Online and Campus College Students Like Using an Open Educational Resource Instead of a Traditional Textbook

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Abstract

There has been little research on student use and perception of open educational resources that are used to replace traditional textbooks/e-textbooks. The creation of the Kansas State University Human Nutrition Flexbook, and online and campus students' perceptions and usage of the flexbook, have been reported previously based survey results from a single semester. Results from multiple online and campus semesters are reported in this paper. Both online and campus students rated the flexbook favorably, but online students used the flexbook more frequently, liked the idea of the flexbook more, and rated it as being of higher quality. Online students also liked and used the animations, videos, and links more and liked the appearance and flexibility of the flexbook more than campus students. The majority of students used an electronic flexbook format and more than one flexbook format. The Portable Document Format version, followed by the Google Docs version, were the most commonly used primary formats. Overall, responses across multiple semesters confirm the authors' original findings that students like using the flexbook instead of a traditional textbook.

Keywords: digital textbook, e-textbook, e-book, flexbook, open access, open educational resource (OER), student perceptions

Introduction and Literature Review

American college students spend over $1,100 USD per year on textbooks and supplies (Baum, Ma, & Payea, 2012), and the price of college textbooks increased 8% from November 2011 to November 2012 (Bureau of Labor Statistics, 2012). In a recent survey, 70% of students reported not buying a textbook due to price, despite 78% believing they would do worse in the course without the textbook(s) (Allen, 2011). An alternative to traditional textbooks is open educational resources (OERs), which are "educational materials that are either (a) licensed under an open copyright license (e.g., Creative Commons) or (b) in the public domain" (Wiley & Green, 2012, p. 81). OERs can be accessed for free and revised, remixed, reused, and redistributed by others (Wiley & Green, 2012). A 2012 EDUCAUSE Center for Applied Research survey found that 57% of students indicated that OERs were a technology that they wished instructors used more. OERs were ranked number one on students' wish lists for instructors' technology usage; a dramatic rise from 2011 when only 19% of students had OERs on their wish lists (Dahlstrom, 2012).

Traditional textbooks are hard-copy books produced by publishers that students typically purchase, or rent, from bookstores or online vendors. The electronic equivalent of a traditional textbook is a traditional e-textbook. In addition to being purchased, traditional e-textbooks are not openly available and licensed

to allow adaption like OERs. One concern about OERs as an alternative to traditional textbooks has been students' poor perceptions and adoption of e-textbooks. It is possible that students simply might not like using electronic resources as their primary course resource(s). Supporting this possibility are more papers that have reported negative student perceptions of traditional e-textbooks and other electronic textbook alternatives (Brunet, Bates, Gallo, & Strother, 2011; Buzzetto-More, Sweat-Guy, & Elobaid, 2007; Cutshall, Mollick, & Bland, 2009; Ditmyer et al., 2012; Folb, Wessel, & Czechowski, 2011; Kropman, Schoch, & Teoh, 2004; McCann, Schneiderman, & Hinton, 2010; McGowan, Stephens, & West, 2009; Nelson & Webb, 2007; Shepperd, Grace, & Koch, 2008; Strother, Brunet, Bates, & Gallo, 2009; Vernon, 2006; Walton, 2008; Woody, Daniel, & Baker, 2010), than have reported mixed (McFall, 2005; McFall, Dershem, & Davis, 2006; Miller & Baker-Eveleth, 2010; Nicholas & Lewis, 2011; Rickman, Von Holzen, Klute, & Tobin, 2009; Schoch, Teoh, & Kropman, 2006) or positive perceptions (Baker-Eveleth, Miller, & Tucker, 2011; Bryant & Mims, 2012; Jao, Brint, & Hier, 2005; Lindshield & Adhikari, 2011; Martinez-Estrada & Conaway, 2012; Peterson, Kaako, Smart, Jorgenson, & Herzog, 2007; Simon, 2001) combined. Past surveys have also indicated that students prefer print textbooks over e-textbooks (Allen, 2009, 2010; Bole, 2011; Schmidt, 2012); however, students' perceptions may be changing. A recent survey found that among students who did not purchase an e-textbook, only 39% indicated it was because they "prefer traditional print textbooks" (Kolowich, 2012, para. 8). Another survey found that "almost six in 10 college students prefer digital over print when reading books for fun (57%) or textbooks for class (58%)" (Finkel, 2012, para. 5). In addition, in an undergraduate economics course, there was a notable trend away from students printing the e-textbook from 2005 through 2010 (Miller & Baker-Eveleth, 2010).

One type of OER is a flexbook, a term coined by the CK-12 Foundation to describe "a free and open-source textbook platform where one can build and edit collaborative textbooks" (Park, 2008, para. 2). The Kansas State University Human Nutrition (HN 400) Flexbook was developed in Google Docs, as previously described in Lindshield and Adhikari (2011), which also reports the results of parallel surveys of campus and online students using it during the same semester. The flexbook can be shared to Google Docs/Drive accounts, accessed through a web link (http://goo.gl/vOAnR), and/or downloaded as an Adobe Portable Document Format (PDF) file from the learning management system. Further, students can print the PDF themselves or have it printed by a copy center. Since the previous publication (Lindshield & Adhikari, 2011), the author updated the flexbook to the newest version of Google Docs, converted from a Google Docs to Google Drive account, changed the font from Times New Roman to Calibri to better facilitate on-screen reading, and continued to refine the content, organization, and look. Overall, in the flexbook author's opinion, the interface of the web version of the flexbook after the conversion to the new Google Docs/Drive format is not as appealing as it was in the older version of Google Docs. In addition, there is also no longer a search box available to use in the web version. The flexbook was also one of three finalists for the 2012 Education-Portal.com Most Open Resource People's Choice Award (Education-Portal.com, 2012).

