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Digital Textbooks Versus Print Textbooks

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by

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Chapter 1: Introduction

Purpose of this Study

Digital technology has become an integral part of our society. It is used for communication, socialization, entertainment, and learning information (Weisberg, 2011). Thus, the education system will logically follow society's lead and incorporate more technology and digital content into classrooms. Teachers have been doing this by using more multimedia in their presentations and incorporating digital resources such as academic games and interactive websites into lesson plans. Electronic textbooks are also gaining popularity.

As districts have been switching to digital versions of textbooks, many people are asking themselves whether electronic versions are better than traditional print versions. Thus, this paper's research question focuses on whether or not digital textbooks are more beneficial to students' learning than print textbooks. As there are many different types of electronic textbooks, I am also interested in whether a certain type or specific features are more effective than others are. Looking at perspectives in the literature from students, teachers, and district officials' points of view will help shed some light on this emerging topic.

Researchers have been somewhat split on their perspectives. Lee, Messom, and Yau (2013) suggested that digitized forms of textbooks, "will potentially replace existing paper-based textbooks in the school curriculum" (p. 32). Districts have been making a shift toward digital content and incorporating online or digital textbooks when updating their curriculum. In the near future, print versions of textbooks could be obsolete just like phone booths and cassette tapes. As society shifts toward the best technologies available, it is likely that the trend will also take over curriculum in schools. Digital content may become more dominant.

However, many students still desire a print version over digital textbooks. Millar and Schrier (2015) mentioned that the primary reason that students want a print textbook is that they, "simply prefer print to digital, and they also believed that printed textbooks were more convenient than electronic textbooks" (p. 182). There are several suggestions of why this may be the case. For example, print is familiar and comfortable to use (Bouck, Weng, & Satsangi, 2016). Traditional textbooks can also be used without the need of a special reading device or software. Others have suggested that print textbooks are less distracting and easier to read (Millar & Schrier, 2015).

Electronic textbooks, on the other hand, have the potential to be very interactive and engaging. Unfortunately, they do not all perform at the same level. Basic forms of e-textbooks are simply digitized versions of traditional textbooks that may or may not have interactive tools and features included (Choppin, Carson, Borys, Cerosaletti, & Gillis, 2014). These are not as engaging as textbooks with more multimedia options. For example, Dobler (2015) listed features of an enhanced e-textbook to include customization tools, links to various media such as videos, podcasts, live hyperlinks, and other resources. Some users like the features of enhanced e-textbooks, since they are accustomed to interacting with technology that allows them to click on a link or video and instantly be sent to additional information on the topic they desire. E-textbooks are relatively new, yet some people like the benefits of a digital format and already prefer this medium to printed textbooks. It is hard to say whether this trend will continue in the future.

School districts across the nation will play an important role in deciding whether to adapt their curriculum to include digital textbooks. There are quite a few variables to consider. For

example, they will need to look at cost, time, current resources, and additional resources that will be needed to successfully implement a digital curriculum. Quite often electronic versions are significantly cheaper than their paper versions (Lokar, 2015). However, Lee et al. (2013) cautioned that, "While the costs associated with paper-based textbooks (e.g., printing, warehousing, selling and shipping) are eliminated; there are costs of going digital" (p. 34). A few costs include software, hardware, installation, network infrastructure, supporting equipment, internet access, maintenance, operational costs, upgrade and replacement costs, curriculum development, support staff, and professional training (Lee et al., 2013). It is easy to forget about hidden costs when the unit prices of e-textbooks are generally less than print versions, but there are costs associated with going digital that need to be taken into consideration. Districts need to examine their own situation, devices, support, and infrastructure before they make the decision to adopt e-textbooks.

