From Proprietary Textbook to Custom OER Solution: Using Learner Feedback to Guide Design and Development

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Abstract

This study presents the initial needs analysis and formative evaluation of the beta version of an open educational resource (OER) textbook solution. The OER textbook, created by the authors, replaces a proprietary, paper-based textbook and is delivered to students digitally, within a learning management system. Needs analysis findings show that students are concerned about cost and convenience, and are likely to seek course content online before reading material in a traditional course textbook. Many do not purchase assigned textbooks at all. Students also want mobile access to course readings, and for those readings to be brief and targeted, covering just the necessary content for completing coursework. Students provided positive feedback on the OER textbook, indicating that it helped them meet course learning objectives. The online integration of reading and other content materials within the LMS encouraged use. Students reported higher rates of access and appreciation that the course textbook was free. These findings suggest that instructors should consider the cost, format, length, and relevance of assigned readings in courses, whether they are ready to adopt, adapt or create open digital textbooks or continue to use proprietary, paper-based ones.

Keywords: instructional design, needs analysis, online textbook, open educational resources

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Textbooks play an important role in the formal learning process, serving as one form of content delivery for learners. Despite proclamations that physical textbooks will be replaced with digital ones (Lewin, 2009) and recommendations that low-cost alternatives be sought (Rosenfeld & Hegadus, 2006), educational publishers still supply the higher education market with large numbers of physical, proprietary textbooks. In an era when many students are taking online or

blended courses and coursework is submitted online, the physical textbook lacks seamless integration with other course elements.

The cost of textbooks is steadily rising, putting some students in the uncomfortable position of choosing between textbooks and living expenses (DeMartini, Marshall, & Chew, 2018). Open textbooks have been recommended as one means of providing students with low cost educational materials (Hilton III, Robinson, Wiley, & Ackerman, 2014). Open textbooks can be designed to meet specific curricular needs, and such texts have been well-received by students (West, 2019). Most open textbooks are delivered online, although many tend to still follow a linear, book-oriented format. However, proprietary textbooks might just as readily be replaced by either a traditionally designed, linear open textbook or a set of open educational resources (OER) delivered digitally to learners via a learning management system. Content may also be delivered via other open resources, including open video repositories (Miller & CohenMiller, 2019).

In this paper, we report on the learner feedback received during an OER design and development project, focusing on both the initial needs analysis and the formative evaluation of the beta version. The project, funded by a university grant, offered the opportunity to replace a proprietary text and develop learning materials to be offered at no cost to the learners in an undergraduate educational technology course. Through our data collection and analysis, we explore the reasons that guided learners to choose to access and use a proprietary textbook and, later, a custom OER textbook, along with learner preferences about format, media, and content.

Review of Literature

Although there has been some skepticism about OER use regarding quality and ability to support learning outcomes, studies in both K-12 and higher education environments refute that criticism. The quality issue is a red herring, exacerbated by poor understanding of what OER are and how they can be used (Belikov & Bodily, 2016). Both proprietary and open educational resources can be well or poorly designed, and both can be appropriately or inappropriately selected for a class. Students and teachers who have experienced high quality OER have rated them equal to or better than other learning materials (Christina, Stefan, & Georg, 2017). Quality is not just a perception, but also relates to measurable outcomes. For example, in higher education settings, the assignment of open textbooks was correlated with increased textbook access and higher student grades (Feldstein et al., 2012) as well as higher rates of course completion (Fischer, Hilton, Robinson, & Wiley, 2015). Although the overall number of studies on OER use in higher education to date is still small, these studies have consistently supported the idea that OER can support high quality learning experiences (Hilton III, 2016).

What, then, are the differences between proprietary and open textbooks? Cost is a major difference. Although open is not the same as free, the two terms are often used synonymously, and open textbooks and other OER typically are free to use (Pomerantz & Peek, 2016). It should be noted that when open textbooks provide often-free content to students, there are costs associated with their development and there may be other costs associated with their use (e.g., e-readers or print-on-demand books). Still, in many cases the use of open textbooks saves students money; one study found that the average proprietary textbook cost was $90.61, with a wide range (Hilton III et al., 2014). Students appreciate and respond favorably to faculty members and courses in which OER are used in lieu of costly textbooks and course materials (Gabrielle & Judy, 2017).

Customizability is another difference between OER and proprietary textbooks. Proprietary textbooks typically have predetermined content. Increasingly academic textbook publishers have offered customized options, in which instructors select content from the publisher's catalog to be provided in compiled format as a course textbook. However, this level of customization is slight and still costly for students. Open resources support the 5 Rs: retain, reuse, revise, remix, redistribute (Wiley, n.d.). In other words, when open resources are adopted for a course, instructors and students are free to use them in a variety of ways, as suits their learning needs. Use, in this sense, does not simply mean being a consumer. Instead, it more broadly encompasses being a collector, co-designer and distributor of learning content. This ability to customize OER is an advantage of OER use for instructors (Belikov & Bodily, 2016), and adaptations may be done to make OER content accessible for learners with disabilities (Rice, 2019). Most instructors simply adopt OER as-is, and provide students with a link to existing resources (Jung, Bauer, & Heaps, 2017).

