facts.

Administrators, teachers, and school librarians will need to carefully consider students' reading levels in the selection of digital textbooks. The methods for calculating comprehension in digital reading are evolving and cannot be accurately calculated for measures like the Lexile Framework for Reading (Rowsell & Burke 2009)

Furthermore, a lack of comprehension can affect students' research and writing habits. Young readers seek immediacy when performing searches for answers to classroom assignments and homework. They may resort to copying, pasting, or

plagiarizing text when attempting to synthesize ideas into writing (Sutherland-Smith 2002).

As one elementary school principal pointed out, there is a need to make adoption decisions based on learning improvement data. She says she'll wait for the next round of scores from the state standardized test given in the spring before spending more money on any devices (Perez 2010).

Digital textbooks can exclude visually-impaired learners. Accessibility of learning materials remains a concern for persons with disabilities. The current e-reader devices present significant barriers that keep people with disabilities (Bagnestos 2010 para. 4). The National Federation of the Blind (NFB) and the American Council for the Blind (ACB) successfully filed suit with the United States Department of Justice Civil Rights Division to intervene in e-reader textbook replacement pilot projects at six major American universities (Dorn & Stein, 2010). While many e-readers have text-to-speech capabilities, most notably menu selection, voice activated navigation, note taking, and bookmarking features are inaccessible to visually impaired users. Images are excluded from screen readers, thus obscuring a significant portion of digital content to low vision users. The settlement reached between the universities and the Department of Justice required an end to the recommendation, purchase, or promotion, of any e-reader devices until the e-readers are fully accessible to all students. E-reader manufacturers are required to bring the devices into compliance with the Americans with Disabilities Act (ADA) (United States Department of Justice, 2010). In June 2010, the United States Department of Education affirmed the Department of Justice position and urged any schools considering the adoption of digital textbooks delivered via e-readers to seek for technical assistance from either agency (Schaffhauser 2010b).

Digital textbooks may perpetuate socioeconomic gaps in education. Californina Governor Schwarzennegger's 2009 California Free Textbook Initiative substitutes open source digital resources for state-adopted science and math textbooks. This move attracted national attention (Lewin 2009). One of the main concerns with this program is its potential to negatively impact students from low socioeconomic backgrounds or children who lack equipment and connectivity at home. Over a fifth of students (22%) find reading on a screen uncomfortable and may resort to printing partial or entire texts (Allen 2008). Printers, paper, and ink can be added to the list of hidden costs, that may, by necessity, shift to the school districts. Some less affluent districts may not be able

to afford these costs, resulting in another type of digital divide for students from low-income families.

Digital textbooks can exacerbate the digital divide, especially in rural areas. Home connectivity is also an issue. It is estimated that about a third of Americans have no access to high speed Internet service because they cannot afford it or choose not to have it (Stelter & Wortham 2010). Although continuity of the school-to-home learning experience is essential when students do not have printed textbooks to rely upon, schools cannot afford to absorb this cost for parents and many parents do not understand the importance of the investment or are not in a position to make it. (Greaves Group 2006). Children in rural areas have disproportionately low access to computers and high speed Internet access (Boris 2005). While rural school districts may offer adequate school day access to technology, few rural children have the ability to travel to and from school beyond the school day (Brown & Stommes 2004).

Although some research has suggested that issues of broadband accessibility have been circumvented by the use of mobile devices like smartphones among urban poor and minority students, it is becoming clear that "not all digital experiences are created equal" (Watkins 2009, 68). Mobile devices are often limitated in their educational use by small screen size, lack of display clarity, limited image size and complexity, restrictive keyboard and mouse functions, and diminished space for interactive elements (Churchill & Hedberg 2008). Although access to the internet may be available through smartphones, data plans are expensive and some cell phone applications (apps) have an associated cost. Despite the fact that groups like Comcast are now making data plans accessible to low income users (Comcast 2012), the new "digital divide" may be an "app gap" in which high quality content cannot be used on mobile devices until a unique app is created for it.

Ancillary costs of digital textbooks can erode savings. School administrators cite cost savings as the main reason to select digital textbooks over print and expect to see savings of 50% or more (Allen 2008). Even though this may be true, the cost of a digital textbook goes beyond this initial investment. Digital textbooks require student access to computers or other mobile devices, Internet connections, and hardware systems that require periodic upgrades and maintenance. And, in many instances, schools must absorb at least part of the cost of making materials accessible to all students through printing and reformatting. In *Eliezer Williams, et al., vs. State of California*, Superior Court officials found that districts were responsible for ensuring that "students receive

printed instructional materials that are identical in content...or by providing those students with the electronic equipment and/or active Internet connections they need at home to access the materials" (Californina Learning Resource Network, 2008 ¶3).

