Benefits and Limitations of E-textbook Use

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Abstract

E-textbooks are sometimes known as e-books, digital books, or online textbooks. E-textbooks are a growing alternative to printed textbooks at many academic institutions. At a university like the University of Wisconsin-Stout, where every student receives a laptop computer, it is important to examine how e-textbooks are accepted and how e-textbooks may affect the study habits of undergraduate students. The purpose of this research is to identify students' preference for e-textbooks or analog, printed books, analyze the perception of student benefits and limitations of the medium, and investigate potential impacts of e-textbook use on the academic experience of UW-Stout undergraduate students.

Keywords: academic, benefits, e-textbooks, limitations

Introduction

Students sometimes face the decision of reading either printed textbooks or electronic textbooks. Although printed textbooks are the traditional content-delivery method for many students, e-textbooks continue to grow as an alternative content-delivery method. Gayle Jesse states that an e-textbook is any form of a textbook that is created to be delivered digitally and may be "consumed" (Jesse, 2014, p. 236). E-textbooks are reading materials used for academic purposes, where content is routinely updated (Terpend, Gattiker, & Lowe, 2014). E-textbooks undergo continuous revision cycles with revised editions to provide the most current academic information; hence, e-textbooks frequently require an Internet connection to ensure that updated content is accessible. For the purpose of this research, it is assumed e-textbooks contain the same content as printed textbooks, but students access that content via a device with a video display.

The University of Wisconsin-Stout, located in western Wisconsin, is a polytechnic university that provides undergraduate students with laptop computers. Because each student possesses his or her own laptop, e-textbooks are practical to implement and distribute to students. Whether e-textbooks have a positive or negative impact on students' academic experience should

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be a concern for all e-consumers. For classes that offer the option of using printed textbooks or e-textbooks, students should be aware of the factors that one medium–e-textbook or printed textbook–may make one delivery format preferred over the other.

Data for this research was gathered through UW-Stout using a survey software tool called Qualtrics. A population of 579 UW-Stout undergraduate students participated. Questions related to undergraduate students' preference for printed textbooks or e-textbooks were addressed in the survey's set of questions. Further details are described in the Method section.

Literature Review

E-textbooks vs. Printed Textbooks: Preferences from Past Research

The growing availability between e-textbooks or printed textbooks leaves students to consider which is better: printed textbooks or e-textbooks? Globally, studies show that undergraduate students from various universities in different countries prefer printed textbooks over e-textbooks for academic use. For example, a study conducted by the Book Industry Study Group concluded that 75% of 1,428 students from ten colleges prefer printed textbooks over e-textbooks (Baek & Monaghan, 2013). Another study, conducted by Dmitriy Chulkov and Jason VanAlstine (2013), concluded that 77% of 158 students preferred printed textbooks over e-textbooks. Whether the sample population was 1,428 students or 158 students, these relevant studies indicate the reading medium that students prefer.

Undergraduate students, who may be rather new to e-textbooks and more familiar with printed textbooks, often undergo an extended adaptation process as they learn how to use e-textbooks. Although today's undergraduate students completed primary schools that provided printed textbooks for most of their educational years, "57% of all [Swedish] two-year-olds…are using the Internet–most of them on a tablet computer" (Myrberg & Wiberg, 2015). Students who are introduced to tablets and computers at a young age may adapt more easily and quickly to e-textbooks; as more of these students age, they may prefer e-textbooks because of their comfort level with technology.

Robert Stone and Lori Baker (2013) cited that students prefer e-textbooks instead of printed textbooks because the "e-book [or e-textbook] is a better delivery method, not a better way to read" (p. 89). Stone and Baker noted that eyestrain was caused by reading from a video display for an extended period. The electronic method of distributing content to others via the web may be faster and more efficient than a printed textbook format. Theoretically, individuals may be more accustomed to reading on-screen

information for specific, straightforward information, summarized points, text messages, social-media feedback, or email. Nonetheless, there are positive and negative factors that may influence students' preference for one delivery method over the other.

Cost Differences of Printed Textbooks and E-textbooks

Although printed textbooks were significantly preferred by subjects over e-textbooks in multiple research studies, one significant factor is their price (Baek & Monaghan, 2013; Chulkov & VanAlstine, 2013; Falc, 2013; Jesse, 2014; Lim & Hew, 2014; Lyman, 2008; Stone & Baker-Eveleth, 2013; Terpend, Gattiker, & Lowe, 2014). Students purchase e-textbooks, although they prefer printed textbooks, because of price differences. On average, an e-textbook costs approximately half as much as a printed textbook (Falc, 2013; Lyman, 2008). Although printed textbooks can be sold back for cash, the lower initial cost of an e-textbook may cause many students to choose e-textbooks over printed textbooks.