Project Context

This project, which began as a quest for an open textbook, was started to serve the needs of instructors and students in an educational technology class for preservice teachers. This course is taught in both online and face-to-face modalities, with both versions of the course sharing the same syllabus, learning materials, and course assignments. The online version of the course meets asynchronously, whereas the face-to-face version has a weekly meeting in a computer lab. The face-to-face version makes extensive use of online technologies to help students communicate and collaborate as well as to deliver course materials and provide an administrative backbone for the course.

This project was undertaken with the support of an OER Textbook grant from the Florida State University Library. The goal of this grant program is to help faculty members shift from assigning expensive proprietary textbooks to using high quality open textbooks and open educational resources that will be free to students. This grant provided a small amount of professional development money for the lead author in exchange for committing to transition a high enrollment course from a proprietary textbook to OER. More importantly, the grant provided the impetus for the OER development process. It also gave us access to a support team of librarians who offered training on various concepts related to open textbooks and OER and who were prepared to help us throughout our design and development process. Although we did not rely on the library's OER team heavily – mostly we sought some initial feedback about development platform options – we were glad to have their support.

It would have been acceptable per the terms of the grant to select an existing open textbook, or to adopt and adapt existing OER. However, we decided to start with a blank slate and create a custom solution. In a sense, what we designed and are now using for this class is not, by default, OER. We could have created the course materials with the intent of using them solely in this course, and not sharing them further. However, we had no need to create proprietary resources. To do so neither reflected the spirit of the grant we received from the library, nor represented what we felt was an appropriate way to approach this project. In this course we teach students about OER and how they might be used by teachers. This project provided the perfect opportunity to model what we were teaching to our students, and hopefully inspire them to create and share their own

OER in the future. It should be noted that making our OER textbook truly open was the last step of our project, and was not fully realized at the time that data were collected for this study.

Our decision to design a custom solution rather than to adopt an existing open textbook reflects our past experiences seeking free, online learning resources to use in this course. We had previously looked for open textbooks, setting the scope of that search narrowly and conventionally, hoping to find a PDF version of a textbook that would meet our curricular needs. Failing in that endeavor, we also looked for free, online learning objects that would serve students in meeting the course learning objectives. However, stitching together OER from multiple sources to replace a textbook for a semester-long course sounded like a time-consuming and tedious process. We had a good idea of the type of content coverage that our students needed and we were happy with the existing course design. We wanted our course design to drive the selection or design of learning materials, and not vice versa.

Our decision also reflects our expertise and our prior work developing content-rich materials for this course and similar courses. Both authors are formally trained as instructional designers and have substantial experience designing instructional content for a wide range of media and contexts, including online instruction in the university setting. Thus we felt confident that given time and effort we would be able to accomplish this task, and joined the minority of instructors who have created their own open textbooks (Jung et al., 2017).

We did not start this process with a clear sense of form and features in mind, but we were cognizant that these elements potentially mattered as much as content. Based on prior comments from students about readings in this and other classes, we suspected that they would want electronic resources, and might opt to do readings on mobile devices. Readablity, effectiveness, accessibility, efficiency and navigation have all been identified as important design factors in mobile reading applications (Matraf & Hussain, 2018), which are generally perceived as less useful and usable than traditional books (Hancock, Schmidt-Daly, Fanfarelli, Wolfe, & Szalma, 2016). At a more macro-level, we considered that university students benefit from the ability to take and find notes and search for words (Jardina & Chaparro, 2015). In sum, while we felt confident about the content that our OER textbook must include, we knew that to successfully accomplish this design task we would have to investigate how our learners used, perceived, and wanted to use textbooks.

Method

Research Questions

This study is situated in a real-world design case, and represents an initial needs analysis followed by a round of formative feedback on the design of an OER textbook. The research questions that guided this study are:

(1) What factors influence undergraduate students' decisions to obtain and use a course textbook?

(2) What features do university undergraduate students want in a textbook?

(3) When presented with a custom OER textbook, how do undergraduate students use and perceive it?

Participants

Participants in this study were students enrolled in an undergraduate educational technology course for preservice teachers at a large public university. Participation was voluntary and consisted of completing an online survey. Students were recruited during two semesters. During the first semester, the survey was completed by 55 of 56 students enrolled in four course sections (response rate = 98.0%). During the second semester, the survey was completed by 89 of 93 students in five course sections (response rate = 95.7%). Although demographic data were not collected, we know from past studies that 70-90% of the students who enroll in this class are freshmen and sophomores, and 60-80% of the students in most course sections are female. The classes surveyed in this study were representative of typical classes.

Data Collection

Surveys were the primary data collection method. The surveys were approved by the university's Institutional Review Board. Both surveys were developed collaboratively by the researchers to ask questions about the potential (survey 1) or beta (survey 2) course materials, and were reviewed by a colleague to ensure clarity.

Survey links were provided within the learning management system and students were asked to use the surveys to provide feedback about course textbooks and learning materials. Surveys were deployed at the end of the term. Depending on available time, students were either provided time to complete the surveys during class or were asked to do the survey on their own time.

During the first semester, data collection occurred via an 8-item survey, with 6 closed items and 2 open-response items. This survey served as the initial needs analysis. The questions focused on how students had interacted with the proprietary textbook that had been assigned that term, and asked students about features and design considerations they would desire in a custom-designed textbook.

