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University-wide e-text adoption and students' Use of, preferences for, and learning with e-textbooks

Chapter 10 – University-Wide E-Text Adoption and Students' Use of, Preferences for, and Learning with E-Textbooks

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By Serdar Abaci, Joshua Quick

Abstract

The consistent growth of electronic textbooks (e-texts) within higher education contexts has led cheaper, more accessible resources for students. Despite this continued growth, the introduction of technology such as e-texts does not necessarily lend itself to more effective teaching and learning practices. Student perceptions on their use of e-texts and the impact of these tools on their engagement and learning present one source of evidence for determining the efficacy of inclusive digital content delivery systems. This chapter describes a survey study conducted with undergraduate students at Indiana University, who has been running a successful university-wide e-text program since 2012. The study used a subset of the National Survey of Student Engagement, specifically designed to examine students' use of, preferences for, and perceived learning with e-texts. Data from 284 students indicated that they generally used e-texts in relation to their class-assigned reading activities. Interactive features within the e-text were moderately to infrequently used in relation to their learning practices. Students also indicated that their use of e-texts had generally positive benefits on their learning. From these results, we discuss the implications of further integrating e-texts within higher education through extended support and scaffolding of these tools for both teaching and learning.

Introduction

The growing trend of e-textbook (e-text) adoption in higher educational institutions in the last decade has sparked a corresponding interest on the efficacy and utility of e-texts for student learning and performance. Much of the discussions of e-texts have centered on the comparative effect of electronic and printed text mediums (Woody, Daniel, & Baker, 2010; Ross, Pechenkina, Aeschiliman, & Chase, 2017). This structuring of the narrative, however, tends to overshadow the pertinent discussion on how students and instructors interact with e-textbooks as part of their learning and teaching practices. Indeed, the constraints and affordances of printed versus electronic textbook mediums are exceptionally dynamic and rely on a variety of factors that impact comprehension and learning with texts such as the learning and instructional design and tasks in which the text is used (Singer & Alexander, 2017). As such, there is substantive need to reframe the discussion of e-texts to incorporate the variety of perspectives and factors that affect how and when e-texts are used within higher educational settings.

Investigations that have focused on the use and adoption of e-text tools have largely discussed the impact of student use of e-texts generally or in terms of specific features on student performance and grades. For example, Junco and Clem (2015) identified positive relations between various e-text feature uses (e.g., page views and annotations) and student score performances. Similarly, Van Horne, Russell, & Schuh (2016) examined the time to adoption of specific markup and annotation tools. Their findings indicated that students were less likely to adopt annotation tools as time within the semester progressed and that students' perception of their performance and time of use were indicative of their actual use. Van Horne et al. (2016) also identified a positive relationship between annotation use and student performance. In our previous institutional case study of e-texts at Indiana University, we found suggestive, descriptive relationships between student and instructor use of e-texts and overall class performance (Abaci, Quick, & Morrone, 2017). Both Van Horne et al. and our case study have identified substantive gaps in scaffolding and supporting student use of e-texts through lack of early structure and support.

This gap in scaffolding and support is suggestive of apparent disconnects in student and instructor aims and expectations of e-texts within higher education. Schuh, Van Horne, & Russell (2018) identified that students are unlikely to use the features intended to support their learning without specific aims and purposes, which are generally framed and elaborated upon by the instructor. Similarly, they also identified that instructors' tendency to use e-texts was generally without specific aims or expectations.

Student interaction with these tools, then, is a function of both the instructors' appropriately structuring e-textbook activities and modeling productive uses of the tool for their learning) and the extent to which higher education institutions support instructors' capacity to use such tools. The extent to how these interdependencies manifest within an institution, however, remains largely unexplored. Indeed, many of the extant studies of student preferences with e-texts have been constrained to a single or small set of classes with a low number of student participants (see Chapman, Seeley, Wright, Glenn, & Adams, 2016; Ji, Michaels, & Waterman, 2014; Knight, Casey, & Dekkers, 2017; Sommers, Shin, Greenebaum, Merker, & Sanders, 2019). As such, the impact of institutional adoption of e-texts remains largely unexplored.