Previously, it was reported that online and campus students positively perceived the flexbook with some interesting differences between students studying in each mode (Lindshield & Adhikari, 2011). However, these results were based on one parallel semester of online and campus courses. Before broader conclusions are drawn about students' perception and use of OERs, and the difference between online and campus students, it needs to be determined if similar results are found across multiple semesters. To this end, the same survey was administered to another one and two semesters of campus and online students, respectively, that took *Human Nutrition* (HN 400) at or through Kansas State University, and the results were combined with the original semester's results. These findings are presented and their implications discussed in this paper.

Methods

Survey

Late in the Spring 2011 (campus and online), Fall 2011 (online), and Spring 2012 (campus and online) semesters, course rosters were imported into the University's Axio Survey platform. Each student was sent an e-mail with a unique link to complete the anonymous survey during the two and a half weeks that it was available. The instructor also personally invited and reminded campus students about the survey in class and posted reminder announcements in both online and campus course management systems. During the Fall 2011 and Spring 2012 semesters, Axio Survey also sent two reminder e-mails to students. The survey and research are described in an earlier publication (Lindshield & Adhikari, 2011). After the

first semester of use, approval for another two academic years was obtained from the Kansas State University Institutional Review Board. The survey used branching logic and had nine demographic questions, a perceived tech savviness question, followed by a question asking how frequently students used the flexbook. Students that indicated never using the flexbook were taken to the final two open-ended questions. The first open-ended question asked about why they chose the format(s) they did or did not use, the second asked for additional comments on the flexbook. Students that indicated using the flexbook were taken to eight questions that asked about their use and perception of the flexbook, followed by two questions that asked about features they used and liked, and two questions that asked about the primary and secondary formats that they used. They were then directed to the same final two open-ended questions.

Data Analysis

Percentages (response rates, frequency of flexbook use, usage and liking of attributes, flexbook formats) and means ± standard error of the mean for the Likert questions were calculated from survey responses. To find differences between the campus and online students' overall responses, perceptions, usage, liking attributes of the flexbook, and formats used, Mann–Whitney–Wilcoxon tests were performed with $p < .05$ considered significant. To check the internal consistency and reliability of the Likert questions, Cronbach's α was calculated. Exploratory factor analysis with promax rotation (two-factor solution) was also conducted on Likert questions to identify the relative importance of the questions, as was done in Lindshield and Adhikari (2011).

Results

Demographics

The combined demographics from the multiple semesters are shown in Table 1. Online students were older than campus students and were predominantly female, non-traditional dietetics majors.

Survey Response Rate

Survey response rates for the semesters are shown in Table 2. The overall response rate of the online students was significantly higher than that of the campus students.

Likert Questions and Frequency of Flexbook Use

Table 3 shows students' responses to the Likert questions. Perceived proficiency with technology or "tech savviness" did not differ between campus and online students. One online student who answered "never" to how frequently he/she used the flexbook made comments about the form of the flexbook he/she used in the open-ended questions, indicating that the student likely selected "never" incorrectly. Online students reported using the flexbook significantly more frequently than campus students. When viewed in more detail as shown in Table 4, the most notable difference is that two thirds of online students reported using it twice a week or more, compared with only one third of campus students.

Students favorably rated their level of satisfaction, liking the idea of the flexbook, ease of flexbook use, not having to buy a textbook, and preferring the flexbook versus buying a textbook for the course, with the only significant difference being that online students liked the idea of the flexbook more than campus students. Both campus and online students rated the quality of the flexbook as high, but online students rated it significantly higher. Students indicated that they used the flexbook somewhat more than a normal textbook, with no difference between campus and online students. Students disagreed or somewhat disagreed that they'd like to have a normal textbook to use in addition to the flexbook, with no difference between online and campus students.

Internal Reliability and Exploratory Factor Analysis

The internal reliability of the 10 Likert questions for both campus and online students, as measured by Cronbach's α, ranged from .62 to .83 (Table 5). Cronbach's α improved compared with the previous study, likely because of the increase in the sample size. For small survey instruments containing 10 to 15 questions, a score of > .5 is an indicator of good internal reliability (Kehoe, 1995).

Exploratory factor analysis is a variable reduction procedure in which two or three factors explain the majority of the variability in a dataset. In other words, the most important response variables will contribute to the first factor, and less important variables will be relegated to higher factors (second or

higher). Rotation (promax in the case of the present study) of the factor pattern obtained is done for ease of interpretation (Hatcher, 1994). A cutoff point of > 0.4 / < −0.4 was chosen to determine significant contributors to the factors; > 0.3 / < −0.3 is considered a rigorous cutoff point (Suhr, 2012).