During the second semester, an 8-question survey was used. Again, we kept the survey brief in order to secure student participation. There were five closed and three open-ended questions, and the open-ended questions could be answered in a sentence or two. The purpose of this survey was twofold. First, we sought to learn about how students used and perceived the OER materials we had created. Second, we wanted to know what else we might design into the next version of the materials.

Data Analysis

Closed survey items were analyzed using frequency distributions, which is appropriate for ordinal data. Open-ended questions were analyzed thematically, with a goal of generating a count of the most frequent themes and to identify both typical and illustrative quotes. During this analysis, both researchers independently reviewed the open responses to identify themes. Then they compared the results of their independent reviews, with the intent of negotiating differences. No major differences were noted during this negotiation.

Results

The findings are organized to reflect our timeline of activities. We begin by describing the starting point, the proprietary course textbook. Next we share findings from the initial needs analysis survey. Then we describe the OER solution that we designed, and finally we present the findings from the second student survey, which provides formative feedback after the beta version of the OER course materials were deployed.

Pre-OER Solution: The Proprietary Course Textbook

The proprietary course textbook was published by a major textbook publishing company. Rather than a traditional bound book, this edition of the textbook was sold as an unbound version. Although the pages had drilled loose-leaf holes, students were required to purchase a binder or folder to keep track of the pages. This format also limited the resale and used book purchasing opportunities for the textbook.

The textbook included a code to access supporting online media (videos, quizzes, etc.), and instructor materials were also available. While there was a less expensive eBook version of the textbook, it did not include access to the additional online content. Accessing the online content was a cumbersome process. Students needed to use the access code to create a new account with a username and password. This account was separate from the one students used to access the university's learning management system (LMS) and computing resources.

The textbook consisted of 10 chapters, and the average chapter was 37 pages long (range = 28-54 pages). Each chapter was further chunked into 3-7 sections. Within each section were multiple sub-sections or features. The pages within these sections were text-heavy, often with few or no supporting visuals. The chapters ended with a topical summary and content-related activities. Although the above description is based on a specific textbook, this textbook is not particularly unique in its form and content. It is the third textbook that we have used in this course during the last decade, or fifth if one is counting updated editions.

Three challenges that we consistently faced with textbooks we adopted were course alignment, quality, and outdated content. We never found a textbook that fit our course design well, and although it is not uncommon for instructors to design a course around a textbook (Allen & Tanner, 2007), we were committed to our course design as the driving curricular force. Although the overall content quality was high, students frequently found both typographic and factual errors in the textbooks. We are entirely sympathetic about the occasional tenacious typo that persists despite copy editing, but the number of errors felt problematic given the high price tag of the textbook. Finally, because the course topic is a dynamic one, sections of the textbooks became quickly outdated. These last two issues were ones that we knew we could fix if we had the ability to revise our course textbook, but they are beyond instructor control when proprietary textbooks are used.

Survey 1: Initial Needs Analysis

The first survey was introduced to students as the opportunity to provide feedback that would help future learners in this course. We explained that we were planning to replace the current textbook with a custom solution, and that there were many possibilities. As students who were completing the course and who had a good sense of course content and requirements, we valued their input about what form and function was desirable in a text for this course. We also wanted to know how they had used the assigned proprietary text. Our own observations as part of the

instructional team suggested that students did not necessarily own or read the textbook, and knowing if that was an accurate perception and what the reasons were would be helpful when designing the new text.

Prior textbook use. When asked if they purchased the course textbook, which had just increased in price to over $100 for a new copy that term, 32 (61.5%) of the students said they had. Another 2 (3.8%) had found another way to obtain the text, and a third (18; 34.6%) simply managed without the text all term. However, purchasing or obtaining the text is not synonymous with using the text. Only 10 (19.0%) students reported that they used the textbook during the course.

When asked on an open-ended question why they did not use the textbook, the most popular responses were that students did not feel the need to use the textbook in order to complete assignments (16 students), and that the necessary content for completing assignments was covered in class (10), was available online (4), or was contained in podcasts (3). These podcasts were created by the supervising faculty member to supplement the textbook in content areas with weak coverage. Additionally, 5 students commented that money had been a factor in not using the textbook. Other comments suggested that the textbook was too long, and too heavy and inconvenient for students to carry around with them. These quotes illustrate some of the student sentiments about needing the text:

- The book did not seem like a complete necessity when I first began taking this course because at times there were pdf files of the textbook given to the class if it was necessary for an assignment. Also most of the information pertaining to this class can be found online.

- Everything that we did in the class was gone over during the lecture. The textbook obtained some useful things but most of the stuff we were learning about referred back to online credible websites that we were able to navigate through as a class/individually

- The expenses related with the textbook were excessive and I figured since I barely used my text book for [another course] last year, that I could make do without it.

In these comments students suggest that instructors were finding ways to compensate for students not purchasing or obtaining the book, whether that be providing the necessary content in lectures, or giving students PDFs of the most critical pages of the book. The latter was not an officially sanctioned instructor action, but based on student comments at least one instructor must have provided readings to students in this manner.