An additional consideration in students' use of any tool is the more general construct of student engagement. Engagement in and of itself represents a multidimensional construct incorporating cognitive, affective, physical, and social processes (Fredricks, Blumenfield, Paris, & Schoo, 2004), which has resulted in a conceptual "haziness" around the concept of engagement (Reschly & Christensen, 2012). Furthermore, institutional commitments and support of student and instructors' involvement in educational processes and resources also influence the ways in which learner engagement can afford (Kuh, 2003; 2007). Consequently, an analysis of students' preferences and use of tools for their learning is not only an interaction between instructors' pedagogical decisions with the tool and students individual learning processes but also institutional structures and systems intended to facilitate teaching and learning with technology.

The systemic interdependencies of tool use, then, inform this chapter by focusing on the various dependencies within and across institutions that have adopted e-texts. Further, investigations into students' adoption and preferences of e-texts within and between institutions have been conducted in institutional contexts in which there has been little to no systemic institutional support (Barajas-Murphy, 2017; Abaci, BrckaLorenz, & Quick, 2019). Consequently, this chapter explores the differences in student adoption and preferences from institution-wide perspectives in which an institution supports inclusive, first-day access of e-texts for all students in courses that have entered the initiative.

Indiana University E-Textbook Program

The context of this chapter is primarily centered on Indiana University's e-text program, which is an institution-wide program intended to enable access to educational materials for all students. Indiana University's e-text program was developed and implemented in 2009 with four principle aims: (1) drive down the cost and materials for students, (2) provide high quality materials of instructor's choice, (3) enable new tools for teaching and learning, and (4) shape and structure sustainable models of

educational materials that work for students, faculty, and authors. To date, e-text adoption use and application within Indiana University has steadily grown to institutional levels of adoption and integration. The function of the program to provide systemic, institutional support to instructor and students has resulted in agreements with many publishers. These agreements enable students to access their texts for their entire career at Indiana University and supports access across multiple devices and offline use of e-texts. Figure 1 and Table 1, respectively, describe the overall and cumulative adoption over time of descriptive trends of e-text use within Indiana University.

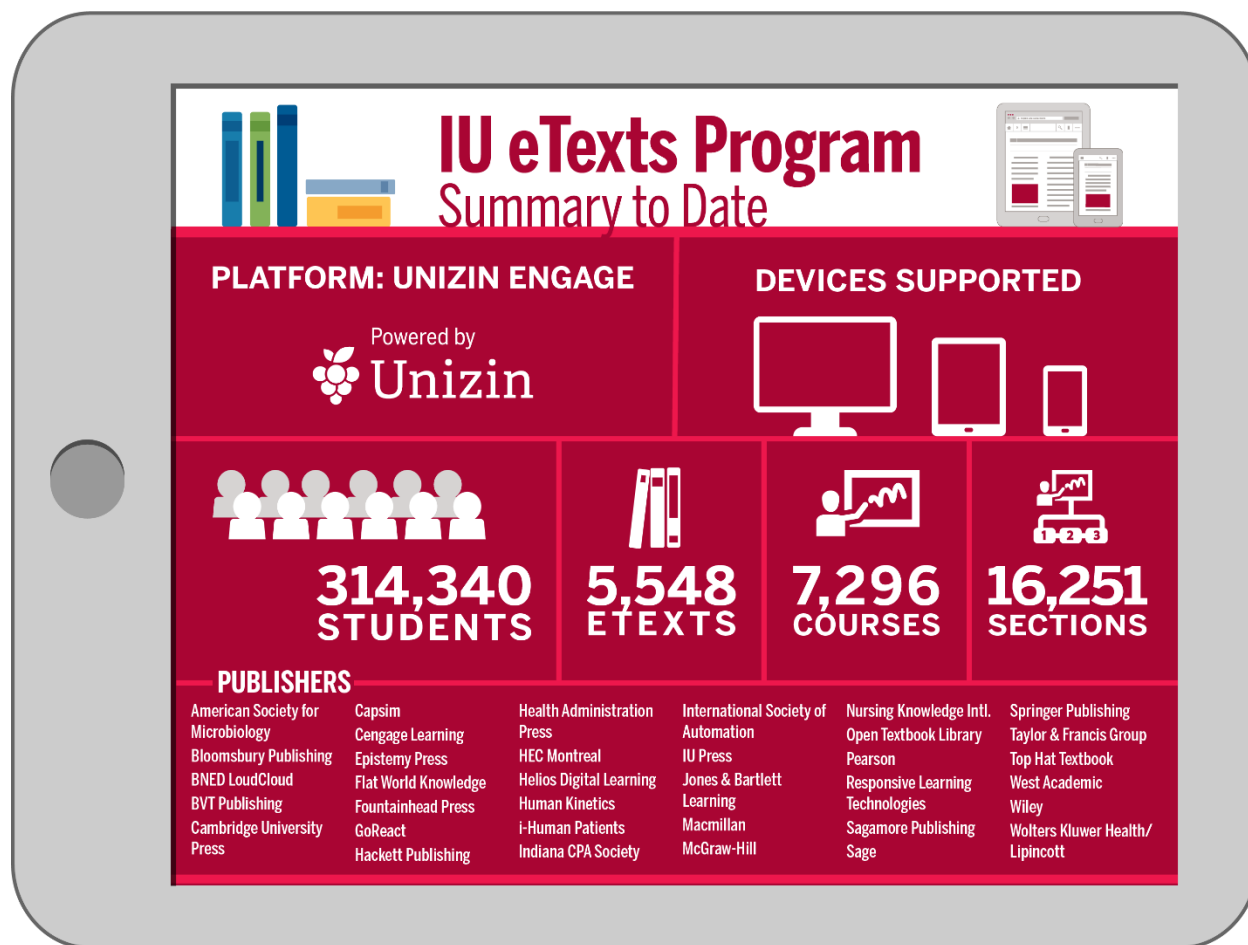*Figure 1 - Snapshot summary of e-text program at Indiana University*