Table 1. *Demographics of surveyed campus and online students*

	Campus (*n* = 94)	**Online** (*n* = 104)
Age		
18-25 years	89	39
26-35 years	4	38
36-45 years	1	18
46-55 years	0	9
Gender		
Female	71	97
Male	23	7
Traditional student		
Yes	87	30
No	7	74
Classification		
Freshman	2	0
Sophomore	24	5
Junior	45	13
Senior	11	7
Senior-plus	6	5
Highest level of education[a]		
Some undergraduate education	0	13
Associates degree	4	22
Bachelor's degree	2	25
Some graduate education	1	7
Graduate degree	0	7
Major/area of emphasis/study[b]		
Dietetics	35	85
Public health nutrition	19	7
Nutrition and kinesiology	20	1
Athletic training	13	5
Nutritional sciences	7	7
Biology	5	2
Life sciences	5	0
Other	13	9

[a]Traditional students-only question.
[b]Non-traditional students-only question.

Table 2. *Total and semester survey response rates*

Semester	**Campus**	**Online**
Spring 2011	40/110 (36.4%)	31/51 (60.8%)
Fall 2011	N/A	32/47 (68.1%)
Spring 2012	54/108 (50.0%)	41/57 (71.9%)
Total	94/218 (43.1%)	104/155 (67.1%)*

*$p < .001$ vs. campus students.

The first two factors of exploratory factor analysis explained nine of the 10 questions for both campus and online students. For campus students, Questions 6 and 3 contributed significantly to Factor 1 and Factor 2, respectively (Table 5). For the online students, there were eight significant contributors to Factor 1 and two significant contributors to Factor 2; Question 7 ("I liked not buying the textbook for HN 400") was a significant contributor to both factors. The tech-savvy loading question (Question 1) was not a significant

contributor to either factor for both campus and online students. Questions about the flexbook's satisfaction level, idea/concept, and quality were significant contributors to Factor 1 (Questions 3 to 5) for both campus and online students. Questions 7, 8, and 10, which were related to flexbook usage compared with a normal textbook, were also significant contributors to Factor 1 for both campus and online students. For both groups, the frequency of flexbook use (Question 2) was a significant contributor to Factor 2. Questions 6 (level of difficulty of using the flexbook) and 9 (flexbook use compared to a normal textbook) showed up in Factor 1 for online students but in Factor 2 for campus students.

Table 3. *Campus and online students' flexbook perceptions using a 7-point Likert scale (*M ± SE*)*

Question	Campus (n = 93-94)[a]	Online (n = 102-104)[b]
1. I consider myself tech savvy. (1 = Strongly disagree, 7 = Strongly agree)	5.2 ± 0.1	5.2 ± 0.1
2. How frequently do/did you use some form of the flexbook? (1 = Never, 7 = More than three times a week)	4.8 ± 0.1	5.7 ± 0.1***
3. Rate your level of satisfaction with the flexbook. (1 = Completely dissatisfied, 7 = Completely satisfied)	5.7 ± 0.1	5.9 ± 0.1
4. I like the idea of the flexbook. (1 = Strongly disagree, 7 = Strongly agree)	6.3 ± 0.1	6.5 ± 0.1*
5. Rate the level of quality of the flexbook. (1 = Very bad, 7 = Very good)	5.7 ± 0.1	6.2 ± 0.1***
6. Rate the level of difficulty of using the flexbook. (1 = Very difficult, 7 = Very easy)	5.8 ± 0.1	6.1 ± 0.1
7. I liked not buying textbook for HN 400. (1 = Strongly disagree, 7 = Strongly agree)	6.5 ± 0.1	6.5 ± 0.1
8. I prefer using the flexbook vs. buying a textbook for HN 400. (1 = Strongly disagree, 7 = Strongly agree)	6.3 ± 0.1	6.5 ± 0.1
9. Compared to my experience with normal textbooks in other courses, I use the flexbook ... (1 = Much less, 7 = Much more)	4.8 ± 0.2	5.1 ± 0.1
10. I would still like to have a normal textbook to use in addition to flexbook in HN 400. (1 = Strongly disagree, 7 = Strongly agree)	2.6 ± 0.2	2.6 ± 0.2

[a]The student who answered never for the textbook frequency question did not answer the flexbook questions.
[b]The two students who answered never for the textbook frequency question did not answer the flexbook questions.
*p < .05, ***p < .001 vs. campus.

Table 4. *Frequency of flexbook use*

Frequency	Campus (n = 94)	Online (n = 104)
Never	1 (1.1%)	2 (1.9%)
Less than once a month	4 (4.3%)	1 (1.0%)
Once a month	7 (7.4%)	3 (2.9%)
Once every two weeks	26 (27.7%)	7 (6.7%)
Once a week	26 (27.7%)	22 (21.2%)
Two to three times a week	23 (24.5%)	37 (35.6%)
More than three times a week	7 (7.4%)	32 (30.8%)

Table 6 shows students' reported usage and liking of flexbook attributes. The majority of students indicated using and liking the text and figures, with no difference between campus and online students; however, significantly more online students reported using and liking the animations, videos, and links. The majority of students indicated liking the organization, format, searchability, and web accessibility, with no difference between campus and online students. Most online students reported liking the appearance and flexibility of the flexbook significantly more than the minority of campus students. A minority of both campus and online students indicated liking its updatability, with no difference between the groups.