Of the 10 students who used the textbook consistently, 6 stated that they needed the readings to complete some of the course assignments. The assignment prompts referred to specific chapters in the textbook, so the discrepancy between the students who said they did not need it and those who reported needing it reflects students' personal feelings about whether the text was needed, and not whether it was incorporated in the course design. Still, even these students were skeptical about the cost-benefit, with one stating: "Occasionally we would have assignments with questions where the information would be found reading the text, however the amount of times we did this did not make up for the cost of the textbook"

Platform and format. Multiple platform and format options were possibilities for the new course materials. Because we were creating the materials ourselves, we knew we would have the ability to offer digital files to our students, but we could also facilitate a paper-based copy if desired. The majority of students (42; 81.0%) indicated a preference for doing readings online.

Still, 1 student wanted to be able to print, and 9 (17.3%) said they would purchase a low-cost, bound version of the text. This suggests that paper is not entirely passé in the eyes of learners, and some learners are still willing to pay a nominal cost to have print reading materials. Mobile options were deemed important by 39 (75.0%) of the students. Even with a preference for reading online, the ability to print was still valued by two-thirds (34; 66.7%) of the students.

Students expanded on the importance of mobile access in an open-ended question. One student confessed, "Most students will look at the textbook on their phone during class to check to see if there is anything that they might have missed or so that they can engage in class discussion so making sure that the textbook is available through a mobile device is important for this class." Another student explained, "It's extremely important to me that it is accessible on a mobile device because I don't prefer lugging my laptop around campus all day. It's also good if it is easy to navigate, an index with links to the chapters, etc." The combination of mobile access and well-chunked, navigable content appear to be related, and logically the two themes fit together.

We were not sure at the onset if we were creating an open textbook that was fairly traditional in terms of form (i.e., a linear, word-processed document in PDF or similar format that could easily be read online, downloaded for offline use, and printed) or if we were incorporating audio-visual media and interactions. We asked students to share their preferences (see Table 1; students could select multiple answers). Videos were the most popular content format that students wanted, followed by reading material. One-quarter of the students did not select reading material as a preferred content medium for the class, and 35 (67.3%) indicated it was important to at least incorporate some sort of audio-visual media elements.

Table 1.
Desired content formats

Answer	%	Count
Videos	84.6%	44
Reading material	75.0%	39
Podcasts	59.6%	31
Integrated practice activities	50.0%	26

The students' desire to reduce reading and increase other media, including practice activities (which half of the students were interested in) came across clearly in student comments, such as this one: "Have it be interactive!! The textbooks associated with [this class and another] have chapters that are WAY TOO LONG WITH WAY TOO MANY WORDS!!" In general, students suggested the desire to move away from a traditional, text-dense textbook, with comments like "Have more images or interactive things and less text to make it seem less like a text book," and "The best textbooks are those that are succinct and communicate information in as few words as possible." These comments were in response to an open-ended question at the end of the survey asking for students to share any additional information that they deemed relevant to the project.

We also were exploring delivery platforms with different features at the time of this survey, and asked students if the ability to take notes was important. The majority (38; 73.0%) said that they wanted such a feature, with two students further commenting that they would like to be able

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to share their notes with each other. This comment likely arose because the students had experienced Diigo (http://diigo.com), a social bookmarking tool that facilitated collaborative annotations, during the course.

Cost and access. We asked students how important it was that course materials be free of cost. Almost all of them (50; 96.1%) said free was important. We also recognized that even if we were not profiting from the materials that we designed and developed, if students accessed a print-on-demand version of a text or if we embedded the course materials and interaction in a platform like Tophat Classroom (http://tophat.com), there would be an associated cost to students. We estimated that the cost would be $30 or less per student, and asked about that price point. All but one student (51; 98.1%) responded that the $30 or less price point was important to them. Students additionally indicated, although to a lesser degree (38; 73.0%) that they would want to have continuing access to the course materials after the class ended.

The OER Textbook Solution

The OER textbook solution was designed based on the student feedback in survey 1. We prioritized the students' desire for course materials that were free, mobile-accessible, and printable. We also noted the students' preference for limited written text and focused content. We did not eradicate text, but found that we were able to really hone in on the important details and chunk text in different ways than the textbook had. For the beta version, the course materials were developed in the Canvas LMS, which was a familiar learning environment for the students. Not only did this mean that the content would be offered for free, but we could also build learning interactions and take advantage of the mobile app.

Most of the content was developed by the authors of this article. Other contributors included course instructors who created content in specific areas of expertise, and practicing teachers who provided examples of their classroom technology practices. Rather than long, laborious chapters, we created brief, targeted readings ranging from around 300 to 1000 words apiece. When topics were connected, hyperlinks were used. Hyperlinks were embedded in the prose or listed at the end of a brief essay as a related topic, depending on what was contextually appropriate. Additionally, we included images, videos, podcasts, and external links.

In the end, what we created somewhat challenges the concept of "textbook" since it is neither fully text nor in a book format (to learn more about the design process and final product, see Dennen & Bagdy, in press). It might be considered a set of open learning materials. However, we will continue to refer to it as the OER textbook for simplicity throughout this article.