Table 1 - Change in e-text adoption over time at Indiana University

	2012	2014	2016	2018
Courses	328	1,166	2,279	7,296
Adoptions*	690	1,751	2,590	5548
Students	12,251	24,290	48,814	88,867

* "Adoptions" refer to the single-course item (e.g., digital book) and a section may have one or more

Research Questions

As there are apparent gaps within higher educational contexts and students' perceived and actual use of e-texts based on their understanding and integration into structured educational aims, we sought to address this gap from an institutional perspective in order to understand the extent to which students at our institution perceive e-texts as impactful for their learning. We therefore sought to answer the following three questions:

1. How do students use e-texts?
2. How do students' preferences for textbook features relate to e-textbook use?
3. How do students' perceived learning relate to their use of interactive annotation tools?

Methods

Data Source

The data for this study came from the administration of the e-textbook question set at Indiana University. This question set was adapted from the 2018 administration of the National Survey of Student Engagement (NSSE). NSSE annually collects information from hundreds of four-year colleges and universities about first-year and senior students' participation in programs that institutions provide for their learning and development. NSSE was designed to measure the time and effort that students invest in activities shown to be related to student positive learning outcomes. NSSE 2018 was administered at 511 institutions across the United States and Canada resulting in responses from 289,867 students. A subset of 34 participating NSSE institutions received an additional item set asking students about their use and perceptions of e-textbooks. We use the results from our previous analysis of the NSSE data (Abaci et al., 2019) as comparative measures to the data collected from Indiana University.

Participants

Of the 284 students in this study, around one in four (26%) were first-year students, compared to one in three (29%) being senior and others as sophomore and juniors. Overall, two-thirds of students (69%) used e-textbooks in two or more of their classes, with around a quarter (27%) using an e-textbook in one course and only 11 students (4%) not using any e-textbooks in their courses. Of the students that did not use an e-textbook, one-third of them (36%) reported this was because they preferred a print textbook. One in five students (18%) did not have a course that required a textbook, and about half (46%) had a

textbook that was not available as an e-textbook. Half of all responding students (51%) preferred using a print textbook with one-third (37%) preferring an e-textbook and the remaining (12%) having no preference.

The largest academic program groups observed at Indiana University involved participants enrolled in Business, Economics, Accounting, and Management programs. The other prevalent respondent enrollment groups were followed by Public Health and Medical Profession and Social Science programs (29.9%, 11.3%, and 7.7% of respondents, respectively). The majority of students also earned As or Bs (n=257, 90.5%). Most of our respondents from IU identified as Female (n=185, 61.1%), while only 76 (26.8%) identified as male. Five respondents preferred not to indicate their gender identity. For additional respondent demographics and student characteristics, see Table 2.