For many schools, investing in digital textbooks results in duplicate expenditures. Learning management systems (e.g., Blackboard and Moodle) are used by an increasing number of districts. They come populated with digital resources which can be as comprehensive as digital textbooks (Greaves Group & Hayes Connection 2008). Teachers may already have integrated these systems into their teaching and may be reluctant to revise current pedagogy to switch to digital textbooks. Until a standard format for digital text is created, schools may have to invest in multiple readers. Some digital texts are formatted for specific e-reader devices; some others work on computers only. Reading devices, or e-readers, are available for netbooks, mobile devices, and tablets as well as dedicated e-book platforms and they continue to expand (JISC 2009), leading schools to invest in multiple devices to provide content to learners and educators.

Current school Internet connectivity cannot support digital textbook use. Despite superintendents' support for 1:1 computing and digital curricula, curriculum directors reported skepticism that their technology infrastructures were ready to handle the demands of digital materials and the accompanying growth in devices (Greaves Group 2006). The majority of curriculum directors surveyed for the *America's Digital Schools 2006* report admitted that expenditure in digital materials were likely to triple in the next five years, but they did not see bandwith and device availability keeping pace (Greaves Group 2006). That five year forecast is rapidly coming to fruition. The subsequent *America's Digital Schools 2008* report confirmed the growth of 1:1 and mobile computing as major trends in education, making bandwidth a continuing critical concern (Greaves Group & Hayes Connection 2008). Web-based learning resources demand high levels of bandwidth to ensure adequate speed and connectivity. Many schools are simply unprepared to handle the volume of network traffic volume and "experience the thwarting effect of inadequate connectivity on instructional innovation" (Everhart & Mardis 2012).

Many teachers are not prepared to make best use of digital content

Adequate professional development is key to the success of digital innovations in schools. The majority of school administrator respondents to the *America's Digital Schools 2006* survey reported that they were concerned about their teachers' and librarians' abilities to seamlessly integrate new digital technologies into the existing curriculum (Greaves Group & Hayes Connection 2008). At about $100 per student per year, districts often do not plan for the substantial time and investment in professional development they will need to make to ensure the success of their digital textbook programs (Greaves Group 2006). The successful integration of technology into everyday classroom practices must be sustained by ongoing professional development. The investment in infrastructure enhancements, hardware upgrades, and mobile learning initiatives has yet to be matched with an investment in human capital (Kirsch, Braun, Yamamoto, & Sum 2007).

Digital textbooks will not resolve flaws in traditional curriculum

Regardless of format, on the whole, textbooks emphasize "familiarity with many topics rather than concentrated attention to a few" (Schmidt et al. 1997, 2). This lack of content rigor has been linked to lackluster U.S. performance on international tests of mathematics and science, declining student motivation, and even lack of high school completion (Koretz 2009). Before digital textbooks can be credited with enhancing learning, curricula must be reformed to focus in depth on key topics and give students a common set of educational concepts upon which to build. In the pressure of daily instruction in a high stakes environment, textbooks become an essential tool of enacted curriculum and, as a result, teachers cover numerous topics shallowly in an effort to complete the range of material contained in the textbook. Splintered adoptions of digital textbooks without national, or even statewide, agreement upon the uses for and content in digital textbooks may only exacerbate this issue further.

Florida's Statewide Adoption

Despite a decline in pupil enrollment from 2007-2008 to 2011-2012, Florida spent the fourth highest amount on instructional materials for its public schools behind California, Texas, and New York (Market Data Retrieval [MDR] 2009). With the passing of Florida legislation allowing school districts to use textbook funds to purchase digital content and other online educational resources (Manzo 2009), the nation will look to Florida as one of the states to take the lead.

In June 2011, Florida's governor signed a bill that mandates that all public schools in the state use entirely digital textbooks and digital assessments by 2015. Later that year, this bill was rolled into education statute as the Digital Learning Now Act. This move is significant because not only is Florida one of the states that benchmarks textbook adoption for the nation, but also because the law is the first of its kind. Only two other states have similar laws. California's legislation encourages, but does not mandate, digital textbooks in public schools by 2020. In 2010, Illinois passed legislation that redefined textbooks to include digital formats. In Texas, a bill was recently signed into law allowing school districts greater flexibility to spend instructional materials funds on digital content, professional development, and technology support. However, Florida's mandate is the most ambitious measure, requiring full implementation of digital textbooks and state standardized assessments within three years. This move will put pressure on schools not only to provide adequate devices and digital resources, but also to ensure that school bandwidth is robust and that home access is possible (Everhart & Mardis 2012).