Survey 2

The second survey was deployed at the end of the beta testing term. The 82 students who completed this survey had access to the OER textbook in digital format in the Canvas LMS for the entire semester. It was presented as their primary source of course materials. Students were informed that their survey feedback would be used in a formative sense, to help improve the course materials.

Textbook access. We started the survey by asking students what they typically do when assigned a course textbook. We wanted to know what their baseline habits were for a course. The majority (49; 55.1%) reported that they purchase a used text. Only 8 (9.0%) preferred to purchase new texts, and 22 (24.7% sought to borrow the textbook. Under an "other" response option, 4 students said they rent textbooks and 2 reported ignoring the need for a textbook.

Students were presented with readings and other course materials interspersed across course modules. Relevant content appeared in a folder labeled by week, along with links to assignments and course interactions (e.g., discussions and blogs). This presentation of content marked a major change from past terms when students had to locate readings as assigned within a linear, paper-based or electronic book. When asked which format they preferred, 68 (76.4%) indicated that this interspersed approach was better. Similarly, when asked if they preferred the online format or print-based readings, 75 (85.2%) of the students chose the online version.

We asked the students how they accessed the OER textbook, 71 (80.0%) reported using a laptop or desktop computer. Despite the enthusiasm for mobile access expressed by the students in Survey 1, only 4 (4.5%) students reported using a mobile phone and 1 used a tablet. There were 13 (14.6%) students who reported that they did not do any readings for the course. Student comments echoed some similar themes to Survey 1; some felt that the readings were necessary in order to be prepared for class and complete the coursework and read because it was required, and others felt that they could pass the class without doing the readings. The one theme from Survey 1 that did not appear in the comments for Survey 2 was cost.

Students left several positive comments about the OER textbook. Some further commented on the ability to do the readings quickly and easily ("they were fairly short reads which I was able to complete before class, since I get here early" and "they were quick and easy") and several other brief comments referred to the readings being free, short, and relevant. Two students mentioned the convenience of the format and platform, stating "I usually get on canvas everyday anyway so while I'm on canvas the day before class I pull them up and read them" and "I really liked having PDF versions of texts accessible through Canvas. Without being weighed down by a physical textbook, I was able to access my readings from anywhere at anytime. It was very helpful to be able to transition between the texts and internet for context and additional resources." Still, one student didn't even realize that there were readings or was a textbook, writing "I kinda forgot. And the course really did not require the readings because there were no texts."

OER textbook content and usefulness. Length of readings and the desire to do minimal reading had been a theme in Survey 1, and the OER Textbook offered brief, streamlined reading materials – just what was deemed necessary for students to complete their assignments. When asked about the length of the readings, 68 (76.4%) students said they were just right. None felt they were too brief, and only 7 (7.9%) thought they were too long. The remainder did not do the readings.

Overall, students reported that the OER textbook was useful for helping them complete the course and achieve the course objectives (See Table 2). Given that 13 students reported not doing the readings and recorded "disagree" responses to these items, only 4 to 12 students did the readings and found them to not be useful for each of the different purposes. The lowest rated item was improving technology design skills, which could reflect student uncertainty about what the item meant. The OER textbook contained information about technology design issues, but did not contain software tutorials. On an open-ended item, some students mentioned that they would have liked such tutorials in the textbook.

Table 2.

Usefulness of OER Textbook for achieving course objectives

Item	Strongly agree	Somewhat agree	Neither agree nor disagree	Somewhat disagree	Strongly disagree
Prepare for in class activities (*n*=89)	35 39.3%	33 37.1%	13 14.6%	4 4.5%	4 4.5%
Complete class assignments (*n*=89)	40 44.9%	28 31.5%	12 13.5%	6 6.7%	3 3.4%
Understand how teachers use technology (*n*=89)	46 51.7%	26 29.2%	11 12.4%	2 2.3%	4 4.5%
Improve your technology design skills (*n*=88)	35 39.8%	28 31.8%	14 15.9%	5 5.7%	6 6.8%

The survey concluded with an open question asking students to share anything else they would like us to know about the course or the OER textbook. This item garnered various comments about the instructors, course structure, and workload. The few additional comments about the OER Textbook recommended that we "keep it free!" and noted that "It was nice to not have to buy the textbook." Additionally, students wrote that "the learning resources were very beneficial" and "helpful."

Discussion

Textbook Access and Use

In response to our first study question about factors influencing students' decisions to access and use a course textbook, both surveys confirmed that cost, perceived need, and convenience were major issues. Cost was a major theme in responses to the first survey. That term, many students did not purchase the assigned textbook because of its cost. For some, the purchase was cost-prohibitive; these students may have found themselves in a position where a textbook purchase would exacerbate an already tenuous financial existence as students (Broton & Goldrick-Rab, 2017). For others, the cost-benefit of purchasing the textbook was unclear. These students likely weighed need against cost.

Convenience was another issue factoring into student use of the textbook. Students wanted the ability to access course content when and how it was most convenient for them, and often this meant via a mobile device. Their comments suggested that using a physical textbook was cumbersome, both in terms of portability and interface. Although the loose-leaf version of the proprietary textbook meant that they could extract and walk around with just a few pages as needed and not the whole book, no one mentioned taking this approach.