Table 2 - Summary of Participant Demographics

Demographic	Category	n	%
Study major	Arts and Humanities	9	3.2
	Bio Sciences, Agriculture, Natural Sciences	11	3.9
	Math, Statistics, and Computer Sciences	27	9.5
	Social Sciences	31	10.9
	Business, Economics, Accounting, and Management	85	29.9
	Communication, Media, and Public Relations	22	7.7
	Education	6	2.1
	Engineering	4	1.4
	Public Health and Medical Professions	32	11.3
	Social Service Professions	4	1.4
	All other	10	15.1
Grades	Mostly A grades	155	54.6
	Mostly B grades	102	35.9
	Mostly C grades or lower	10	3.5
Transfer student		212	74.6
Enrolled full-time		250	88.0
Gender identity	Male	76	26.8
	Female	185	65.1
	Prefer not to respond	5	1.8
Age	19 or younger	38	13.4
	20-23	174	61.3
	24-29	23	8.1

	30 or older	27	9.5
Racial/ethnic background	American Indian or Alaska Native	2	0.7
	Asian	26	9.2
	Black or African American	17	6.0
	Hispanic or Latino	11	3.9
	White	183	64.4
	Multiracial	15	1.4
	Other	4	1.4
	Prefer not to respond	7	2.5
Class standing	Freshman/first-year	73	25.7
	Sophomore	46	17.3
	Junior	52	18.3
	Senior	83	29.2
	Unclassified	9	3.2

Measures

To address our three research questions, we examined the following metrics through the administration of the survey. First, respondents of the survey were asked to identify their frequency of classes that adopted e-texts regardless. Second, items asking students to identify factors that were pertinent to their adoption and use of e-texts at Indiana University as well as their preferences for printed or electronic mediums. Finally, we asked students several items on their perceived learning and use of e-text features such as annotations, keyword search, and interaction with other students or their instructors with e-texts. Specific items were used to construct an *e-text learning* score. This score was computed from items asking respondents how much the e-text contributed to their understanding of the course material, studying or completing coursework on their own, and completing coursework with other students.

Data Analysis

Our analysis of Indiana University data was adopted from our previous study on student preferences and e-text use across higher education institutions using NSSE data (see Abaci, BrckaLorenz, & Quick, 2019). Descriptive analyses were used to determine the use and adoption of e-texts by Indiana University students. In order to determine the impact of students' preferences for e-text features on their adoption of e-texts, we conducted independent t-tests and computed Cohen's *d* effect sizes to compare the importance of textbook features between students who prefer printed or electronic mediums. Finally, to address our third research question, we collapsed student feature use to frequent (i.e., responded with either very much or quite a bit of use) and infrequent (i.e., responded with some or

very little use) and conducted independent t-tests with Cohen's *d* effect sizes to compare students' perceived impact of frequent versus infrequent use of e-text features on their learning scores.

Results

We compared our findings from Indiana University to our previous investigation into other e-textbook adopting institutions in order to identify differences in faculty led versus institutionally-supported adoption (Abaci et al., 2019).

How Do Students Use e-Texts?

Many of IU's responders perceived that most of their time spent in a class was on assigned reading, regardless of the medium. Over half (n = 174, 60%) of respondents indicated that they spent at least half of their average class time per week on reading assignments. Nearly half (n=138, 48%) of responders indicated they did not frequently use the keyword search features with IU e-texts, while 40% (n=114) indicated frequent use of the search functions. The majority of responders indicated they frequently used annotation features such as bookmarks (n=208, 73%), highlights (n=170, 59%), and notes (n=215, 75%). Similarly, the majority of respondents indicated that they frequently used e-texts to interact with other students (n = 201, 70%) and send their instructor questions (n = 216, 76%). These reports, however, must be taken into account with our previous analyses of students' interactions with e-texts at Indiana University (see Abaci, Quick, & Morrone, 2017) where we found the use of the question features as the least used function of e-texts. Students also reported frequently downloading (n = 208, 73%) and accessing additional online resources (n= 208, 73%). Relatively fewer students (n=165, 58%) indicated they frequently used e-texts for self-assessment purposes.

Interestingly, the NSSE results reported in our previous study indicated students perceived using the keyword search more frequently. A larger proportion reported using e-texts for self-assessment, highlighting, and accessing online resources. Fewer NSSE responders indicated they used e-texts for note-taking, sending the instructor questions, and interacting with other students.