Negative Influences of E-textbooks on Academic Performance

Students express a strong preference for printed textbooks because e-textbooks frustrate students in several ways, including, but not limited to: difficult on-screen notetaking, headache/eyestrain, difficult navigation, long page-load times, and Internet-connection requirements. These issues are foundational in this research study.

Difficult On-Screen Notetaking

The difficulty of notetaking with the e-device is a possible reason that readers prefer printed textbooks over e-textbooks. A survey conducted by Amanda Rockinson-Szapkiw (2013) found that 52.8% of 106 university students took notes on paper rather than the other four listed choices, which were "Not Answered," "I did not take notes from the book," "Type on Word document," and "Write in textbook/Type in text" (p. 264). Students are challenged to adapt to diverse annotation tools from various e-text applications. Depending on the provider, e-textbook tools for notetaking may differ slightly in appearance and function. The process of becoming accustomed to each providers' tool could be time spent reading.

Headaches/Eyestrain

Factors such as the bright light from an e-textbook's display and high pixelation of the screen strain the reader's eye and eventually make the eye work harder to follow the text, often causing headaches (Myrberg &

Wiberg, 2015; Stone & Baker-Eveleth, 2013). Eyestrain caused by reading an e-textbook, especially for an extended period, may lead to the student taking long and multiple breaks to relax the eyes before reading again. A survey conducted by Nancy Foasberg (2011), a librarian at Queens College, found that 63% of 338 participants agreed that eyestrain is one of seven identified negative e-textbook qualities. A temporary condition called "computer vision syndrome" may lead to eyestrain, fatigue, and dry eyes from looking at a device's display for a long period of time (Myrberg & Wiberg, 2015). With e-textbooks, it is recommended that readers view the content from larger screens because larger text and tools are more visible.

Difficult Page Navigation

Page-to-page navigation is identified as a negative issue that may create a struggle for e-textbook users (Hobbs & Klare, 2015). Readers can easily flip to any page of a printed text in a matter of seconds, but e-textbook users must navigate from page to page by repeatedly clicking a button, or by typing in a specific page number to navigate to a particular page; these latter actions take considerably more time. Scrolling from page to page has become a universal page-navigation method for many online users whether they use an e-textbook application, news site, or social media platform, yet, some e-textbooks don't allow scrolling from one page to another page, which is likely easier (Hobbs & Klare, 2015). A third challenge that e-textbook users may encounter occurs when attempting to navigate from one page to another distant page, such as navigating to a glossary or an index page. The e-textbook application may not save, or bookmark, the page from which the user originally navigated.

Long Page-Load Times

The intensive loading times of e-textbook pages may cause users to become irritated and annoyed, especially when a particular page contains content that increases its file size, and, therefore, creates a time lag before the device displays the content. Complex content may cause a page to load at a slower rate–or not at all. These complexities may consist of visual, auditory, cognitive, and speech-dictation features that interfere with the loading of the page (Grajek, 2013). The additional features that are provided by the e-textbook application, such as a text-to-speech function for visually impaired students, may cause the page to take longer to display as the device loads additional information to support such features. Waiting for a page to load may decrease the reader's motivation to read the text, or the student may do something else while waiting, such as browse the Internet, which may distract the reader from reading the e-textbook.

Internet-Connection Requirements

Internet access is a fundamental component of e-textbooks and is a high priority for college students for daily interaction or social media (Bossaller & Kammer, 2014). Whether students access their e-textbook from a tablet or desktop computer, Internet access may be required to use an e-textbook that does not allow downloading. Internet requirements may not be necessary for e-textbooks that are downloaded; however, updated content will be limited (Baek & Monaghan, 2013). Students who connect via a local campus network may have easy access to the Internet and readily find a location with Internet access to facilitate reading their e-textbook; however, if the student travels on a bus, train, or car, Internet access may be limited or nonexistent. Because of the lack of Internet access, students may prefer a printed textbook to read, especially if these students do most of their reading in an area where Internet access is limited.