Students perceive mobile access to be convenient, which is not surprising given the high rate of smartphone ownership among American young adults of traditional college age (Pew Research Center, 2019). In the end, whether students actually used a mobile device to access course readings is immaterial. Findings from the second survey suggest that although the OER textbook was fully accessible via a mobile app, using laptop and desktop computers was the norm for access. This finding likely reflects the actual situations in which students accessed the OER textbook. Although

we do not know for certain, we imagine that their access was concurrent with completing other course assignments, many of which were best done on a laptop or desktop computer for reasons related to software access and screen size.

In terms of use, several students took an assignment-driven approach. In other words, if they needed the information to complete a graded assignment and could not find it in another format (i.e., search for it online), they were likely to use the textbook. The proprietary textbook was considered a resource of last resort, and not a primary learning tool. One reason may be the format. Everything else students did in the course was digital, and the course topic also was digital. In this digital environment, a paper-based textbook feels like a shift back in time rather than a teaching approach that matches with current trends. We do not mean to suggest that paper textbooks are no longer necessary or valued, and a subgroup of students remains interested in reading paper-based text, but providing digital text allows students the option to choose the reading format that best matches their preferences and situational needs.

Textbook Features

Our second research question focused on the features that students want in a textbook. Across both surveys we identified the desire for less reading material or streamlined reading material, and increased use of non-text media. Students also wanted the ability to take and share digital notes on readings with their peers, and to print content as desired. Students made relatively few open comments about interface features, which may reflect our decision to use the LMS to host the OER textbook. This interface, although frequently maligned by students as required LMS interfaces often are, was familiar and expected. Consequently, students may not have felt they could reasonably have other expectations.

Although none of the students in this study raised the issue, accessibility remains a concern when digital materials are used. Specifically, adjustable text size and color or contrast, along with print and text to speech capabilities are important interface features for many students with disabilities, and their support in popular e-reading tool interfaces is variable (Mune & Agee, 2016). By using the LMS, we again opted for a platform that was familiar to our learners and likely bypassed student concerns in these areas.

Evaluation of OER Textbook Solution

The third research question examined student use and perception of the OER textbook. The OER solution was designed in accordance with student feedback about reading length and online and mobile accessibility. It consists of small chunks of reading material interspersed with brief videos, podcasts, and images.

The reported rate of OER textbook use was much higher than the reported rate of proprietary textbook use. From student comments, we infer that cost, portability, ease of access, and perceived usefulness led students to use the OER textbook. Students had a favorable reaction to brief, chunked readings and videos, and shared further ideas for the types of content and media that would be helpful for learning.

The OER textbook seemed to meet students' needs better than the proprietary textbook. On Survey 2, fewer students reported that the textbook was unnecessary, that they sought ancillary online information, or that the instructor provided all of the information that they needed via lectures. The majority indicated that the resources included in the OER textbook had been helpful for completing assignments and learning about course topics. Other studies have confirmed that

once they have experienced high quality OER, instructors and students have positive perceptions (Bliss, Hilton III, Wiley, & Thanos, 2013). We believe that the students offered positive feedback because the OER were customized to meet their needs. By designing our own resources, we ensured that our students received accurate, relevant, and focused learning materials. Although we used customized learning resources entirely by design, three of the 5 Rs of open – revise, remix, and redistribute (Wiley, n.d.) – support the ability to select, adapt, and combine OER from a variety of sources to meet curricular needs.

Student Beliefs about Textbooks and Reading

Like students in prior studies (Feldstein et al., 2012), students in this study expressed the belief that textbooks are not necessary for successful course completion. Within Survey 1, many students outright stated that they had not needed the proprietary textbook. This finding likely reflects the cumulative effects of student experiences in which textbooks were assigned and not used, textbook readings did not align with course assessments (i.e. poor instructional design), or instructors compensated for students not reading by replicating textbook content during lectures. This latter phenomenon is an example of students influencing an instructor's activities, and was evident in this course, too. During the semester when the proprietary textbook was in use, many students did not purchase or otherwise access it. As a result, instructors found alternate means of providing the necessary content to students. The different approaches reflected in the survey responses were providing PDFs of the book sections and incorporating the content into class lectures and activities.

Some students indicated that they simply sought the information online independently, and because they were able to find free information on the course topic, they did not feel the need to purchase a textbook. This finding likely reflects a high degree of comfort accessing and using online information in other contexts, and hints at a response to a provocative question asked by Feldstein and colleagues (2012, p. 8): "Do students find textbooks a more trusted, authoritative resource than online materials?" Based on this study, we would say no, and other studies corroborate our findings (Hilton III, 2016). Students seem to view textbooks as only one potential source of course information, and do not prioritize traditional textbook use due to cost, convenience, and interface (physical textbooks are not easily searchable) issues.

Interestingly, a few students left comments on Survey 2 claiming that there had not been a course textbook. These comments suggested that not everyone equated the readings and other resources embedded in weekly LMS modules with the content that they might be assigned to read in a textbook. Perhaps the chunking, brevity, and non-linear, hyperlinked format challenged their ideas about textbooks, or they maintained a narrow definition of textbook as a physical book that is available to purchase.