If districts incorporate e-textbooks, teachers are responsible for implementing them into their classrooms. Lokar (2015) statd that e-textbooks should make teachers' work easier, quicker, and provide more options. Unfortunately, this is not always the case. E-textbook features vary from a digital copy of the textbook that has annotative features to ones that have interactive multimedia throughout the textbook (Choppin et al., 2014). These features will impact the teacher's ability to incorporate the electronic textbook into the curriculum. Several teachers may have to treat it like they did print versions, because it will not be interactive. However, enhanced e-textbooks could possibly allow teachers to incorporate interactive features into their lesson plans. These textbooks may even have interactive practice problems that give students immediate feedback on their progress. Ultimately, all educators have a similar goal: "to

see our students become independent learners, able to inquire, understand, and analyze ideas and use their knowledge to solve problems" (Dobler, 2015, p. 482). Textbooks, no matter what form, serve as a primary learning tool to help students on their education journey. Teachers will need to assess what they are given, and incorporate it into their classrooms as they see fit to best serve their students.

As an educator, I am very interested in the debate over digital and print textbooks. I want to know the pros and cons for both viewpoints, as well as what the difference is between different types of electronic textbooks. My high school math students use their textbook on a daily basis. In the near future my department will be faced with selecting a new curriculum. We currently have print textbooks with a very basic online version that is not user friendly for our students. Gathering accurate background knowledge on electronic textbooks, and whether they are any better at improving student proficiency, will be helpful to my colleagues and me. It will assist us with knowing what features to look for, as well as what format seems to be the most beneficial to student learning.

I am also interested in examining this topic from different perspectives. Students' opinions are important to consider because they are primarily going to be the users of the new textbook. Other teachers' points of view will also be valuable. It will be helpful to learn what other educators are using and whether or not they believe digital or print is the best option. I am especially interested in math teachers' opinions. District officials' or curriculum directors' perspective will also be insightful. In this study, I hope to determine whether print, electronic, or enhanced e-textbooks are the best option for students by studying literature of different viewpoints.

Research Questions

Are digital textbooks or print textbooks more beneficial to students' learning?

To answer this question, I reviewed the literature on

- Features of electronic textbooks and print textbooks

- Perspectives on e-textbooks from students, district officials, and teachers

- Effectiveness of e-textbooks and/or digital materials

- Costs of e-textbooks and print textbooks

Use of Findings

The findings from this study will be used in the near future when the math department at my school is considering new textbooks. We will need to decide on the features and format that we want. Knowing the benefits of e-textbooks and print textbooks will be very helpful in making this decision. Other departments and districts may find the results helpful when looking at their curriculum as well. The findings from this study will directly impact my students and the curriculum materials, thus I am very interested to see what type of textbook is most beneficial to students.

Limitations

The study is limited by solely being a literature review and by the years of articles published. The types of textbooks that were described in the literature will also be a limitation as new and improved versions are constantly developed.

Definitions

- **Digital**: For the purpose of this study, digital will refer to electronic media.

- **Electronic textbook** (also known as **e-textbook**): For the purpose of this study, electronic textbooks are a digital form of a print textbook that may have some additional features such as annotative abilities.

- **Enhanced e-textbook**: For the purpose of this study, enhanced e-textbooks are electronic textbooks with additional features. For example, Dobler (2015) listed features of an enhanced e-textbook to include customization tools, links to various media such as videos, podcasts, live hyperlinks, and other resources.

- **Print textbook** (also known as **traditional textbooks**): For the purpose of this study, print textbooks are textbooks that are printed on paper. They may also include separate multimedia components to enhance the predominately print textbook.

Chapter 2: Review of Literature

This chapter reports the findings of literature on whether or not digital textbooks are more beneficial to students' learning than print textbooks. It does this by looking at different types of electronic textbooks and some of the different features available. Chapter 2 also discusses perspectives on e-textbooks from students, districts, and teachers.

Electronic Textbook Overview

Textbooks are an integral part of curriculum in schools. They "provide detailed development of topics, comprehensive coverage of content, high-quality graphics and photos, selected data conveniently tabulated, many exercises and problems to solve, and sundry other features useful to students" (Moore, 2003, p. 359). Since educators use textbooks as a main resource to provide information to their students, there is a lot to consider when choosing a good textbook to use in the classroom.