Positive Influences of E-textbooks on Academic Performance

Students may find e-textbooks to be a burden, given the aforementioned negative qualities. Still, Baek and Monaghan (2013) found that students tend to be more accepting of e-textbooks over an extended period of time, and one or two semesters may not be enough time for a student to develop comfort and user adeptness (Baek & Monaghan, 2013). Undergraduate students who are accustomed to reading course material from a printed page typically need to experience a transition period before they become comfortable using e-textbooks. Although there is a strong preference among students for printed textbooks over e-textbooks, e-textbooks offer multiple features that students view favorably and may enhance their learning. This research studied the favorable qualities of ease of access, ease of reading, ease of page navigation, portability, and printability. These beneficial qualities are described in the following paragraphs.

Ease of Access

Like many screen devices that can access the Internet, e-textbooks can be read nearly anywhere. A study conducted by Hamid Jamali (2009), from the JISC National E-Book Observatory, concluded that the ease of accessing an e-textbook, is considered an advantage by 55% of users. With e-textbooks, accessibility is available wherever an e-textbook reader device is available. Depending on the e-textbook provider, some e-textbooks can be downloaded and read without an Internet connection; others are only web accessible and require an Internet connection to allow interactive and up-to-date features (Lim & Hew, 2014).

Ease of Reading

E-textbook providers continually improve their e-textbook applications. One important tool helping students comprehend readings is the inclusion of an English dictionary that instantly defines words students may not understand (Chen, Fan, & He, 2012). With a click of a button, the reader receives a definition of the specified word. Often, students who read an e-textbook do not intend to read the whole of the course material, but only specific sections. Smaller sections and shorter reading sessions reduce eyestrain. Shorter chapters may make reading e-textbooks easier because text and interactive features provide assistance that a student can access during a reading session to enhance their understanding of the content.

Ease of Page Navigation

Most undergraduate students complete their primary education while reading printed textbooks and flipping printed pages. Students learn to memorize where specific chapters are located or use physical bookmarks. When using e-textbooks, navigation can be completed more rapidly (Lyman, 2008). Students are able to proceed to the next page of content or revert to the previous page, using commands built into the e-textbook software, such as a mouse click. Students can "jump" to a specific page from a current page; for example, students are able to navigate directly from page five to page ten. In addition, most e-textbooks include indices and glossaries. Although viewing two-page spreads may require a larger display, the larger display permits reading with fewer mouse clicks. Those students who use e-textbook page navigation to its fullest, such as jumping from page to page, using the index, or consulting the glossary, may benefit the most from their e-textbook resource.

Portability

Ee-Lon Lim and Khe Foon Hew (2014), researchers at Nanyang Technological University in Singapore, explain portability as "not having to carry heavy printed books around, [and the] ability to store collections of readings in a personalized digital library" (p. 35). The ability to access multiple e-textbooks using a single device and to archive files eliminates the need to carry multiple, printed textbooks to classes or to other locations when studying. A survey conducted by Nancy Foasberg (2011) at Queens College ranked portability as the e-textbook's most valuable factor, ahead of four other choices (convenience, storage, special functions, and text-to-speech) in student's preferences for e-textbooks.

Printability

Depending on the e-textbook provider, the ability to print portions of the e-textbook may be allowed. Students can save paper by printing shorter sections rather than the entire text (Falc, 2013). The ability to print specific pages rather than an entire chapter or e-textbook is advantageous because students print what they want to highlight or annotate, including images, graphs, or other illustrations. David James Johnston and his colleagues at University of Windsor in Canada conducted a survey and concluded that subjects used the e-textbook print option for three reasons: "A general preference for print, difficulty reading and studying from e-textbook, and general preference to have access to both formats" (Johnston, Berg, Pillon, & Williams, 2015, p. 75). With printability, students may print pertinent sections and annotate by hand to fit their comfort (Hobbs & Klare, 2015). Printability allows students to read from printed sheets if they wish, and allows them to make annotations directly on the printed copy. The option of printing may be emphasized by instructors who use e-textbook materials to accentuate the availability of multiple media to facilitate learning. Having the print option allows students to choose the electronic or printed version, whichever best fits the student's need.

Acceptance of E-textbooks

Although e-textbooks compete with printed textbooks for student acceptance, most students may not be ready to accept e-textbooks. For example, a study conducted by Ya-Ling Chen, Sitong Fan, and Zhongyuan (2012), graduate students at Johnson Wales University, concludes that 78% of 80 students "disagreed that e-book would take over traditional print books in the future" (p. 9).