We were concerned by student comments about not wanting to read. As educators, we value reading as one strategy for learning. We did not want to reduce the amount of assigned course reading simply to appease students, and we did not feel that the prior reading assignments were unreasonable in length for a college course. However, upon careful consideration we found a different message in these comments. Many students enroll in a course to earn a grade and credit hours by achieving the learning objectives. They are prepared to do the required tasks, but do not necessarily want to read text that does not directly support that mission. Textbooks, however, are not always designed to offer streamlined course content. Publishers often require authors to deliver a certain number of chapters or words, and may expect chapters to be parallel in length and format

even if the content dictates otherwise. In this sense, textbooks may not uphold the slogan popularized by *The New York Times*, "All the news [or content] that's fit to print" but instead may encourage the opposite: all the content that's print to fit. By contrast, OER offer instructors the ability to adjust course texts so they focus on what students need to read.

Additionally, we started to think about how much non-textbook reading is required of students enrolled in online and blended courses. Many of these courses – ours included – are heavily reliant on text-based student interactions through discussion forums and blogs. These interactions generate more required reading for students, and as instructors we should be sensitive to how much time it takes to read peer-generated text each week.

Next Steps of the OER Textbook Project

The learning materials that we designed are not yet fully available on the Internet at the time of this writing, although they have been shared to Canvas Commons, the course repository for the Canvas LMS and we provide access to other people on request. The OER textbook is a living project. Our first priority was to meet our local students' needs and build a comprehensive set of course materials to support learners in this course. We have revised these materials and added additional media based on the student survey feedback, and feel confident that this first priority has now been satisfactorily met. We will, of course, continue to edit, update, and add to the OER textbook in order to ensure the content remains accurate and reflects current trends.

Our next steps are to make the OER textbook more fully open, offering the resources in a variety of formats and in a venue available to a wider audience than Canvas Commons. This is a part of the open experience that requires more labor. We need to find the best way to save, organize, host, and share the many learning objects that comprise our OER textbook, and to be mindful that we offer files that facilitate others to fully engage with our learning objects per each of the 5 Rs.

Limitations and Future Research

A major limitation is that this study relies solely on self-reported data. Given the degree of student candor about not purchasing or accessing the textbook in Survey 1 and in comments provided about the class in general on the last question of Survey 2, we believe that students likely responded honestly on the surveys. However, we were unable to confirm that students accurately reported their purchase, access, and use activities. We were unable to access analytic data from the LMS about how frequently students accessed different learning resources; having that data would have provided a useful point of triangulation.

We did not collect student grades in this study. Consequently, we cannot comment about the relative effectiveness of the OER textbook versus the proprietary textbook in terms of supporting student learning outcomes. Also, this is a single case study, which is not generalizable. We believe that most of our findings likely apply to similar courses, namely undergraduate educational technology courses. We encourage others to explore their own learning contexts to determine similarities to and differences from the learners and course described in this case, and to engage in petite generalization (Stake, 1995) as appropriate.

Implications

These findings have implications for instructors when selecting course materials. We encourage instructors to consider adopting or adapting open textbooks or other forms of OER, when available, and to consider making and sharing their own when these materials are not already available. Although adopting, adapting, creating, and sharing OER is a time-consuming process,

as more educators participate in the OER movement it will surely become easier to find relevant resources.

These findings also have implications for students in terms of both learning and financial well-being. Students benefit when proprietary textbooks are replaced with open solutions. They spend less money on learning materials, which means they are more likely to have and use these materials. These conditions, in turn, support learning. Students are likely to appreciate the flexibility of access that many digital OER offer as well.

Instructors should consider using focused, streamlined reading assignments, which may lead students to do more of the assigned readings. If those readings can be focused by eliminating extraneous text from the original, all the better. Additionally, instructors might be mindful of just how much reading students are required to do across all areas of an online or blended course.

Conclusion

As Hilton III (2016) noted, each situation in which OER are used will differ, and so too may the results. Although this study focuses on an instructor designed and developed textbook solution – a path we imagine relatively few readers will wish to undertake on their own – we recognize the extra effort that would be involved in revising, remixing, and redistributing OER textbooks as well. Poor instructional design, whether reflected in the textbooks themselves or in the selection of textbooks that do not align well with course outcomes, may occur whether the textbook is open or not. Adopted, adapted, and self-created OER can be effective and well-received by students, and offer instructors the important opportunity to design and implement effective instruction. In closing, like Wiley and Hilton III (2018), we believe that the interesting issues to explore moving forward are related to pedagogy, with possibilities for instructors and students to create and share their creations in support of learning processes.

Acknowledgement

References

Allen, D., & Tanner, K. (2007). Putting the horse back in front of the cart: Using visions and decisions about high-quality learning experiences to drive course design. *CBE—Life Sciences Education, 6*(2), 85-89. doi:https://doi.org/10.1187/cbe.07-03-0017

Belikov, O., & Bodily, R. (2016). Incentives and barriers to OER adoption: A qualitative analysis of faculty perceptions. *Open Praxis, 8*(3), 235-246.