Electronic textbooks provide an alternative to traditional print textbooks. Lee et al. (2013) suggested that digitized forms of textbooks, "will potentially replace existing paper-based textbooks in the school curriculum" (p. 32). This is a common notion, especially since technology has become increasingly popular. Electronic textbooks are also known by a handful of other terms such as e-textbooks, e-books, e-texts, and digital textbooks. E-textbooks integrate familiar features of textbooks into a digital format that can be accessed through the internet or an app; a wide spectrum of e-textbooks are available when looking at their different features (Dobler, 2015).

Basic Electronic Textbooks

The unique features of e-textbooks set them apart from one another, and often are the most challenging part to decipher when trying to select a textbook to use. Basic forms of e-textbooks are digitized versions of traditional textbooks that may or may not have interactive tools and features included (Choppin et al., 2014). These basic features, if included, are usually annotative abilities. This includes the ability to bookmark pages, highlight text, and take notes within the digital textbook. It may also have embedded links to complement what is being said within the text.

Basic e-textbooks have been around for a long time. According to Asunka (2013), they appeared in the early 1970s as plain text files, but did not become very popular since it required a special reader that was quite expensive. Simple electronic textbooks still have the same idea of being little more than plain text files. However, they have adapted to become more user friendly as years have gone by. According to Weisberg's (2011) study, in 2009 e-textbooks were read on devices that, "offered little more than straightforward reading capabilities" (p. 191). This is similar to when they first came out. Then, around 2010 eReader devices started incorporating, "basic note taking, highlighting, and search capabilities" (Weisberg, 2011, p. 191). This change evolved e-textbooks into a more user-friendly format which became the preference for some users.

There are a variety of ways that e-textbooks can be accessed. Baker-Eveleth and Stone (2015) suggested that users generally view, "content on a website, a PDF download, or on an electronic reading device" (p. 992). Other formats may include a portable storage device such as a CD-ROM, DVD, or flash drive (Prasad, Totaram, & Usagawa, 2016). A common format of

basic e-textbooks is a PDF download since it is user friendly. "Almost all computers and other digital computing devices such as smart phones and tablets have software that will render PDF files without compromising the original formatting" (Feldstein, Martin, Hudson, Warren, Hilton, III, & Wiley, 2012, p. 4). The features included in the textbook will depend on the format chosen, but in general basic e-textbooks are very simple and have basic annotation abilities.

Enhanced E-textbooks

As more multimedia options are incorporated into the textbook, the digital textbook becomes more interactive with the reader. Dobler (2015) listed features of an enhanced e-textbook to include customization tools, links to various media such as videos, podcasts, live hyperlinks, and additional resources. Some e-textbooks also include note sharing or some type of discussion board to allow students the opportunity to collaborate with each other. In addition, many even have interactive activities and assessments built in to the textbook that give students immediate feedback on whether or not they understand the material (Choppin et al., 2014). Depending on the type of textbook being used, these interactive assessments have the possibility of providing interventions for students.

Enhanced e-textbooks generally offer more features than the basic versions of electronic textbooks. Researchers Muir and Hawes (2013) found that many people wanted improved interfaces that are intuitive as well as interactive electronic textbooks with animations or links to visualizations for explanations. A common, easy to use interface would help users have more meaningful interactions with e-textbooks without having to figure out how to navigate different books. Woody, Daniel, and Baker (2010) pointed out that enhanced e-textbooks also have increased visual appeal "due to features such as still and moving graphics, and video clips, as

well as the potential to add supportive materials such as audio collections, links to activities and websites, etc." (p. 945). The extra features in enhanced textbooks are enticing to some users. These types of e-textbooks can, "offer students a more personalized, interactive multimedia experience" (Heider, Laverick, & Bennett, 2009, p. 107).

Unfortunately, the added features also come with challenges. Some of these barriers were mentioned in Gueval, Tarnow, and Kumm's (2015) article "Implementing E-Books: Faculty and Student Experiences," including resources not being linked properly, difficulty accessing online videos, navigation frustrations such as too much scrolling, a sense of information overload, eye strain, inconvenience in needing an outlet to recharge computers, and search engines that required specificity. Every digital textbook is a little different, thus some challenges may not arise in every situation. However, difficulties are inevitable. Mulholland and Bates (2014) mentioned that electronic books are in an environment that is "rapidly and constantly evolving" (p. 493). They are constantly being updated to improve their features and functionality for an enjoyable user experience.