E-textbooks are gaining popularity due to ease of access, ease of reading, page navigation, portability, and printability. On the other hand, e-textbook users also report negative qualities that affect their ability to easily consume e-textbooks: difficult notetaking, headaches/eyestrain, difficult navigation, long page-load times, and Internet-connection requirements. As e-textbook providers continue to improve their interfaces and interactivity, more students may realize the benefits of using e-textbooks and adopt e-textbooks over printed textbooks.

Importance of this Research Paper

This research studies the importance of e-textbooks and how they significantly influence an undergraduate student's study habits. The aforementioned positive and negative characteristics of e-textbooks

are included to illustrate factors that make an e-textbook favorable or unfavorable. The e-textbook medium is continually growing and publishers will compete to enhance and provide their services to more students and universities, expanding as a business and helping students succeed academically as the result. This research aims to identify students' preference for e-textbooks, the benefits and limitations of the medium, and because of those use issues, the potential effects of e-textbook use on the academic experience of UW-Stout undergraduate students.

Method

For this paper, a mixed-model research was conducted by using an investigative survey instrument to gather voluntary response data from subjects. The survey instrument used for this research was Qualtrics, a survey software tool used to create, distribute and collect data.

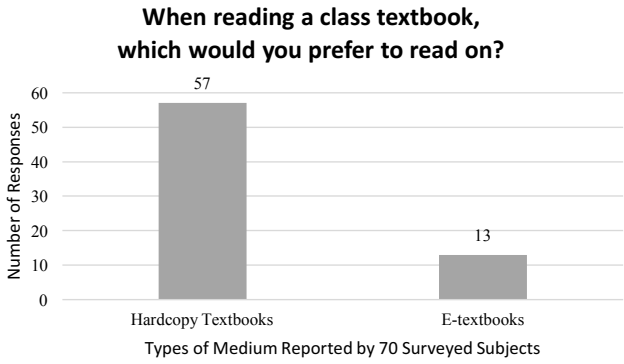
Prior to the distribution of the survey, the researcher submitted the survey and an informational ethics form to the Institutional Review Board (IRB). The IRB ensured the survey followed ethical guidelines and assured that survey subjects were safe from physical or mental harm. After the IRB reviewed and approved the submitted survey, the researcher distributed the survey to 579 UW-Stout undergraduate students via the Planning, Assessment, Research, and Quality (PARQ) office at UW-Stout.

Of the 579 students, 500 students were randomly emailed with the survey by PARQ, and 79 students were emailed the survey by the Cross-Media Graphics Management undergraduate program. The survey was available for response for a period of one month. Two email reminders were sent to each subject, reminding them to complete the survey. After one month, the survey closed and the data was collected and tabulated by the researcher. Of the total survey requests sent (579), 78 surveys were started and 70 of the 78 surveys were successfully completed and submitted within the time period, resulting in a response completion rate of 12%. For results and discussion purposes, the 70 completed responses are referenced with their corresponding results for this review.

The survey conducted for this research consisted of multiple-choice questions, respondents' typed opinions, and a Likert rating scale that included the five chosen e-textbook features that are viewed as beneficial or problematic. The multiple-choice questions attempted to clarify both the subjects' awareness of e-textbooks and their attitudes related to the use of e-textbooks.

Results

Figure 1



Students were presented with a two-choice question asking, "When reading a class textbook, which would you prefer to read on?" The choices allowed were "Hardcopy textbooks" and "E-textbooks." Respondents had a strong preference for printed textbooks at 81.4%, or 57 out of 70 students. A low percentage of 18.6%, or 13 out of 70 students, preferred e-textbooks.

The survey asked subjects to rate five problematic limitations of e-textbooks on a one-to-five Likert scale. A rank of "1" specified the most problematic issue; a ranking of "5" indicated the least problematic. As Table 1 shows, subjects identified headaches/eyestrain as most problematic, followed by Internet-connection requirements, difficult page navigation, difficult on-screen notetaking, and long page-load times.