Bliss, T., Hilton III, J., Wiley, D., & Thanos, K. (2013). The cost and quality of online open textbooks: Perceptions of community college faculty and students. *First Monday, 18*(1-7). doi:https://doi.org/10.5210/fm.v18i1.3972

Broton, K. M., & Goldrick-Rab, S. (2017). Going without: An exploration of food and housing insecurity among undergraduates. *Educational Researcher, 47*(2), 121-133. doi:https://doi.org/10.3102/0013189X17741303

Christina, H., Stefan, A. R., & Georg, W. R. (2017). The adoption of an open textbook in a large physics course: An analysis of cost, outcomes, use, and perceptions. *The International Review of Research in Open and Distributed Learning, 18*(4). doi:https://doi.org/10.19173/irrodl.v18i4.3006

DeMartini, B., Marshall, J., & Chew, M. (2018). Putting textbooks in students' hands. *Technical Services Quarterly, 35*(3), 233-245. doi:https://doi.org/10.1080/07317131.2018.1456842

Dennen, V. P., & Bagdy, L. M. (in press). Going open: A textbook replacement design case. *Interational Journal for Educational Media & Technology*.

Feldstein, A., Martin, M., Hudson, A., Warren, K., Hilton III, J., & Wiley, D. (2012). Open textbooks and increased student access and outcomes. *European Journal of Open, Distance and E-Learning, 15*(2).

Fischer, L., Hilton, J., Robinson, T. J., & Wiley, D. A. (2015). A multi-institutional study of the impact of open textbook adoption on the learning outcomes of post-secondary students. *Journal of Computing in Higher Education, 27*(3), 159-172. doi:https://doi.org/10.1007/s12528-015-9101-x

Gabrielle, V., & Judy, G. (2017). Student perceptions of college faculty who use OER. *The International Review of Research in Open and Distributed Learning, 18*(4). doi:https://doi.org/10.19173/irrodl.v18i4.3032

Hancock, G. M., Schmidt-Daly, T. N., Fanfarelli, J., Wolfe, J. L., & Szalma, J. L. (2016). Is e-reader technology killing or kindling the reading experience? *Ergonomics in Design, 24*(1), 25-30. doi:https://doi.org/10.1177/1064804615611269

Hilton III, J. L. (2016). Open educational resources and college textbook choices: A review of research on efficacy and perceptions. *Educational Technology Research and Development, 64*(4), 573-590. doi:https://doi.org/10.1007/s11423-016-9434-9

Hilton III, J. L., Robinson, T. J., Wiley, D., & Ackerman, J. D. (2014). Cost-savings achieved in two semesters through the adoption of open educational resources. *The International Review of Research in Open and Distributed Learning, 15*(2). doi:https://doi.org/10.19173/irrodl.v15i2.1700

Jardina, J. R., & Chaparro, B. S. (2015). Investigating the usability of e-textbooks using the technique for human error assessment. *Journal of Usability Studies, 10*(4), 140-159.

Jung, E., Bauer, C., & Heaps, A. (2017). Higher education faculty perceptions of open textbook adoption. *The International Review of Research in Open and Distributed Learning, 18*(4). doi:https://doi.org/10.19173/irrodl.v18i4.3120

Lewin, T. (2009, August 9). In a digital future, textbooks are history. *The New York Times*.

Matraf, M. S. B., & Hussain, A. (2018). Modeling neasurement metrics for e-book app on mobile devices. *Journal of Telecommunication, Electronic and Computer Engineering, 10*(1-11), 63-67.

Miller, M. V., & CohenMiller, A. S. (2019). Open video repositories for college instruction: A guide to the social sciences. *Online Learning, 23*(2). doi:http://dx.doi.org/10.24059/olj.v23i2.1492

Mune, C., & Agee, A. (2016). Are e-books for everyone? An evaluation of academic e-book platforms' accessibility features. *Journal of Electronic Resources Librarianship, 28*(3), 172-182. doi:http://dx.doi.org/10.1080/1941126X.2016.1200927

Pew Research Center. (2019). Mobile Fact Sheet. https://www.pewinternet.org/fact-sheet/mobile/

Pomerantz, J., & Peek, R. (2016). Fifty shades of open. *First Monday, 21*(5). doi:https://doi.org/10.5210/fm.v21i5.6360

Rice, M. F. (2019). Accessibility that supports literacy: Virtual school course design teams' instructional planning for students with disabilities. *Online Learning Journal, 22*(4). doi:http://dx.doi.org/10.24059/olj.v22i4.1508

Rosenfeld, D., & Hegadus, A. (2006). *Textbooks for the 21st Century: A guede to free and low cost textbooks*. Retrieved from Boston, MA: https://studentpirgs.org/assets/uploads/archive/sites/student/files/reports/textbooks-for-the-21st-century.pdf

Stake, R. E. (1995). *The art of case study research*. Thousand Oaks, CA: Sage.

West, R. E. (2019). Developing an open textbook for learning and instructional design technology. *TechTrends, 63*(2), 226-235. doi:http://dx.doi.org/10.1007/s11528-018-0263-z

Wiley, D. (n.d.). Defining the "open" in open content and open educational resources. http://opencontent.org/definition/

Wiley, D., & Hilton III, J. L. (2018). Defining OER-enabled pedagogy. *International Review of Research in Open and Distributed Learning, 19*(4). doi:https://doi.org/10.19173/irrodl.v19i4.3601