Table 5. *Cronbach's α and factor analysis of flexbook perceptions*

Question	Internal Reliability (Cronbach's α)		Factor Analysis			
			Campus (*n* = 93)		Online (*n* = 102)	
	Campus (*n* = 93)	Online (*n* = 102)	Factor 1	Factor 2	Factor 1	Factor 2
1. I consider myself tech savvy. (1 = Strongly disagree, 7 = Strongly agree)	0.75	0.75	-0.08	0.18	0.01	0.12
2. How frequently do/did you use some form of the flexbook? (1 = Never, 7 = More than three times a week)	0.70	0.72	-0.09	0.65*	0.16	0.54*
3. Rate your level of satisfaction with the flexbook. (1 = Completely dissatisfied, 7 = Completely satisfied)	0.63	0.64	0.57*	0.38	0.73*	0.22
4. I like the idea of the flexbook. (1 = Strongly disagree, 7 = Strongly agree)	0.66	0.61	0.70*	0.04	0.89*	0.18
5. Rate the level of quality of the flexbook. (1 = Very bad, 7 = Very good)	0.65	0.65	0.58*	0.30	0.75*	0.06
6. Rate the level of difficulty of using the flexbook. (1 = Very difficult, 7 = Very easy)	0.68	0.62	0.12	0.52*	0.77*	0.08
7. I liked not buying textbook for HN 400. (1 = Strongly disagree, 7 = Strongly agree)	0.68	0.68	0.85*	-0.19	0.61*	-0.42*
8. I prefer using the flexbook vs. buying a textbook for HN 400. (1 = Strongly disagree, 7 = Strongly agree)	0.65	0.64	0.97*	-0.11	0.84*	-0.25
9. Compared to my experience with normal textbooks in other courses, I use the flexbook ... (1 = Much less, 7 = Much more)	0.67	0.66	0.20	0.56*	0.63*	0.27
10. I would still like to have a normal textbook to use in addition to flexbook in HN 400. (1 = Strongly disagree, 7 = Strongly agree)	0.83	0.82	-0.74*	0.06	-0.57*	0.29

*Significant contribution (> 0.4 / < −0.4).

The flexbook is available in multiple formats that are described in Lindshield and Adhikari (2011). Table 7 shows the formats students reported using. Overall, a large majority used electronic formats of the flexbook. PDF followed by Google Docs were the most commonly used formats, with no significant difference between campus and online students. Significantly more campus students used the web version, whereas significantly more online students used a hard copy as their primary flexbook format. A majority of campus and online students also reported using a secondary format in addition to a primary format. The web version was the most commonly used secondary format among campus students, and significantly more campus students than online students reported using this secondary format. PDFs were campus students' next most commonly used secondary format, which, along with the Google Docs version, were online students' most commonly used secondary formats.

Table 6. *Campus and online students' reported usage and liking of flexbook attributes*

	Campus (*n* = 93)	**Online** (*n* = 102)
Used		
Text	90 (96.8%)	99 (97.1%)
Figures	81 (87.1%)	87 (85.3%)
Animations	28 (30.1%)	53 (52.0%)**
Videos	30 (32.3%)	59 (57.8%)***
Links	30 (32.3%)	56 (54.9%)**
Liked		
Text	86 (92.5%)	93 (91.2%)
Figures	73 (78.5%)	85 (83.3%)
Animations	30 (32.3%)	48 (47.1%)*
Videos	33 (35.5%)	63 (61.8%)***
Links	35 (37.6%)	58 (56.9%)**
Organization	50 (53.8%)	62 (60.8%)
Format	48 (51.6%)	61 (59.8%)
Appearance	34 (36.6%)	59 (57.8%)**
Searchable	64 (68.8%)	63 (61.8%)
Flexible	34 (36.6%)	58 (56.9%)**
Web accessible	52 (55.9%)	65 (63.7%)
Updatable	25 (26.9%)	40 (39.2%)

*$p < .05$, **$p < .01$, ***$p < .001$ vs. campus.

Table 7. *Flexbook format(s) that campus and online students reported using*

Question	**Campus** (*n* = 93)	**Online** (*n* = 102)
Primary way of using the flexbook		
Google Docs version shared to Gmail or K-State Google account	23 (24.7%)	20 (19.6%)
Web version (accessed through link)	24 (25.8%)	14 (13.7%)*
PDF (downloaded)	43 (46.2%)	51 (50.0%)
Hard copy (self-printed or purchased from vendor)	3 (3.2%)	17 (16.7%)**
Second most common way of using the flexbook		
Google Docs version shared to Gmail or K-State Google account	13 (14.0%)	20 (19.6%)
Web version (accessed through link)	23 (24.7%)	13 (12.7%)*
PDF (downloaded)	21 (22.6%)	20 (19.6%)
Hard copy (self-printed or purchased from vendor)	3 (3.2%)	5 (4.9%)
Flexbook used in only one way	33 (35.5%)	44 (43.1%)

*$p < .05$, **$p < .01$ vs. campus.