Table 1

Limitations	Total Respondents	Respondents' Ranking: Most Problematic to Least Problematic →					Weighted Average Of Respondents' Ranking
		1	*2*	*3*	*4*	*5*	
Headaches/Eye Strain	67	31	11	10	7	8	***2.25***
Internet-Connection Requirements	67	16	17	12	15	7	***2.77***
Difficult Page Navigation	67	13	13	14	14	13	***3.01***
Difficult On-Screen Notetaking	67	5	19	18	8	17	***3.19***
Long Page-Load Times	67	2	7	13	23	22	***3.84***

In addition to using the Likert scale, respondents were also provided an opportunity to submit their own typed input related to other problematic features that were not listed among the survey choices. As related to notetaking, subjects specifically noted the absence of an ability to copy and paste from an e-textbook onto another application such as Microsoft Word. Additionally, the distraction rate of using an e-textbook may be higher as

well; some students stated that e-textbooks are "harder to pay attention to since they are on the Internet. It is tempting to go on other websites while doing homework." Another student added that e-textbooks are "hard to focus … [and] get side tracked and distracted easily." User attention span may be lower while reading e-textbooks because of distractions in their surroundings, such as the easy access to other websites or pop-up application notifications. Other respondents negatively described e-textbooks as follows: "Poor reading retention," "Different company with different tools and software. Too much to remember," "Navigation and views not customizable," "Don't work well on mobile devices," and "Inconvenient and use of device battery." These additional, problematic features of e-textbooks are issues that may require consideration to improve the adoption of e-textbooks by students.

Table 2 shows that students ranked the beneficial features of e-textbooks in this order: ease of access (most beneficial), followed by portability, ease of page navigation, ease of reading, and printability.

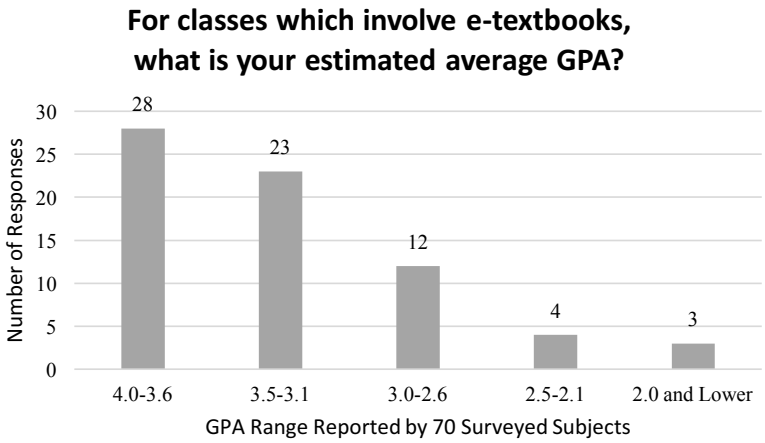
Table 2

Benefits	Total Respondents	Respondents' Ranking: Most Beneficial to Least Beneficial →					Weighted Average Of Respondents' Ranking
		1	*2*	*3*	*4*	*5*	
Ease of Access	68	24	25	10	7	2	***2.09***
Portability	68	22	13	12	14	7	***2.57***
Ease of Page Navigation	68	7	12	24	15	10	***3.13***
Ease of Reading	68	12	11	15	12	18	***3.19***
Printability	68	3	7	7	20	31	***4.01***

In addition to using a Likert scale, respondents were again invited to type their own input related to advantageous e-textbook features. One subject stated that, "The search is a nice feature that you don't get in hard copy books." Another subject concurred about the ease of the search tool: "If I need a certain key word or topic and am having issues finding it, ctrl + f speeds things up immensely." Other beneficial features of e-textbooks also included less "worry about damaging it [e-textbooks] and going to pick it up and return it." A third subject did not "comprehend the information better after reading a book online, compared to a hard copy [textbook]," although this subject did "find it much easier to take notes on the computer while reading an e-textbook." These and other responses indicate that the subjects acknowledge the beneficial features of e-textbooks.

Subjects were asked to report their estimated grade-point average (GPA) for courses that used e-textbooks. More than half of the subjects who responded (70) reported that they earned a GPA of 3.1 or greater. The following figure shows the subjects' reported GPA:

Figure 2



Discussion

At a university like UW-Stout, where students are given a personal laptop to use throughout their undergraduate careers, one might predict that students would favor e-textbooks. However, when asked whether they prefer to read material via e-textbooks or printed textbooks, data shows that the respondents overwhelmingly prefer to read printed textbooks over e-textbooks. This response is similar to a Foasberg (2011) survey that found that 76.5% of survey respondents preferred print materials to e-books or e-textbooks; in the UW-Stout research, 81.4% of the participants preferred to read print materials over e-textbooks. Numerous factors may cause students to prefer printed textbooks over e-textbooks, such as adaptability, the willingness to change reading preferences, cost, age, classroom style (face-to-face versus online courses), features, and more. Depending on the course, students may be unable to choose whether to buy an e-textbook or printed textbook; e-textbook use may be their sole option. Yet, this research shows students strongly prefer printed textbooks.

