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EDUCAUSE REVIEW

Exploring the Use of E-Textbooks in Higher Education: A Multiyear Study

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Key Takeaways

- A four-year university-wide study of students' e-textbook practices found that **e-textbook use has increased, particularly among younger students**.
- The **major barriers** — including a student preference for print and unfamiliarity with e-textbooks — **show signs of being alleviated**.

- Other factors related to **mobile device access** and **pedagogically effective e-textbooks** show little change over the study period.
- **Instructor practices** have improved, but there is still **room for growth,** with implications for focused professional development.

Textbook affordability is a growing concern in the US higher education context. A study conducted by the **Florida Virtual Campus** found that more than 70 percent of student respondents reported spending at least $300 on textbooks during the spring 2016 term.[1] Compared to a previous survey,[2] there was a decrease in the "$0–$100" cost category from 9.8 to 8.2 percent, while the "$601 or more" cost category increased from 8.5 to 8.9 percent. To reduce college costs, some students may decide not to purchase textbooks or to simply take fewer classes.[3] A recent survey of our students at **University of Central Florida** found that, due to high costs,

- 30 percent of respondents said they have opted not to purchase a textbook at least once,
- 41 percent have delayed purchasing a textbook, and
- 15 percent have taken fewer courses or decided not take a particular class.

These figures are even more troubling when extrapolating to student performance, retention, and graduation rates.

Various solutions have been proposed to make textbooks more affordable for college students. E-textbooks (that is, books

available electronically) have been touted as reducing costs and alleviating the need for students to carry heavy textbooks.[4] In 2009, Indiana University pioneered the concept of bulk purchasing course materials from textbook publishers to directly provide books in an electronic format on the first day of a course.[5] This model has been adopted by **Unizin**, a 22-member consortium of higher education institutions in the US. Another proposed solution to reduce costs is e-textbook rentals. The **2016 Florida Virtual Campus survey** reported that students shifted away from purchasing lifetime access and toward renting e-textbooks to save money. Despite these proposed institutional solutions, however, less expensive digital materials have not reached mainstream adoption.

A movement, motivated by complex factors, has changed the narrative of e-textbooks within the academic literature. The focus has swiftly shifted from publisher-produced printed or electronic format materials to creating and adopting **open educational resources** (OERs). At their most basic definition, OERs are materials that are openly licensed, giving users the legal permission to retain, reuse, revise, remix, and redistribute the material.[6] Examples of OERs range from comprehensive materials such as curriculum and textbooks to individual videos, syllabi, lecture notes, and tests.[7] Emerging research finds that students using OERs are no worse in course performance than those using costly materials.[8]

To better understand this changing landscape, our research team at UCF conducted three surveys (in 2012, 2014, and 2016) to assess college students' attitudes and practices concerning e-textbooks. Our research was limited to current practices and attitudes, since the university's restrictive

bookstore agreement did not permit an institutional-level initiative to broaden the adoption of e-textbooks.

The goal for the initial 2012 survey was to provide a baseline of ownership and use on which to build future research, while the goal of the 2014 and 2016 surveys was to gauge changes that had occurred over time.[9] In the 2016 survey, we paid particular attention to e-textbook types and OER.

This article compares our results to previous surveys and addresses three research questions:

1. What is the rate and types of e-textbook use, and how has this changed over time? Are demographic factors at play?
2. What are the influential factors to using e-textbooks, and how have they changed over time?
3. Has instructor integration of e-textbooks changed over time?

Key Issues

Despite the advantages of e-textbooks, including interactive features and accessibility on mobile devices, several barriers exist regarding implementation in higher education: the availability of digital alternatives, the questionable effectiveness of the e-textbooks being used, the inconsistency of state textbook affordability initiatives, and the unclear role of the instructor in adoption of e-textbooks in courses.

Availability

Although the availability of digital materials is growing in the higher education market, the concept of the traditional print textbook remains steadfast. In the UCF bookstore, for instance, digital materials comprise about 3 percent of course material purchases. In the 2016–2017 academic year, approximately 40 percent of required textbooks were also offered in a digital format.[10]

Furthermore, instructors required e-textbooks in conjunction with a printed textbook more often than requiring e-textbooks alone. All of this could be problematic, given that the majority of incoming students from the K–12 context are likely to be familiar with digital materials.