Devices Used for E-textbooks

Not only is there a wide variety of digital features found within e-textbooks, the type of devices and software required to use them also varies. Common devices used to read e-textbooks include e-readers, tablets, smartphones, and computers (Dobler, 2015). Unfortunately, not all e-textbooks are compatible across all media devices (McFadden, 2012). This makes accessing some e-textbooks challenging for users. It also gives some digital textbooks an edge if they have multi-touch capabilities. Overall, e-textbooks were expected to make print books obsolete, but there has been some resistance (Wiese & du Plessis, 2014).

Students' Preference of Textbook Media

There have been mixed feelings when it comes to choosing between print textbooks and e-textbooks. There are many factors that can contribute to which type of textbook format students prefer. However, there does not seem to be any significant correlation between textbook media type and academic performance (Chulkov & VanAlstine, 2013). Even though research does not show a clear academic performance benefit, each type of textbook has its advantages and disadvantages.

E-textbooks are relatively new, yet some people have already converted their preference of textbook medium to the digital format. College students' main factors of choosing textbook format included cost, ease of use, ease of purchase, ability to keep the book, and match to their learning style (Chulkov & VanAlstine, 2013; Dobler, 2015). In general, the cost of an e-textbook is less than a print version of the same book. Electronic textbooks are also eco-friendly as they save paper and are a more convenient size and weight (Millar & Schrier, 2015). The user-friendly size comes with the ability to store multiple e-textbooks on one device (Dobler, 2015). This feature is helpful, especially for students who are taking multiple classes. The possibility of having links to other media and resources is also important to some students. Having videos, podcasts, dictionaries, and other links can complement the learning experience. In addition to these resources, Dobler's (2015) study mentioned that many students really enjoyed the digital note sharing ability within e-textbooks. This allows students to post notes and questions to a discussion board and collaborate with each other. Some e-textbooks also have the ability to be interactive with activities and formative assessments, which can help keep students engaged with the content (Choppin et al., 2014). Immediate feedback can provide

students with input on whether or not they understand the material, and some digital textbooks can even link students to alternative learning resources if needed.

However, many students still desire a print version over digital textbooks. Millar and Schrier (2015) mentioned that the primary reason students want print is that they "simply prefer print to digital, and they also believed that printed textbooks were more convenient than electronic textbooks" (p. 182). Print versions of textbook are the traditional method of choice. For many students, print is familiar and comfortable to use (Bouck et al., 2016). Print textbooks also have other benefits. For example, neither internet nor a special device is required to read the textbook. Thus, if students do not have an e-reading device, it could be more cost effective to opt for a traditional textbook. Kinesthetic learners may also prefer print over digital. In Dobler's (2015) student responses there were indicators that the ability to physically touch the page when writing notes and highlighting sections is important for certain learners. Results also indicated that e-textbooks were distracting to some while studying, yet print textbooks put them in the mindset for studying. In addition, Millar and Schrier (2015) reported:

> Students also appreciate that with printed textbooks they can go back and look at their notes and highlighted sections of the book after a course has ended as some like to keep their textbooks. However, for e-textbooks, many are only available for a semester, after which time a student loses access to it. (p. 180)

For those who did not want to keep their textbook, having the ability to sell it back to a bookstore was also a positive for print versions, as that is not possible with electronic textbooks (Millar & Schrier, 2015). Research from several studies has shown that there is a slight preference for print textbooks over digital (Bouck et al., 2016; Millar & Schrier, 2015; Wiese & du Plessis, 2014).

However, this may change as e-textbooks continue to evolve. When students get more exposure to digital textbooks and knowledge of their benefits, their popularity will likely continue to grow. As of right now there are mixed results when it comes to students' preference of textbook media, and a major factor stems from students' learning preferences.