Currently, in many districts across the state, students and teachers access digital versions of their current textbooks (Surdin 2009). Florida educators will want to pay particular attention to discussions of digital textbooks because policymakers are often attracted to the perceived cost savings that are linked to their adoption. The textbook adoption process in Florida has had a long tradition and one that includes digital textbooks. An established state initiative, Orange Grove Texts Plus, provides textbook titles free to higher education students who go online to view them. Students can download and print the books, or they can buy bound volumes at about half the cost of normal textbooks. For example, students using the an introductory calculus textbook can read, download and print some or all of the pages for free while comparable textbooks retail for $100 to $160 at bookstores (Travis 2010). Orange Grove Texts Plus, geared to college students, proved enticing to Florida's high schools due to its free content.

Clearwater High School in Pinellas County is a frontrunner in the digital textbook movement. They established a 1:1 initiative putting a wireless reading device into the hands of each of its 2100 students for the 2010-11 school year. The school issued e-readers to all of its teachers - who are pleased with them (Catalanello 2010).

However, the largest consumer of digital content in Florida, the Florida Virtual School (FLVS), relies on other forms of digital content, not digital textbooks, to date. Florida Virtual School is the largest in the nation and expanding rapidly. In 2008-2009 the school's enrollment climbed to over 124,000 which represented a 25% increase over the previous school year (Center for Digital Education 2009). According to the FLVS Chief Development Officer (Smith 2010),

> We use digital textbooks...only in our AP courses, when/if required. We really try to limit the amount of external resources we include in our courses because of recurring costs/licensing fees often associated with the resource. We also sell our courses outside the state of Florida and external resources can create licensing issues for our clients (i.e. the client would have to purchase a license to use the external resource in addition to purchasing the course)...We do have a former [school librarian] on our team who works with our curriculum specialists, project managers, etc. to help us select, contract and license external resources.

In 2011, the Florida legislature passed House Bill 7197 which mandates that, as of the 2011-2012 school year, all Florida students must have taken an online course prior to high school graduation. The growth of virtual schooling exacerbates the challenges virtual school educators and learners face in accessing digital content. The results of a 2010 survey conducted by Blackboard, Inc., and Project Tomorrow suggested that demand for online learning for credit forward, credit recovery, and curriculum supplementation is skyrocketing in all secondary grades (Blackboard Inc. & Project Tomorrow 2010). And, as Table 2 illustrates, virtual schooling is widespread and the lessons learned from FLVS' handling of digital content will set a noticeable example.

Table 2. Existing state-led virtual schooling programs (Barth, Hull, & St. Andrie 2012; Center for Digital Education 2009).

Alabama	Kansas	North Dakota
Alaska	Kentucky	Ohio
Arizona	Louisiana	Oklahoma
Arkansas	Maryland	Oregon
California	Massachusetts	Pennsylvania
Colorado	Michigan	Rhode Island
Delaware	Minnesota	South Carolina
District of Columbia	Mississippi	South Dakota
Florida	Missouri	Tennessee
Georgia	Nevada	Texas
Hawaii	New Hampshire	Utah
Idaho	New Jersey	Virginia
Illinois	New Mexico	Washington
Indiana	New York	West Virginia
Iowa	North Carolina	Wisconsin
		Wyoming

School Librarians are Key to Florida's Digital Textbook Implementation

Digital textbooks represent another opportunity for school librarians to enhance their vital leadership in teaching and learning. As the builders and maintainers of the schools' learning resource base, these professionals have pivotal roles to play in technology and digital resource adoption (Everhart, Mardis, & Johnston 2011). Librarians are experts at identifying, collecting, and organizing the best content, free or for a fee, and a move to open content learning resources may even free up funds to create stronger digital collections. Because digital content for the expanding array of technology tools in K-12 classrooms comes from a variety of providers, but predominantly free or open-source resources from websites (Raugust, Mickey, & Meaney 2012), school librarians have a vital role to play in adopting primary or supplementary instructional materials.

Library of Congress. Digital textbooks will justify continued subscriptions to the high quality supplemental resources we promote to teachers and students every day. Marcia Mardis, an assistant professor at Florida State University's School of Library and Information Studies who studies how school librarians can successfully integrate digital content into their collections and services maintains, "Teachers don't have the time to spend searching websites for these resources and then learning how to use them in the classroom. They need a single integrated approach—the type that a school librarian can create" (Whelan 2009).