How Do Students' Preferences for Textbook Features Relate to e-Textbook Use?

Similar to our previous findings with the NSSE survey, the largest difference for students' preference was a stronger preference for e-textbook users to use keyword search functions of e-texts ($p < .001$, $d = 1.07$). Other relevant differences in preference were due to cost ($p < .001$, $d = .51$) and instructor highlights ($p < .001$, $d = .62$). Like our larger NSSE study, print textbook users found it more relevant to be able to sell back books ($p < .001$, $d = .43$). However, no significant differences in preference between

print and e-textbook users was observed for offline access (p = .469). Similarly, no significant differences were observed in students' preferences due to the ability to make or see each other's annotations (p = .468) or first day access (p = .098).

How Do Students' Perceived Learning with E-textbooks Relate to the Use of Interactive Annotation Tools?

In general, students who more frequently used interactive e-text features perceived greater benefits to their learning at Indiana University. The frequency of students' taking notes had substantial impact on their perceived learning ($p < .05$, d = 1.01). Similarly, participants' intensity of using e-text interactively, such as web-based features like hyperlinks ($p < .001$, d = .84), highlights ($p < .01$, d = .76) and bookmarks ($p < .01$, d = .63), self-assessment processes ($p < .001$, d = .87), asking their instructor questions ($p < .02$, d = .91), and the frequency of interacting with other students ($p < .05$, d = .71), had a moderate impact on students' perceived learning. Interestingly, frequency of using the keyword search feature had a less pronounced effect ($p < .01$, d = .38). Finally, intensity of downloading or printing texts did not have a significant impact on students' perceived learning (p = .148). This finding is in line with our previous results from our NSSE study, though the intensity of downloading or printing e-texts was found significant in the larger study.

Discussion

While student perceptions of their learning are not the complete picture, these results do suggest that there was a tendency for students to perceive positive benefits to using e-texts for their learning. Interestingly, similar findings were provided by both the results from the NSSE survey, where responding institutions tended to have more faculty driven adoption and support of incorporating e-texts, and Indiana University's application of institutional support for e-texts. The question, then, is what factors are contributing to students perceived learning and use of e-texts?

A likely explanation for this is the influence and impact of instructor scaffolding and modeling of e-text activities to support their students' learning. The support for instructor activities with e-texts and the deeper impact on student learning has been shown to provide some promising avenues for students to incorporate the tool into their learning practices (Abaci, Quick, & Morrone, 2017, Jensen & Scharff, 2019; Schuh, Van Horne, & Russell, 2018;). Therefore, the questions regarding further support and impact may well be due to providing faculty with adequate support in developing their pedagogy with

tools such as e-texts. Future work should seek to address how this connection can be successfully enabled.

It is also interesting that students in both our Indiana University study and the larger NSSE study perceived benefits of using the e-text interactive features to their learning. This is interesting in the context of a larger discussion on the effects of digital content tools on students' learning processes. Despite the increased prevalence of digital mediums for content delivery, many studies are suggestive of the benefits of paper texts. Delgado et al.'s (2018) meta-analysis review of reading comprehension suggested small positive effects to reading comprehension when using paper mediums. Small benefits were also observed in a similar meta-analysis conducted by Clinton (2019).

While it is beyond the scope of this chapter to evaluate these studies, it should be noted that the gains of using a printed versus paper text should be weighed against a dynamic system of factors. These factors can range from the nature of the reading task, the pedagogical and learning designs, and the affordances and constraints of the tool being used within a particular context. Therefore, it is probably more appropriate to determine **how** rather than **whether** e-texts should be used to further teaching and learning. Future work should therefore seek to examine the ways in which the tool interacts with the dynamic system of a classroom.

Finally, it should be reiterated that student perceptions of the tool are not the complete picture. Rather, they are necessary for informing examinations into how e-text use can be framed to coincide with teaching and learning processes within and between particular teaching and institutional contexts.

Conclusion

Student perceptions of e-texts on their learning suggest that students see some benefit of using these tools. It remains to be seen, however, whether these tools' application to learning and teaching processes matches with these perceptions. This fact suggests several avenues for future work. First, investigations into the correspondence between student perceptions and their actual learning processes should be conducted. Similarly, examination into instructor perceptions of their use of e-texts impact on their teaching and their student learning and these factors' relation to the actual processes of teaching and learning would provide new insights into warranted use of e-text and related tools. Lastly, combining these approaches into a more systemic analysis of digital content tools would be beneficial for understanding when and why e-texts and related tools are helpful for teaching and learning.