Effectiveness

Of the e-textbooks being used, quality is still under investigation. The design of the e-textbook is an important factor for user acceptance.[11] Thomas Chiu found that the strongest predictor for e-textbook's use was attitude toward the e-textbook; that is, students must perceive it as useful.[12] An article by Ghislaine Gueudet and her colleagues articulates the process by which instructors worked together to co-author an e-textbook and pinpointed areas in which e-textbooks noticeably differ from their traditional counterparts.[13] For instance, because of the more nonlinear experience, the instructors realized they would need to create a "toolkit" more than a "textbook" and provide students multiple pathways to navigate through the topic areas. Indeed, some features, such as concept maps and videos, may increase learning outcomes for readers.[14]

Affordability

In the US, textbook affordability legislation is inconsistent. States such as California, Oregon, Georgia, New York, and Virginia have made strategic investments at the higher education system level to create and promote OERs. At a local level, institutions may assess a course material fee to provide each student with a digital copy of the textbook. Using this model reduces the cost to each student by ensuring that all students are paying for the materials. Further, a Florida statute encourages institutions to explore bulk purchases or licensing digital course materials and to pursue OER.[15] It remains to be seen how these state and local efforts pay off.

The Role of Instructors

Instructors have an influential role to play in textbook selection. Higher education instructors tend to have more flexibility in selecting course materials compared to their K–12 counterparts.[16] The K–12 system operates in a top-down approach in comparison to higher education. Given their power of choice, higher education instructors need to how to select optimal instructional materials to meet their pedagogical needs at the lowest cost for students.

Beyond that, instructors continue to need support in determining how to best facilitate a digital reading experience. For example, Alan Dennis and his colleagues found that students performed better on open-ended test items when they had access to instructor-created annotations within e-textbooks than students who did not have this access.[17]

Survey Methods

Because of the sparse research on students' e-textbook practices at the time, we developed a **survey questionnaire** in 2012 to explore basic usage and attitudes about e-textbooks.

We defined an "e-textbook" as an electronic version of a print textbook that is typically divided by chapters on particular subject areas. Our 2014 and 2016 survey questions, based on the 2012 survey, also contained questions to gain more in-depth information about instructor behaviors and the types of e-textbooks used. All three surveys were approved by UCF's Institutional Review Board and tested by survey experts for content validity.

Our research team contacted all instructors credentialed to teach online at UCF for the three surveys and sought permission to place a link to the online surveys in online, blended, and face-to-face sections of their courses.

All three surveys had similar student respondent characteristics, including sex and age (see table 1). The research team downloaded all survey responses from the online survey system and calculated frequencies and percentages to measure students' use of and beliefs about e-textbooks. Chi square statistics were used to detect whether demographic factors affected students' e-textbook practices. We also compared results of the 2016 survey to the 2014 and 2012 surveys where appropriate.

Table 1. Characteristics of samples

Characteristics	2012	2014	2016
Courses	84	83	118
Colleges	12	12	12
Undergraduates	809	1,075	1,179
Graduates	133	106	295
Female	69%	68%	63%
Male	31%	32%	37%
Age	M = 26 SD = 8.17	M = 24 SD = 7.04	M = 24 SD = 7.09

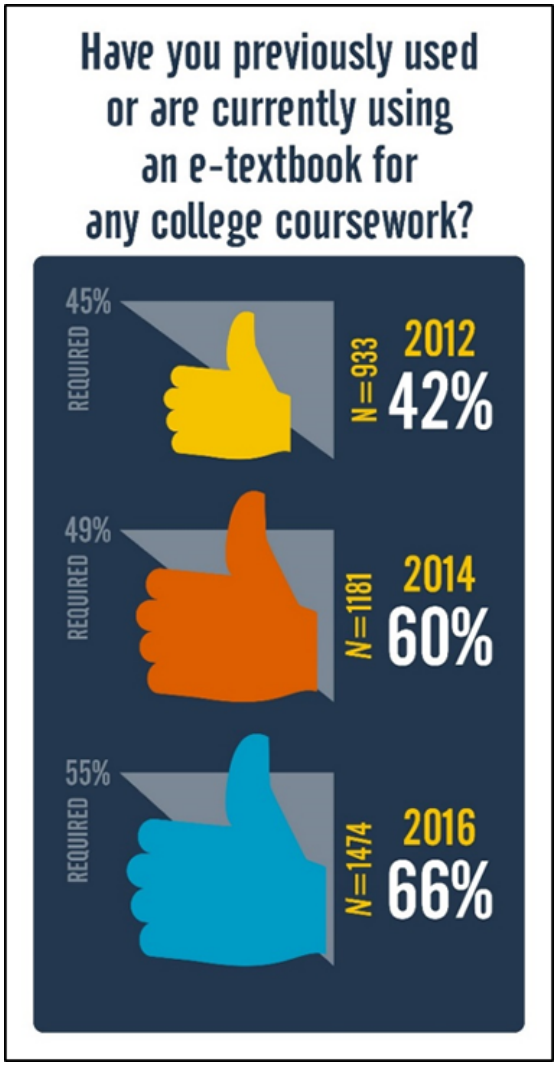
Survey Results

The survey results that follow are organized according to the three research topics: use, adoption, and instructor role.