Two leaders in the digital book movements for schools, Forney Independent School District in Texas and Cushing Academy in Massachusetts, included their school librarians in the shift to digital texts. Forney, an early adopter of digital textbooks in 2004, included an extensive library of e-books on its district-purchased student laptops along with eight digital textbooks. Forney's technology director says district librarians helped review the over 2000 e-books including novels, historical documents, and major speeches to identify sources that related to the curriculum (Ishikuza, 2004). Cushing Academy is a partner institution with the James Martin 21st Century School at Oxford University. They have transformed their library into a learning center complete with e-readers, flat screen TVs and laptops (Block 2009). Surveys conducted by the school showed students were not turning to printed materials for research, instead they were going online. So, instead of a 20,000 volume collection of print books, Cushing now has a database of millions of digital textbooks from which students will access materials using e-readers or laptops. In an interview on National Public Radio's *All Things Considered*, Suzie Carlisle, Dean of Academics, stated, "Part of our desire to move in this direction is to meet the students where they are most comfortable, and it's our responsibility, as well, to help students understand the emerging technologies that they are going to be faced with" (Block 2009). According to Cushing Academy's headmaster, the change has already increased the library's circulation numbers (Block 2009).

School librarians can provide school-wide leadership to assist students, teachers, and parents to tackle these concerns when transitioning to digital textbooks. Working in collaboration with teachers, school librarians promote comprehension through questioning, clarifying, seeking meaning, and discussion. Librarians play a significant role in reading comprehension instruction in order to enable students' creation and application of new knowledge.

Implications for Policy and Practice

In addition to considering the possible benefits and drawbacks to digital textbooks outlined above, educational stakeholders have considerations unique to their roles.

For Educational Policymakers

The research and analysis presented here suggests that policymakers at national and state levels may wish to work closely with education researchers to determine the extent to which digital textbook project design mimics what has been shown to work in technology adoption. Particularly, attempt to promote design models that take into account phases of organizational and personal change as well as barrier levels that might prevent educators and learners from taking advantage of the innovation digital textbooks offer.

An effective way to determine the efficacy of digital textbooks is to pilot the use of digital textbooks in a limited number of school districts in various parts of the country or state. Once the kinds of learning that results from print textbook-based activities are compared to the results to similar activities based on digital texts, realistic expectations for the impact of the digital shift can be made.

A key battleground established by common standards and instructional materials is to balance federal desires for standardization with local adoption of digital materials. Because local district officials have more details knowledge about the readiness of their teachers, students, and parents, they may be in the best position to define the kinds of instructional materials that will be most effective for learning and economy. For this reason, OERs may be a sensible choice for many school districts because they offer flexibility as well as the cost savings traditional textbooks do not (Tulley 1989; Tulley & Farr 1985). However, local adoption succeeds with technical assistance and this type of support should be provided.

But, a movement to open content requires strategic planning and leadership. It will be important for national policymakers and professional organizations to establish guidelines for the adoption of open content. Having no national guidance on content adoption threatens to return public education to the late 1800s-style of uncontrolled, unvetted, and often unrecorded educational resources. Work currently underway by groups like The Institute for the Study of Knowledge Management in Education (ISKME), the parent organization of the OER Commons, can help curriculum developers and other district officials to

evaluate the quality of OERs and determine the extent to which the digital objects meeting curriculum goals and how best to combine OERs for educational application with their free tools

The U.S. Department of Education is taking the lead on encouraging of a national or statewide clearinghouses of digital educational material that can be located through its Learning Registry (http://www.learningregistry.org/). Support continued funding for these resources and development of tools that allow school librarians and teachers to access them more readily and contribute content that they develop.

One aspect that requires high level leadership is an effort to ensure that content is usable by students with disabilities and English Language Learners. Adoped content should provide supports and scaffolds to support independent learning by diverse student populations. While in general, digital textbooks that require printing will counteract cost savings, a printing option should be available for students without home access to the Internet or a computer.

For School Administrators

As American school district officials look for sustainable ways to adopt any platform of digital textbook on their campuses, there are many hardware, content, and human factors to consider.

Hardware Considerations

Many schools are considering Bring Your Own Device (BYOD). In BYOD schools, students are responsible for providing their own devices upon which to display digital content. While BYOD may offer cost savings by requiring parents to purchase and maintain devices, digital content may not be compatible with all devices and student-owned devices are not subject to the manatory content filtering of school-owned devices (Intel IT Programs 2012) and, of course, not all students are in a position to purchase their own devices and will still require equipment provided by the district (Nielsen 2011).