Districts' Decision

School districts across the nation have been faced with the task of deciding whether they should adapt their curriculum to include digital resources. There are many variables to consider before districts decide to eliminate print textbooks. Important factors that warrant exploration include cost, current resources, and additional resources that will be needed to implement a digital curriculum.

The price of e-textbooks is a major factor that districts need to consider carefully. Quite often electronic versions are significantly cheaper than their paper versions (Lokar, 2015). However, Lee et al. (2013) cautioned that "While the costs associated with paper-based textbook (e.g., printing, warehousing, selling and shipping) are eliminated; there are costs of going digital" (p. 34). Some of these costs include software, hardware, installation, network infrastructure, supporting equipment, internet access, maintenance, operational costs, upgrade and replacement costs, curriculum development, support staff, and professional training (Lee et al., 2013). It is easy to forget about hidden costs when the unit prices of e-textbooks are generally less than print versions, but there are costs associated with going digital that must be considered. Districts should check with their technology department before investing in e-textbooks to ensure they have the capacity and ability to handle the extra devices that would be required.

Besides cost, districts also need to examine the potential benefits associated with electronic textbooks. Unlike paper, digital media is relatively easy to update, which helps ensure the material is current (Christie, 2011; Moore, 2003). Depending on the e-textbook used, districts may have the ability to adapt the content as well. This adaptability can help districts align the curriculum with their standards and potentially integrate formative assessments and interventions for students (Christie, 2011). Providing students with immediate feedback and extra resources will help individualize students' learning experiences.

Districts need to take a variety of concerns into consideration. Choppin et al. (2014) and Christie (2011) stated the concerns of equity and equal access to materials. The district may have to provide e-reading devices for those without access. In addition to this, students without internet may need an alternative form of the materials to use at home, or the district may need to provide hot spots. Bouck et al. (2016) also mentioned the concern of equal access to digital learning for everyone. While this source focused only on students with visual impairments, all students should be considered when districts are deciding whether or not to change their curriculum to include e-textbooks. Districts need to consider their population makeup. Access to electronic devices may not be a major barrier as many people have a smartphone, tablet, or computer (Wiese & du Plessis, 2014). Giving a survey or gathering information about students' current technology access before making a decision on curriculum would be wise.

Students' preference on media type should be a factor as well. So far, there has been a resistance in the shift towards e-textbooks with many still preferring print over digital (Millar & Schrier, 2015). Thus, providing students with choices between print and digital is a possible compromise for districts to help encourage engagement (Dobler, 2015). Allowing students to

choose the media they prefer will help ensure students are comfortable with the material and that it complements their learning style. Overall, districts have to consider what is best for their situation when choosing whether to adopt e-textbooks into their curriculum or not.

Teachers' Role

If districts incorporate e-textbooks, teachers are going to be responsible for implementing them into their classrooms. Lokar (2015) stated that e-textbooks should make teachers' work easier, quicker, and provide more options. Unfortunately, this is not always the case. E-textbook features vary from a digital copy of the textbook that has annotative features to ones that have interactive multimedia throughout the textbook (Choppin et al., 2014). This variety will impact how teachers incorporate e-textbooks into their classroom. Ultimately, all educators have a similar goal, "to see our students become independent learners, able to inquire, understand, and analyze ideas and use their knowledge to solve problems" (Dobler, 2015, p. 482). Textbooks, no matter which format, serve as a primary learning tool to help students on their education journey.

Since e-textbooks come in different formats, teachers need to teach students how to use them. It cannot be assumed that students know how to use e-textbooks just because they appear adept in using digital devices (Dobler, 2015). Texting and using the internet for recreation are different skills than using digital academic resources. Teachers should demonstrate how to use basic annotative functions such as enlarging text, highlighting, and taking notes. Millar and Schrier (2015) reported that students "may be accustomed to using technology, but they do not know, or are not taught, how to use it efficiently and effectively" (p. 172). It is important that teachers take the time to explain basic functions of e-textbooks and model how they would utilize them when studying. Dobler (2015) suggested that an effective way to pass on knowledge

of digital textbooks is for teachers to be digital readers themselves, and to model study suggestions with thinking aloud. If the e-textbook also has multimedia features or collaborative abilities, students will need an explanation of how to use these as well.