Open-Ended Question Responses

Overall, the responses to the open-ended questions were similar to the first-semester results reported in Lindshield and Adhikari (2011). Most of the responses to the question asking students' reasons for or not choosing a format(s) were about the PDF or hard-copy formats. Students who indicated a preference for the PDF format cited wanting to use, or have the option to use the flexbook without Internet access; familiarity/preference for the interface; and/or ability to use it on tablets, e-readers, and smart phones as reasons for choosing this format. Students who indicated a preference for the hard-copy format wanted access without a computer or other electronic device, and/or preference/familiarity for studying/reading a hard copy. From the question asking for additional comments, most students indicated liking that the flexbook was free and expressed their appreciation for the resource. They also indicated that they liked that the flexbook is concise and written from the instructors' point of view. Some students noted that there are grammatical and spelling errors that they would like to see corrected.

Discussion

This study sought to determine whether survey results about an OER over multiple semesters would result in different outcomes than the single-semester results reported previously (Lindshield & Adhikari, 2011). Most of the outcomes did not change, but a few differences occurred as a result of aggregating semesters. For instance, online students did not like not having to buy a textbook for the course significantly more than campus students, nor did they like the text or the web-accessibility of the flexbook significantly more than their campus counterparts. Campus students seemed to like not buying a textbook more than the initial, single-semester results indicated, as there was no longer a significant difference in this attribute after multiple semesters of results. Significantly more online students than campus students liked the appearance and flexibility of the flexbook, which were differences not found previously. With regard to the formats used, the new findings that emerged were the fact that significantly more campus students used the web version as their primary and secondary flexbook formats, and that significantly more online students used the hard copy as their primary format.

These differences from the single-semester results are likely due to increased power from more students completing the survey across multiple semesters. More campus students used the web version, which might fit with their less frequent use of the flexbook. For instance, a number of students reported using the flexbook every two weeks, which is approximately the time between quizzes and exams in the course. These students might use the flexbook more as a reference to complete or study for these assessments, rather than reading along with the material presented in class. As such, the web version might be fine for their purposes. The fact that campus students do not use or like the animations, videos, and web links is also consistent with this type of use. Many of these are shown in class, so it is not surprising that fewer campus students report using them, but that fewer of these younger students like them is surprising. The more frequent use of the flexbook by online students is consistent with previous reports that found online students referred more frequently to written materials (Dutton & Dutton, 2005) and online (Armatas, Holt, & Rice, 2003) and non-traditional students (Adams & Corbett, 2010) study more. Online students more frequently used the hard-copy version, which fits with student comments indicating that they work on a computer for their occupation during the day and do not want to read from a screen in the evening.

Exploratory factor analysis results of Questions 3 to 5 indicated that the idea of a flexbook and its quality were more important to the online students. The reverse trend could be seen for Questions 7, 8, and 10, where the campus students' responses strongly suggested that not having to buy a regular textbook and having access to a free textbook in the form of the flexbook was the major consideration for using/liking the flexbook. For both groups, the frequency of flexbook use (Question 2) was less important, as indicated by the significant contribution to Factor 2. Questions 6 and 9 were significant contributors to Factor 1 for online students as opposed to Factor 2 for campus students, which suggests that online students valued that the flexbook was easy to use, and they were more certain that they used the flexbook more than a normal textbook. The tech savviness question was not a significant contributor to either factor and had minimum impact on liking or usage of the flexbook by both online and campus students.

The results of this study support the proposition that students are willing to move beyond traditional print textbooks. But before OERs are designed and/or adopted to replace traditional textbooks it is important to have an understanding of what students want from this type of OER. A survey of Florida college students found that from a text they want "unlimited accessibility for multiple devices, an affordable print edition, self-print access to the entire book, and online study aids" (Morris-Babb & Henderson, 2011, p. 149). The flexbook along with course assignments meets all these desires, which might be why students perceive it positively.

The authors believe that the multiple formats available are the primary reason why so many students use electronic formats instead of hard copies of the flexbook. For example, even though the PDF format was the most commonly used, if the other electronic formats were not available, more students who used a different primary format likely would have used a hard copy as their primary format. The ability to use more than one format, which the majority of students indicated they did, might also provide flexibility that contributes to a high number of students using electronic flexbook formats. If other OER textbook replacements provide multiple formats, and unrestricted access to them, it remains to be seen whether they will also find that students primarily use the electronic formats.

While the results reported in this paper suggest that students are willing to accept an OER as a replacement for a traditional textbook, there are barriers that will have to be overcome for widespread use

of similar OERs. A majority of both administrators and faculty members indicate that individual faculty members have the primary role in the decision to adopt OER. Difficulty in searching, lack of a comprehensive catalog, and concerns about the time to learn and use were listed as the primary barriers to OER adoption by faculty. In addition most faculty members do not think that their institutions have fair systems of rewarding contributions to digital pedagogy (Allen & Seaman, 2012). In another survey faculty indicated that the biggest barriers are no reward for time or energy invested, no support from administration, and lack of time (Humbert, Rébillard, & Rennard, 2008). Another barrier is that most faculty are not familiar with OERs and do not consider them when deciding what textbook or learning resource(s) to use for their course(s) (Morris-Babb & Henderson, 2011).