E-Textbook Use

What is the rate and what are the types of e-textbook use, and have either or both changed over time? How do demographic factors relate to use?

E-textbook use grew in popularity over the four-year period (see figure 1). In 2012, 42 percent of participants reported using an e-textbook at least once in their college studies. That number rose to 60 percent in 2014, and again to 66 percent in 2016. In 2016, 55 percent of participants who reported using an e-textbook said it was a required course component, compared to 49 percent in 2014 and 45 percent in 2012. While the rate of an e-textbook requirement increased over the four years, the rate of overall e-textbook use among students increased at a more rapid rate.



We found demographic factors to be significant over the three surveys. All three surveys discovered that undergraduate students were significantly more likely to report using e-textbooks than graduate students ($X2(1, N = 1,306) = 5.83$, $p = .02$). In 2016, age emerged as an influential factor; younger students were significantly more likely to report using e-textbooks than older students ($r(1,333) = 0.081$, $p < .01$). While males were more likely to use e-textbooks in 2014,

Figure 1. Use of e-textbooks 2012–2016

we did not find this in 2012 or 2016, suggesting a variation in sampling. Similarly, in 2012, full-time students were more likely to use e-textbooks, but we did not find this in subsequent surveys. Our results suggest that e-textbook use has flourished across the university, but academic discipline did emerge as a significant factor. Across the four years, the College of Business was significantly more likely than other colleges to use e-textbooks ($X2(14, N = 1{,}304) = 34.49, p < .01$).

Appreciating the vast differences in e-textbook features, we asked participants in 2014 and 2016 about the types of e-textbooks they had used in their studies (see figure 2). Curiously, use of all types of e-textbooks decreased from 2014 to 2016.

The most commonly used e-textbooks were ones that offered basic features such as highlighting and annotations; 51 percent of students reported using these in 2016 (down from 72 percent in 2014). "Flat" PDFs dropped 10 percent to a rate of 37 percent in 2016. The other three categories mentioned (interactive elements, open access, and instructor-created) also declined slightly in the two-year period. In 2016, only 5 percent of students reported using an e-textbook created by the instructor; 20 percent reported using an open online textbook, and 24 percent used e-textbooks with interactive features (such as embedded quizzes).

A possible explanation for the curious decline from 2014 to 2016 emerged from the open-ended survey comments. When asked what types of e-textbooks they had used, students listed

products such as **Bookshelf**, **Yuzu**, **MyMathLab**, **Lynda**, **ALEKS**, **McGraw Connect**, and **Google Books** — a true mix of publisher materials, personalized learning software, Web-based tutorials, and e-reading platforms. It is possible that students' conception of e-textbooks does not conform to our narrow definition.

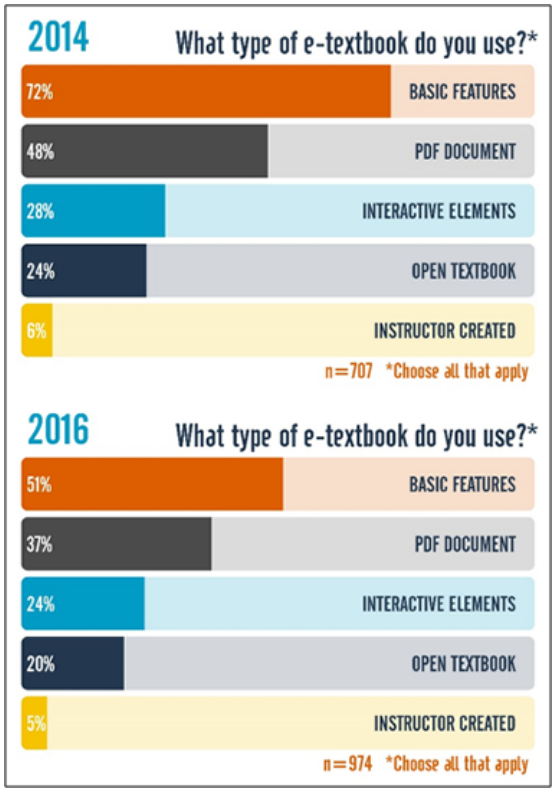


Figure 2. Types of e-textbooks used, 2014 and 2016

Use of devices has changed little over the four-year period. The majority of students in 2016 (82 percent) reported using a computer as the primary way to access e-textbooks (vs. 83 percent in 2012).