Ranked as most problematic in this research survey, eyestrain seems to be a physical concern that the majority of the respondents encountered while reading e-textbooks. Although e-textbook-accessible devices do provide brightness adjustments to the video display, the low pixilation of the screen, as well as screen contrast, may cause the reader to feel the effect of eyestrain, leading to headaches that will require taking breaks to relieve the eyes. The researcher's findings indicate that an Internet-connection requirement is a problematic feature related to e-textbooks. Not all e-textbook providers allow downloadable e-textbook content, in

effect requiring an Internet connection to access content; therefore, an Internet connection is a necessity when reading e-textbooks that are not downloadable. As shown by Table 1, page navigation had a balanced ranking throughout the scale. This suggests that some subjects struggle with page navigation while others do not see page navigation as a problem. Lastly, difficult notetaking and long-page load times were the least problematic for subjects. The results suggest that students do not struggle with finding alternatives to notetaking or worry about page loading. The least problematic, page loading, suggests that the subject's Internet connection speed is sufficient to support the content. Audiences of this research paper should consider the five problematic features surveyed in this research when they choose course textbook materials.

According to Grajek (2013), three main factors that concern students or faculty most about e-textbooks are cost, availability, and portability. The findings from this research survey illustrate that accessibility and portability are two important features that influence e-textbook usage. Ease of reading ranked as fourth most beneficial. One should be aware that "ease of reading" does not necessarily correlate or relate to headache/eyestrain in this study, but exemplifies the ease of reading the size of the text on an electronic video display. Although concerns related to page navigation and printability were less significant when compared to the other three features, the ability to easily navigate and print materials for notetaking may also be important for other circumstances, such as students who want to scan from page(s) to page(s) or students who prefer to read a printed text over an e-text. Approximately 46% of subjects stated that printability was not a problem that they encounter regularly. These five chosen features are factors that may influence students' interest in e-textbooks.

Figure 2 illustrates GPAs self-reported by the subjects as related to e-textbook use. As shown by Figure 2, there is no apparent correlation between e-textbook use and negative academic performance. Over half the respondents reported a GPA between 3.1 and 4.0 on a scale of 1.0-4.0. This may imply that students do relatively well while using e-textbooks. The survey question asked for the subjects' "estimated average GPA," the survey results may be skewed or miscalculated by the respondents. Nonetheless, as shown by the figure, subjects appear to perform well academically when they use e-textbooks. There are certainly other factors not addressed by this study that may influence grade outcomes and the use of e-textbooks.

Limitations

The respondents were UW-Stout undergraduate students, which eliminated many potential subjects, including graduate students and other e-textbook users from different universities, colleges, and high schools. The small population for this research shows a result that affected a particular audience, specifically, UW-Stout undergraduate students only. Future studies of e-textbooks may benefit from additional elements with a focus on a particular population, such as gender, learning style (face-to-face or online), age, experience with digital media, course subject, major, e-textbook experiences, grade-point averages, and more. Another significant factor that has been discussed in similar studies–that was not included in this survey–was an e-textbook versus print textbook cost comparison. Numerous other factors that were not surveyed in this research may also influence student preferences for e-textbooks; study of such factors could be addressed in further research.

Conclusion

Since its availability in the late 1990s, the e-textbook medium has grown in popularity among learners of all ages, and particularly among college students. Because technology, such as computers, tablets, and electronic devices, play an immense part in many students' academic careers, e-textbooks provide an alternative content-delivery to printed textbooks. E-textbook publishers are constantly refining e-textbook features to improve user-friendliness. However, this study's findings show that e-textbooks are not preferred by the majority of college students. Printed textbooks are–presently, and by a wide margin–the preferred reading medium for most students. This survey analyzed five beneficial and five limiting features of e-textbooks, confirming that eyestrain is the most problematic feature (of the five choices) for e-textbook users, while ease of access was the most significant positive feature (of the five choices). Although this research does consider factors that may influence e-textbook preferences among students, there may be other factors that were not addressed in this research that may influence students' preferences for electronic texts and printed texts.

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