Having multimedia and interactive abilities in digital textbooks can be very helpful for teachers. They provide options for customization and personalization, which Lokar (2015), considered all good e-textbooks to have. The ability for teachers to adapt the material for sequencing and to provide their students with immediate feedback through interactive media are improvements from traditional print. Providing students with formative assessments can give students immediate feedback. They can also provide links to additional learning resources when students do not understand a concept (Choppin et al., 2014). Some e-textbooks also provide reports from these formative assessments directly to teachers, which helps determine lesson pacing.

While e-textbooks have many potential advantages in student learning, teachers need to take into consideration all types of learners. Chulkov and VanAlstine (2013) stated that student choice between print and electronic textbooks has to do with differences in learning habits and student preferences. There are still people who prefer print to digital. Dobler (2015) reflected, "the reading experience is a personal one, [and] students should be offered a choice between print and digital text whenever possible to encourage an engaging and motivating reading experience" (p. 490). If teachers only provide students with one choice of media format, it will be a disservice to students who learn better from the other type of media. Overall, teachers need to incorporate digital media into their classrooms as they see fit to best serve their students.

Chapter 3: Summary and Recommendations

This chapter provides an overall summary of the digital versus print textbook debate with regard to student learning. It includes a conclusion, recommendations, and suggestions for further research. The results of this chapter are based on the findings of the literature review in the previous chapter.

Conclusion

The purpose of this study was to determine whether digital or print textbooks are more effective when it comes to students' learning. There are a wide variety of electronic textbooks available whose features vary from basic annotation abilities to enhanced e-textbooks that have interactive multimedia. This paper outlines some of the different features available, as well as perspectives on e-textbooks from students, district officials, and teachers.

It turns out that print and electronic textbooks both have advantages and disadvantages. Most have to do with the format medium, but some depend on the user's perspective or specific textbook features. Overall, research has shown that these differences do not have a significant impact on learning outcomes (Woody et al., 2010). Students can learn on either type of textbook. Yet, many still prefer print over electronic. Shin (2014) reported that over half of college students preferred print books. This was found to be true in most of the literature reviewed as well.

This preference may be due to how each type of medium is read. In general, Woody et al. (2010) reported that students skim computer-based text more than paper-based and also read electronic text, "in an "F" pattern, searching for key terms rather than reading line by line" (p. 945). It is hard to say whether this trend will continue in the future. Mulholland and Bates

(2014) also noted that "e-books are preferred for searches, information retrieval and convenience, but print books are preferred for extended reading" (p. 493). Thus, each format seems to have a purpose that is better suited depending on the user's needs. Mangen, Walgermo, and Brønnick (2013) summarized it well by saying that people appear to perceive print text as more suitable for effortful learning, whereas electronic medium is better for "fast and shallow reading of short text such as news, e-mails, and forum notes" (p. 66).

Some leading factors as to why there is a push towards electronic versions include cost, convenience, and interactivity. In general, e-textbooks are cheaper to purchase than print versions. However, most have a limited license and will not be available indefinitely to the user. This can cause some frustration. Shin (2014) mentioned that "When students find valuable information, they want it stored on their personal computer or in a computer network to secure its permanency. They do not consider an e-book as a permanent place to store valuable information" (p. 71). Print textbooks on the other hand are always around. Although, convenience of the e-textbook with accessibility almost anywhere and interactive features such as multimedia links and searchability can sometimes be enough for users to switch over from print.

Recommendations

Overall, the decision to choose between print and electronic textbooks is very complex. Students, faculty, and district officials all have their own priorities and preferences. Furthermore, every e-textbook is different. Some are very basic PDF files with simple annotation features, while enhanced e-textbooks include hyperlinks and are more interactive.

As technology continues to evolve, it makes sense that educational resources would eventually follow suit. Heider et al. (2009) stated "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" (p. 104). There are some benefits in utilizing electronic textbooks, especially for quick searches or research projects. However, there is also a value in print books.