Adoption Factors

What are the most influential factors regarding e-textbook adoption, and have they changed over time?

In each survey, students were asked what would influence them to use an e-textbook. Over the period from 2012 to 2016, the factors that typically encouraged students to use an e-textbook have all decreased (see figure 3).

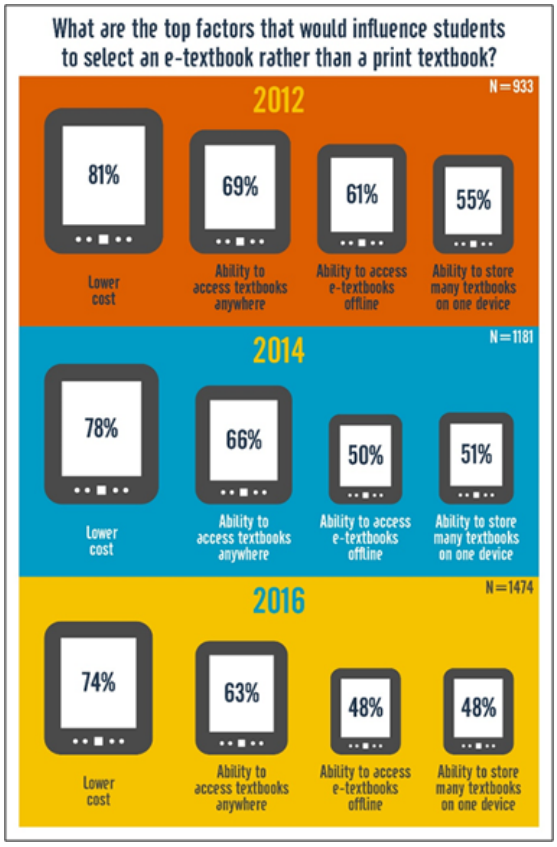


Figure 3. Factors that encourage students to adopt e-textbooks, 2012–2016

While "low cost" is still the most-cited factor across all three surveys, it has decreased. In 2012, 81 percent of students said that "low cost" would influence them to adopt an e-textbook; four years later, that figure had dropped to 74 percent. While the benefit of the "ability to read offline" was 61 percent in 2012, by 2016 it was down to 48 percent. In 2016, only 33 percent said that the ability to print pages would influence them to adopt an e-textbook; in 2012, 49 percent had cited it as important. These are intriguing results, given that the actual use of e-textbooks has risen 24 percent during this time period.

Asking students why they have *not* used e-textbooks provides additional context to understand these findings (see figure 4).

In 2012, 38 percent of students said that they chose not to use an e-textbook because they preferred print. In 2014, the number had actually risen to 42 percent. Two years later, that number had drastically dropped to just 17 percent. Citing "not

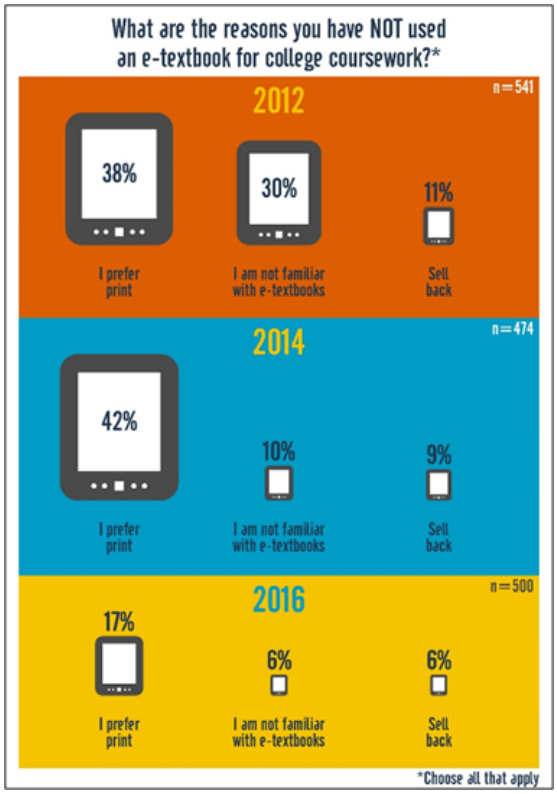


Figure 4. Factors that discourage students from adopting e-textbooks, 2012–2016

familiar with e-textbooks" has also decreased; in 2012, 30 percent said they chose not to use e-textbooks because they were not familiar with them. By 2014, the figure was down to 10 percent. In 2016, that figure had dropped to only 6 percent.