References

Abaci, S., Quick, J., & Morrone, A. (2017). Student engagement with e-texts: What the data tell us. *Educause Review* [Online].

Abaci, S., BrckaLorenz, A., & Quick, J. (2019). *Examining students' use of, preferences for, and learning with e-textbooks*. Paper presented at the Annual AERA 2019 Meeting, Toronto, ON.

Barajas-Murphy, N. (2017). *Digital textbooks: A study of factors affecting college student adoption* (Doctoral dissertation, University of La Verne).

Chapman, J. R., Seeley, E. L., Wright, N. S., Glenn, L. M., & Adams, L. L. (2016). An empirical evaluation of a broad ranging e-text adoption with recommendations for improving deployment success for students. *E-journal of Business Education and Scholarship of Teaching*, 10(2), 1-14.

Clinton, V. (2019). Reading from paper compared to screens: A systematic review and meta-analysis. *Journal of Research in Reading*, *42*(2), 288-325.

Delgado, P., Vargas, C., Ackerman, R., & Salmerón, L. (2018). Don't throw away your printed books: A meta-analysis on the effects of reading media on reading comprehension. *Educational Research Review*. 25, 23-38.

Fredricks, J. A., Blumenfeld, P. C., & Paris, A. H. (2004). School engagement: Potential of the concept, state of the evidence. *Review of educational research*, *74*(1), 59-109.

Jensen, M., & Scharff, L. (2019). Improving critical reading with e-texts: A controlled study in a collegiate philosophy course. *Journal of the Scholarship of Teaching and Learning*, *19*(3). https://doi.org/10.14434/josotl.v19i2.23978

Ji, S. W., Michaels, S., & Waterman, D. (2014). Print vs electronic readings in college courses: Cost-efficiency and perceived learning. *Internet & Higher Education*, *21*, 17-24. https://doi.org/10.1016/j.iheduc.2013.10.004.

Junco, R., & Clem, C. (2015). Predicting course outcomes with digital textbook usage data. *The Internet and Higher Education*, *27*, 54-63. https://doi.org/10.1016/j.iheduc.2015.06.001

Knight, B., Casey, M., & Dekkers, J. (2017). Using electronic textbooks to teach mathematics in the secondary classroom: What do the students say?. International Journal of Education and Development using ICT, 13(1).

Kuh, G. D. (2003). What we're learning about student engagement from NSSE: Benchmarks for effective educational practices. *Change: The Magazine of Higher Learning*, *35*(2), 24-32.

Kuh, G. D. (2007). What student engagement data tell us about college readiness. *Peer Review*, *9*(1), 4-8.

Reschly, A. L., & Christenson, S. L. (2012). Jingle, jangle, and conceptual haziness: Evolution and future directions of the engagement construct. In *Handbook of research on student engagement* (pp. 3-19). Springer, Boston, MA.

Ross, B., Pechenkina, E., Aeschliman, C., & Chase, A. M. (2017). Print versus digital texts: Understanding the experimental research and challenging the dichotomies. *Research in Learning Technology*, *25*.

Schuh, K. L., Van Horne, S., & Russell, J. E. (2018). E-textbook as object and mediator: Interactions between instructor and student activity systems. *Journal of Computing in Higher Education*, *30*(2), 298-325.

Singer, L. M., & Alexander, P. A. (2017). Reading on paper and digitally: What the past decades of empirical research reveal. *Review of educational research*, *87*(6), 1007-1041.

Sommers, S. R., Shin, L. M., Greenebaum, S. L., Merker, J., & Sanders, A. S. (2019). Quasi-experimental and experimental assessment of electronic textbook experiences: Student perceptions and test performance. Scholarship of Teaching and Learning in Psychology, 5(1), 11.

Van Horne, S., Russell, J. E., & Schuh, K. L. (2016). The adoption of mark-up tools in an interactive e-textbook reader. *Educational Technology Research and Development*, *64*(3), 407-433. https://doi.org/10.1007/s11423-016-9425-x

Woody, W. D., Daniel, D. B., & Baker, C. A. (2010). E-books or textbooks: Students prefer textbooks. *Computers & Education*, *55*(3), 945-948.