Both types of medium are associated with health concerns. Print textbooks require students to carry the entire text with them. These books are heavy, especially if people take more than one with at a time. Heider et al. (2009) noted "that more than a third of middle-school children carry loads on their backs in excess of 30% of their body weight" (p. 107), even though it is recommended to carry no more than 10% of their body weight in backpacks. This often results in back pain. Electronic texts have been noted to cause eye strain and fatigue. Cennamo, Ross, and Ertmer (2014) stated "Computer monitors challenge our eyes in ways that printed text does not and may lead to vision problems" (p. 198). This may be due to the type of device being used. Mangen et al. (2013) explained that, "Light-emitting screens are known to cause visual fatigue and more specifically, computer vision syndrome" (p. 67). Thus, neither form of medium is perfect.

Content and cost are also typically considered when deciding on which medium to purchase. As mentioned earlier, electronic textbooks are generally more cost effective. Since they are not printed, e-textbooks are able to include features such as color and images with no additional cost (Heider et al., 2009). However, digital textbooks require some type of device to access the book. This could be a computer, phone, tablet, or another eReader device. A student

in Shin's (2014) article raised concern about having to "carry around an easily damageable electronic device (my laptop) as opposed to a paperback book that is not easily damaged and that no one would want to steal" (p. 71). The cost of reading devices and replacement costs also need to be considered. As for the content in textbooks, they are typically the same in both formats. Nonetheless, e-textbooks have the capacity to accommodate frequent content updates which increase accuracy as opposed to paper-based textbooks that would need to be reprinted (Baker-Eveleth & Stone, 2015). Electronic textbooks also have the potential to include hyperlinks to extra features.

I also wanted to look at the effectiveness of learning in regard to different types of textbooks. Chulkov and VanAlstine (2013) concluded "that achievement of learning outcomes was not significantly different between students using printed and electronic textbooks" (p. 216). However, there did seem to be a difference in how efficient students were in gathering information. Daniel and Woody (2013) stated, "e-textbooks may actually be less efficient than paper-based textbooks because students take significantly longer to read the e-textbook than the paper version" (p. 19). Navigation can also be an issue. Mangen et al. (2013) cautioned that, "Scrolling is known to hamper the process of reading, by imposing a spatial instability which may negatively affect the reader's mental representation of the text and, by implication, comprehension" (p. 65).

It may be that e-textbooks and print versions are better suited for different types of reading. Mulholland and Bates (2014) pointed out that electronic textbooks are "used like reference books, to locate information and evidence rapidly, viewings are brief, and users do not normally read the entire book," while "print books are preferred for extended reading" (p. 493).

Originally, I thought that there needed to be a final decision on the best type of textbook medium. However, after seeing statements about different types of reading in multiple articles, I started reconsidering what would be best for students. I have decided that there is no absolute best option available for the type of textbook to use. Muir and Hawes (2013) stated that "electronic and print books can co-exist and the growth of the former represents more of an opportunity than a threat" (p. 272). I agree that electronic textbooks should be seen more as opportunities than competition to print. Mulholland and Bates (2014) summed it up nicely by saying "e-books are complementary to collections and not a replacement of print books and they should co-exist due to the differential benefits of each format" (p. 494). Students have different learning preferences, and it would be a disservice to some if districts or teachers limited learning materials to one format or the other.

Further Research

Technology is constantly changing and improving, as are educational resources. There is relatively limited research available on the impact of digital textbooks. It would be interesting to examine the effects of digital resources in the near future when more research has been done. Finding studies that relate more specifically to math classrooms or similar subject areas would be enlightening. I would also like to review studies that use a hybrid approach instead of limiting it to print versus digital. Understanding how to integrate both types of resources in the classroom effectively would be beneficial as an educator.

Conducting a local study would also be valuable. Understanding the perceptions and resources available near my own district would be beneficial when deciding on future curriculum. I would also like to see more data that relates to high school students. Looking at

subject specific data from other schools could also be insightful. Only time will tell what the future of e-textbooks looks like in education. A future research question could focus on whether they work better for some subjects than in others.

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