An often overlooked aspect of implementing any educational technology application of a broad scale is the pressure that simultanous use puts of district network infrastructure. Researchers for SETDA (Fox, Waters, Fletcher, & Levin 2012) have benchmarked necessary bandwidth to support district-wide implementations of digital textbooks aand related activities and found that many school districts fall far short of the necessary connection capacities; in Florida, connectivity is also lacking, particularly in rural areas (Mardis 2011). For school

administrators, a hidden cost of moving to digital textbooks may be the need to upgrade the district bandwidth to the maximum possible to ensure that content remains readily accessible, even in peak use times (JISC 2009).

Content Considerations

Once content is decoupled from the physical confines of a print textbook, school administrators will likely have to assert leadership in new areas relating to content. For OERs or even commercial resources that are purchased, administrators will need to understand that the intellectual property considerations around adopted materials. Any restrictions on how the content can be combined with the content of other providers, including at the section, lesson or unit levels, should be explored and noted for teachers.

School administrators will also need to get involved in the policymaking regarding access to information. Aside from the enormous importance of districts officials ensuring that content can be redistributed and accessed by students and parents at home and other off-campus locations, they will also need to play a leadership role in ensuring that content is readily available in the school building. One way to accomplish on site access is to have school librarians develop and maintain content collections. In many schools, librarians already circulation strategies for textbooks and, in many cases, support the devices that will be used to interact with the digital content (Oder 2009). This natural expansion of the school librarians' role and will allow administrators to empower staff they have instead of having to find funding for new staff to assist resource selection and description.

Another way in which school librarians can support the adoption of high quality content is by reviewing content using the criteria they already use to add materials to the school library's collection. Administrators can use the skills and expertise of school librarians to develop a system in which digital content is integrated with the school library collection, linked to local curriculum and assessments, updated on an ongoing basis, and factually correct. School librarians can also facilitate a process by which content problems and errors are tracked and reported.

Educator Support Considerations

Aside from considerations relating to devices and content, educators require professional development to support the transition to digital textbooks and ameliorate classroom management, instructional design, and technology implementation burdens that may result from the shift.

A key actor in this area is the school librarian. School librarian can become active in the school district's efforts to adopt digital textbooks because they have the expertise to select high quality resources. High quality resources have a better chance of being adopted by teachers if they are curated by a knowledgable individual (JISC 2009). School librarians have been trained to look at educational content a granular perspective; that is, think of how a video, an podcast, an image, and text can work together to promote understanding of a concept. An active and involved school librarian can assemble from songs, audiobooks, podcasts, and videos that to enable your teachers and students to create "playlists" of high quality open content. Likewise, school librarian already manage an on-site repository for educational materials, i.e., the library catalog. School librarians can facilitate resource discovery by annotating catalog records for grade level, Lexile, keywords, local descriptors, and curriculum objective. They can also have teachers and pupils tag resources so that they can find the digital content they need in your collection.

Conclusion

In this chapter, we explored the promise and potential pitfalls of digital textbook adoption in the context of the statewide adoption facing the state of Florida in 2015. In the U.S., textbooks provide structure and consistency to classroom experiences, although many states appear to be interested in forging ahead with their own instructional materials choices instead of following the lead of textbook adoption states. Certainly, an approach that makes use of free and low cost digital resources circumvents traditional textbook adoption cycles and constraints. However, the benefits and drawbacks of digital textbooks must be considered carefully.

Digital textbooks offer educators a way to bring 21st Century Skills to the classroom by facilitating learning environments that take advantage of multimedia and technology skills that transfer to college, career and lifelong learning. And, at a time when districts face unprecedented financial challenges

and globally, environmental impacts of mass paper consumption appear to be very dire, digital textbooks may offer a solution to spending and waste concerns.

Yet, these potential benefits may be overshadowed by issues relating to the accessibility of high quality digital content by English Language Learners, students with learning disabilities, and students who lack access to after school learning environments, devices, and connectivity. As the directors of the classroom experience, teachers' professional development levels must be tailored and maintained as content and format changes occur. Digital textbooks will require ongoing investments for districts that may outpace current staggered multi-year textbook adoption cycles.

Policymakers and administrators should use this oportunity to take stock of the capabilities in place within their staff. School librarians have led and continue to lead digital implementation efforts in Florida, currently the only state in the U.S. with a digital textbooks mandate. Florida's unique initiative provides a context in which to trace the extent to which adoptions follow the guides on top-down imposed or bottom-up educator-led implementations.

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