Notably, another course at a different institution is using the first few chapters of the flexbook along with other online resources to replace the traditional textbook that had been used previously. This is the first course outside HN 400 using the flexbook that the flexbook author is aware of. The instructor of the course learned about the flexbook at a seminar and wanted to replace the traditional textbook; the instructor was unhappy with the content and price of the traditional textbook. The author shared the flexbook to the students' Google Docs/Drive accounts after getting requests from them. In addition, in Spring 2013 the flexbook was used by a Coursera Fundamentals of Human Nutrition Massive Open Online Course (MOOC) with an enrollment of 30,000 students. It also has been selected as the nutrition textbook for the Open Course Library, a project to develop course content for high-enrollment courses in the Washington State Community College system.

A number of funding models have been proposed to support OERs (Downes, 2007) because most faculty members will likely require incentive to change from the status quo of using traditional textbooks. Faculty indicated that the biggest incentives to produce OERs are financial reward and the acknowledgement as creator (Humbert et al., 2008). One possible approach is for institutions to create an OER student fee for courses that use OERs that meet certain criteria. The fee could be used to provide financial incentive for faculty to create, adapt, and/or adopt OERs for their course(s) and save students money by replacing more costly textbooks. The amount of the OER student fee and policies about its use would need to be established, but one example of a similar approach already has been reported (Baker-Eveleth et al., 2011). The authors plan to gauge students' perception to the idea of an OER student fee in future semesters.

There are limitations to the present study that should be mentioned. First, the results are from a single OER, used in one course, by one instructor, at one institution. It is not known how the flexbook would be perceived and used if even one of these variables was changed, let alone what the same students' perception and use of a different OER would be. In addition, although there are multiple semesters of students, the sample size is still relatively small. While the internal reliability of Likert questions in the survey was established, the validity of the survey administered was not tested. The validity of the survey could be established if it is administered at a few other institutions that use similar OERs. Another limitation is that survey e-mail reminders were only sent after the initial semester courses; which likely contributed to the higher response rate in subsequent semesters. Furthermore, while the survey response rate across the semesters was adequate for statistical purposes (Bartlett, Kotrlik, & Higgins, 2001), the possibility that students who completed it might have had a more positive perception of the flexbook and used it more cannot be ruled out. Lastly, the flexbook is a "living" resource that is continually being revised and improved, thus the different semesters of students were using slightly different versions of it, which may have altered their use and perception of it.

Conclusion

Over multiple semesters, campus and online students both had positive perceptions of the flexbook and primarily used an electronic format of the OER. More research is needed on other OER in courses to determine if they have similar outcomes, because little data has been published to date. Further research is also needed on how to increase acceptance, creation, adaptation, and adoption of OER.

References

Adams, J., & Corbett, A. (2010). Experiences of traditional and non-traditional college students: A quantitative study of experiences, motivations and expectations among undergraduate students. *Sociological Perspectives, 15*. Retrieved from http://www.unh.edu/sociology/media/pdfs-journal2010/JenniferAdams_AlexiaCorbett.pdf

Allen, I. E., & Seaman, J. (2012). *Growing the curriculum: Open education resources in U.S. higher education*. Babson Park, MA: Babson Survey Research Group and Quahog Research Group. Retrieved from http://www.onlinelearningsurvey.com/reports/growingthecurriculum.pdf

Allen, N. (2009). *High tech textbooks: A snapshot of student opinions*. Boston, MA: The Student Public Interest Research Groups. Retrieved from http://www.studentpirgs.org/sites/student/files/resources/high-tech-textbooks.pdf

Allen, N. (2010). *A cover to cover solution: How open textbooks are the path to textbook affordability*. Boston, MA: The Student Public Interest Research Groups. Retrieved from http://www.studentpirgs.org/sites/student/files/reports/A-Cover-To-Cover-Solution_4.pdf

Allen, N. (2011). *High prices prevent college students from buying assigned textbooks* [Press release]. Retrieved from http://www.studentpirgs.org/news/ap/high-prices-prevent-college-students-buying-assigned-textbooks

Armatas, C., Holt, D., & Rice, M. (2003). Impacts of an online-supported, resource-based learning environment: Does one size fit all? *Distance Education, 24*(2), 141-158. doi:10.1080/0158791032000127446

Baker-Eveleth, L. J., Miller, J. R., & Tucker, L. (2011). Lowering business education cost with a custom professor-written online text. *Journal of Education for Business, 86*(4), 248-252. doi:10.1080/08832323.2010.502911

Bartlett, J. E., Kotrlik, J. W., & Higgins, C. C. (2001). Organizational research: Determining appropriate sample size in survey research. *Information Technology, Learning, and Performance Journal, 19*(1), 43-50. Retrieved from http://www.osra.org/itlpj/bartlettkotrlikhiggins.pdf

Baum, S., Ma, J., & Payea, K. (2012) *Trends in public higher education: Enrollment, prices, student aid, revenues, and expenditures*. New York, NY: College Board Advocacy & Policy Center. Retrieved from http://advocacy.collegeboard.org/sites/default/files/12b_5303_PubHighEd_AnalysisBrief_WEB_120530.pdf

Bole, A. (2011). *College students want their textbooks the old-fashioned way: In print* [Press release]. Retrieved from http://www.bisg.org/news-5-603-press-releasecollege-students-want-their-textbooks-the-old-fashioned-way-in-print.php

Brunet, D. P., Bates, M. L., Gallo, J. R., & Strother, E. A. (2011). Incoming dental students' expectations and acceptance of an electronic textbook program. *Journal of Dental Education, 75*(5), 646-652. Retrieved from http://www.jdentaled.org/content/75/5/646.full.pdf