Open-ended comments revealed additional themes. Student concerns included e-textbooks taking up too much memory or running down their battery power; as one student put it, "e-book devices die." Negative physical effects such as headaches and eyestrain were also cited, as were other challenges associated with digital reading. One student shared, "It is difficult for me to go back and locate passages," while another said, "I prefer to highlight when I read." Interestingly, most e-textbooks have search and highlighting features, but students might be unaware of that functionality.

An interesting finding is that students' beliefs about their ability to use e-textbooks effectively actually fell over the study period, even in the face of increasing use. Fewer students in

2016 felt they had the technical and study skills to effectively use an e-textbook than in 2012. While in 2012 60 percent of students felt they could learn as effectively using an e-textbook as using a print textbook, in 2016 only 44 percent of students said the same.

Role of the Instructor

Has instructor integration changed over time?

After analyzing the 2012 survey results and considering the literature, we recognized the importance of the instructor's role in successful e-textbook implementation. In 2014 and 2016, we asked students about various factors here, such as whether the e-textbook was acknowledged in the syllabus, if the instructor provided technical instructions, and if the instructor modeled the pedagogical use of the e-textbook (see figure 5).

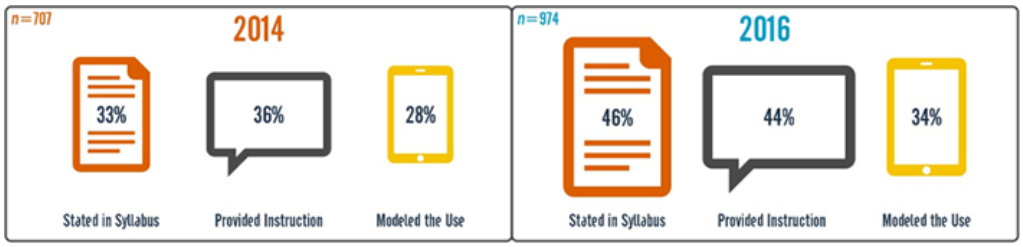


Figure 5. Instructor role in students using e-textbooks, 2014 and 2016

Each of these categories saw increases in 2016. For instance, 46 percent of students said it was acknowledged in the syllabus (up from 33 percent in 2014); 44 percent said the instructor provided technical instructions (up from 36 percent in 2014); and 34 percent said the instructor modeled use of the book (up from 28 percent in 2014).

The most positive finding related to whether the instructor actively used features of the e-textbook, such as note-taking or highlighting. Although 77 percent of students in 2014 said the instructor never used the features, only 48 percent said the same in 2016. Given how critical instructors are to the success of e-textbook implementation,[18] these numbers are promising.

Discussion

Our study findings have implications in several key areas: (1) use and efficacy, (2) instructor support, (3) institutional activities, and (4) maximizing the e-textbook experience.

Use and Efficacy

At UCF, students are using e-textbooks at an increasing rate. However, the factors typically cited as reasons to adopt them (lower cost and the ability to print) appear to be less influential in 2016 than in previous years.

Undergraduates, particularly those on the young side of the spectrum, consistently use e-textbooks at a higher rate than graduate students. This is not surprising, given the proliferation of digital materials throughout the K–12 school system. We predict that the rate of e-textbooks will continue to increase because of the skills and familiarity with them of the incoming student population. However, a troubling issue is that students in 2016 reported lower self-efficacy than those in 2012 concerning e-textbook technical and study skills, and less than half felt that they could learn as effectively with an e-textbook as with a print textbook. And yet: more students are using e-

textbooks than ever. These findings have implications at the student, instructor, university, and state levels.

Over the span of 2012–2016, our survey found a 24 percent increase in use of e-textbooks. Perhaps students responding to the 2016 survey were more aware of their abilities concerning e-textbook-related activities because exposure has increased. Being more familiar with the digital reading experience might actually explain the decreasing perceptions about learning effectiveness.[19] This is a potential line of research for others to explore to tease out student patterns.