Bryant, B., & Mims, T. C. (2012). Student's perception of e-texts: Value or hindrance. In *Proceedings of the 2012 SAM International Business Conference*. Corpus Christi, TX: Society for Advancement of Management. Retrieved from http://www.cob.tamucc.edu/sam/conferences/SAM2012Papers/Student%20Perceptions%20of%20ETexts%20Bryant%20Mims.pdf

Bureau of Labor Statistics. (2012, December 14). *Consumer Price Index News Release* [Press release]. Retrieved January 12, 2013, from http://www.bls.gov/news.release/cpi.htm (archived at http://web.archive.org/web/20130112214529/http://bls.gov/news.release/cpi.htm)

Buzzetto-More, N. A., Sweat-Guy, R., & Elobaid, M. E. (2007). Reading in a digital age: E-books are students ready for this learning object? *Interdisciplinary Journal of Knowledge and Learning Objects, 3*, 239-250. Retrieved from http://www.ijklo.org/Volume3/IJKLOv3p239-250Buzzetto.pdf

Cutshall, R. C., Mollick, J. S., & Bland, E. M. (2009). Use of an e-textbook and web-based homework for an undergraduate business course: Students' perceptions. In F. G. Crane (Ed.), *Proceedings of the 10th Annual Conference of the Academy of Business Education*. Fort Lauderdale, FL: ABE. Retrieved from http://www.abeweb.org/proceedings/proceedings09/cutshall.pdf

Dahlstrom, E. (2012). *The ECAR study of undergraduate students and information technology, 2012*. Louisville, CO: EDUCAUSE Center for Applied Research. Retrieved from http://net.educause.edu/ir/library/pdf/ERS1208/ERS1208.pdf

Ditmyer, M. M., Dye, J., Guirguis, N., Jamison, K., Moody, M., Mobley, C. C., & Davenport, W. D. (2012). Electronic vs. traditional textbook use: Dental students' perceptions and study habits. *Journal of Dental Education, 76*(6), 728-738. Retrieved from http://www.jdentaled.org/content/76/6/728.full.pdf

Downes, S. (2007). Models for sustainable open educational resources. *Interdisciplinary Journal of Knowledge and Learning Objects, 3*, 29-44. Retrieved from http://www.ijklo.org/Volume3/IJKLOv3p029-044Downes.pdf

Dutton, J., & Dutton, M. (2005). Characteristics and performance of students in an online section of business statistics. *Journal of Statistics Education, 13*(3). Retrieved from http://www.amstat.org/publications/jse/v13n3/dutton.html

Education-Portal.com. (2012). *The best free education of 2012: Education-Portal.com People's Choice Awards winners*. Retrieved from http://education-portal.com/articles/Education-Portalcom_Peoples_Choice_Awards_List_of_Winners.html

Finkel, S. (2012, March 14). *New survey finds dramatic increase in tablet ownership among college students and high school seniors* [Press release]. Retrieved from http://www.pearsonfoundation.org/pr/20120314-new-survey-finds-dramatic-increase-in-tablet-ownership-among-college-students-and-high-school-seniors.html

Folb, B. L., Wessel, C. B., & Czechowski, L. J. (2011). Clinical and academic use of electronic and print books: The Health Sciences Library System e-book study at the University of Pittsburgh. *Journal of the Medical Library Association, 99*(3), 218-228. doi:10.3163/1536-5050.99.3.009

Hatcher, L. (1994). *A step-by-step approach to using SAS for factor analysis and structural equation modeling*. Cary, NC: SAS Institute.

Humbert, M., Rébillard, C., & Rennard, J.-P. (2008). Open educational resources for management education: Lessons from experience. *eLearning Papers, 10*. Retrieved from http://www.elearningeuropa.info/files/media/media16676.pdf

Jao, C. S., Brint, S. U., & Hier, D. B. (2005). Making the neurology clerkship more effective: Can e-textbook facilitate learning? *Neurological Research, 27*(7), 762-767. doi:10.1179/016164105X35639

Kehoe, J. (1995). Basic item analysis for multiple-choice tests. *Practical Assessment, Research & Evaluation, 4*(10). Retrieved from http://www.pareonline.net/getvn.asp?v=4&n=10

Kolowich, S. (2012, July 5). Hype vs. adoption. *Inside Higher Ed*. Retrieved from http://www.insidehighered.com/news/2012/07/05/survey-ipad-adoption-sluggish-e-textbooks-booming

Kropman, M., Schoch, H. P., & Teoh, H. Y. (2004). An experience in e-learning: Using an electronic textbook. In R. Atkinson, C. McBeath, D. Jonas-Dwyer, & R. Phillips (Eds.), *Beyond the comfort zone: Proceedings of the 21st ASCILITE Conference* (pp. 512-515). Perth, Australia: The University of Western Australia. Retrieved from http://www.ascilite.org.au/conferences/perth04/procs/kropman.html

Lindshield, B. L., & Adhikari, K. (2011). The Kansas State University Human Nutrition (HN 400) Flexbook. *EDUCAUSE Quarterly, 34*(4). Retrieved from http://www.educause.edu/ero/article/kansas-state-university-human-nutrition-hn-400-flexbook