Instructor Support

Instructors will need state and institutional support to choose high-quality, low-cost materials to support student learning. To exercise this top-down influence, states need to invest in creating effective, sustainable e-textbooks, as well as in incentivizing instructors to co-create digital materials, create and promote open repositories, and engage in professional development. Adopting existing OERs should be considered, but instructors will likely need guidance in choosing and adapting them. In some cases, they might need support in building their own digital materials. As detailed in previous articles,[20] collaborative writing of e-textbooks is complex. Facilitation is also key; to be truly effective, instructors need to model and think aloud, allowing student readers to see the strategies that work and thereby become more immersed in the reading experience.[21]

Institutional Activities

For a university, a course material fee model could expand access to traditional publisher e-textbooks. It is advantageous for each student to have access from the first day for a reduced cost. However, it remains important to select a platform that offers a valuable reading experience. The diverse expertise of librarians, instructional designers, and technical specialists can assist instructors in this pursuit. It is therefore essential that institutions provide resources dedicated to the selection, creation, and implementation of digital resources. Universities can also collect data on low-cost e-textbooks and OER adoption and use across all courses. Further, universities can track students longitudinally to evaluate the impact on retention and graduation rates.

Realizing the Digital Promise

Despite the increase in e-textbook use, we do not see a corresponding increase in e-textbooks that offer advantageous features, such as instructor annotations or interactive quizzes. This suggests that, while students are more familiar with digital versions, they might not be experiencing anything beyond a digital version of print material. The digital promise is to take advantage of the Internet, to take it on the go, and to be easily accessible to all. At the time of this writing, this promise is not being fully realized.

Authors and publishers must focus beyond simply offering digital versions of print materials and instead consider the digital advantages that can be embedded. Natalie Gerhart, Daniel Peak, and Victor R. Prybutok identified three antecedents for e-textbook use that explain the majority of the variance: perceived usefulness, habit, and hedonic

motivation.[22] They suggest publishers focus on these three areas; e-textbooks should be useful, as well as employ components that are only available digitally (such as multimedia and real-time collaboration).

Conclusions

Distributing the same survey three times across a four-year period has been quite telling, and it allows us to appreciate both the dramatic and subtle changes in the e-textbook landscape. It is interesting to reflect on the action items identified in our previous article's conclusion.[23] There, we predicted a shift in student expectations from a "print book first" to a "digital first" mentality when purchasing course materials. While perhaps not yet at "digital first," we see clear signs that digital is being considered at higher rates than in the past.

Our previous article also mentioned a collaboration of librarians and instructional designers that we formed to promote access to lower-cost and open e-textbooks. Through this collaboration, we worked with several instructors to create and adopt digital resources that have the potential to save approximately $100,000 for students across campus. We also offered a professional development opportunity, in which a cohort of instructors learned strategies to find, reuse, remix, create, and share OERs with an emphasis on active learning. This "bottom-up" approach is a crucial component within the higher education landscape.

Considering the longitudinal data collected and the successes realized so far, our future plans have shifted from encouraging

awareness of e-textbooks to scalable adoption of effective e-textbooks at the university level. Our action items include the following:

- Establish a university-wide task force on textbook affordability, with a special focus on adoption of digital materials
- Focus efforts on general education courses to experience the highest impact
- Track the experiences of instructors who are currently creating their own digital resources and promote them as champions for incentive
- Expand professional development to include student support and pedagogical strategies, such as careful e-textbook selection and active instructor modeling
- Explore the option of bulk licensing/infrastructure in the upcoming bookstore contract
- Fund dedicated resources (for instance, an OER librarian)
- Relate survey data to institutional effectiveness and performance-based funding metrics

This survey research has its limitations; the sample included undergraduate and graduate students at only one university located in the southeastern US. Future research could focus on varied contexts or samples, such as adults or students of other ages, undergraduates only, or various regions or countries.

Also, while the survey provides data regarding e-textbook use, it does not speak to the effectiveness of this instructional

delivery method. Further experimental research, properly designed and conducted, could explore the effectiveness of e-textbooks or certain facilitation techniques within e-textbooks; it could also help us better understand why students' original reasons to adopt e-textbooks have declined while their use continues to rise. A qualitative approach to understanding how students conceive and experience e-textbooks would be ideal. These lines of research will help us understand e-textbook patterns at individual universities and beyond.

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E-Books, **E-Textbooks**, **Faculty Development**, **Instructional Technologies**, **IT Integration**, **Student Technology Use**, **Teaching with Technology**