Martinez-Estrada, P. D., & Conaway, R. N. (2012). EBooks: The next step in educational innovation. *Business Communication Quarterly, 75*(2), 125-135. doi:10.1177/1080569911432628

McCann, A. L., Schneiderman, E. D., & Hinton, R. J. (2010). E-teaching and learning preferences of dental and dental hygiene students. *Journal of Dental Education, 74*(1), 65-78. Retrieved from http://www.jdentaled.org/content/74/1/65.full.pdf

McFall, R. (2005). Electronic textbooks that transform how textbooks are used. *The Electronic Library, 23*(1), 72-81. doi:10.1108/02640470510582754

McFall, R., Dershem, H., & Davis, D. (2006). Experiences using a collaborative electronic textbook: Bringing the guide on the side home with you. *ACM SIGCSE Bulletin, 38*(1), 339-343. doi:10.1145/1124706.1121448

McGowan, M. K., Stephens, P. R., & West, C. (2009). Student perception of electronic textbooks. *Issues in Information Systems, 10*(2), 459-465. Retrieved from http://www.iacis.org/iis/2009/P2009_1299.pdf

Miller, J. R., & Baker-Eveleth, L. (2010). Methods of use of an online economics textbook. *American Journal of Business Education, 3*(11), 39-44. Retrieved from http://journals.cluteonline.com/index.php/AJBE/article/download/61/59

Morris-Babb, M., & Henderson, S. (2011). An experiment in open-access textbook publishing: Changing the world one textbook at a time. *Journal of Scholarly Publishing, 43*(2), 148-155. doi:10.3138/jsp.43.2.148

Nelson, K., & Webb, H. (2007). Exploring student perceptions of an electronic textbook: A TAM perspective. In J. A. Hoxmeier & S. Hayne (Eds.), *Reaching new heights: Proceedings of the 13th Americas Conference on Information Systems*. Atlanta, GA: Association for Information Systems. Retrieved from http://aisel.aisnet.org/amcis2007/107/

Nicholas, A. J., & Lewis, J. K. (2011). The net generation and e-textbooks. *International Journal of Cyber Ethics in Education, 1*(3), 70-77. doi:10.4018/ijcee.2011070107

Park, J. (2008, September 10). The "flexbook" [Web log post]. Retrieved from http://www.creativecommons.org/weblog/entry/9378

Peterson, D., Kaako, T., Smart, E., Jorgenson, M., & Herzog, C. (2007). Dental students attitudes regarding online education in pediatric dentistry. *Journal of Dentistry for Children, 74*(1), 10-20.

Rickman, J. T., Von Holzen, R., Klute, P., & Tobin, T. (2009). A campus-wide e-textbook initiative. *EDUCAUSE Quarterly, 32*(2). Retrieved from http://www.educause.edu/ero/article/campus-wide-e-textbook-initiative

Schmidt, C. (2012, July 31). *Student spending on textbooks continues to decline* [Press release]. Retrieved from http://www.nacs.org/advocacynewsmedia/pressreleases/studentspendingontextbookscontinuestodecline.aspx

Schoch, H. P., Teoh, H. Y., & Kropman, M. (2006). Adopting an electronic text book for a postgraduate accounting course: An experiential study. *Australasian Journal of Educational Technology, 22*(2), 166-188. Retrieved from http://www.ascilite.org.au/ajet/ajet22/schoch.html

Shepperd, J. A., Grace, J. L., & Koch, E. J. (2008). Evaluating the electronic textbook: Is it time to dispense with the paper text? *Teaching of Psychology, 35*(1), 2-5. doi:10.1080/00986280701818532

Simon, E. J. (2001). Technology instead of a textbook: Alternatives for the introductory biology classroom. *The American Biology Teacher, 63*(2), 89-94. doi:10.1662/0002-7685(2001)063[0089:TIOATA]2.0.CO;2

Strother, E. A., Brunet, D. P., Bates, M. L., & Gallo, J. R. (2009). Dental students' attitudes towards digital textbooks. *Journal of Dental Education, 73*(12), 1361-1365. http://www.jdentaled.org/content/73/12/1361.full.pdf

Suhr, D. (2012). Exploratory factor analysis with the world values survey. In *Proceedings of the SAS Global Forum 2012 Conference*. Cary, NC: SAS Institute. Retrieved from http://support.sas.com/resources/papers/proceedings12/331-2012.pdf

Vernon, R. F. (2006). Paper or pixels? An inquiry into how students adapt to online textbooks. *Journal of Social Work Education, 42*(2), 417-427. doi:10.5175/JSWE.2006.200404104

Walton, E. W. (2008). From the ACRL 13th National Conference: E-book use versus users' perspective. *College Undergraduate Libraries, 14*(4), 19-35. doi:10.1080/10691310802046728

Wiley, D. A., & Green, C. (2012). Why openness in education? In D. G. Oblinger (Ed.), *Game changers: Education and information technologies* (pp. 81-89). Louisville, CO: EDUCAUSE. Retrieved from http://www.educause.edu/library/resources/chapter-6-why-openness-education

Woody, W. D., Daniel, D. B., & Baker, C. A. (2010). E-books or textbooks: Students prefer textbooks. *Computers & Education, 55*(3), 945-948. doi:10.1016/j.compedu.2010.04.005