

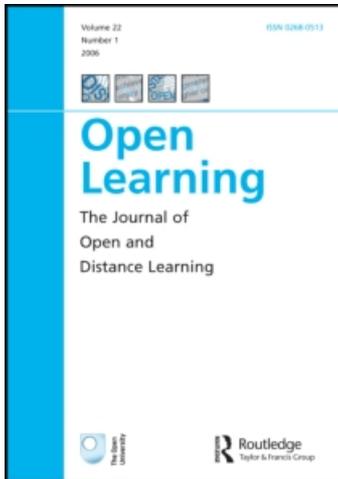
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Open textbook adoption and use: implications for teachers and learners

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The Community College Open Textbook Project (CCOTP) was developed to support the use of textbooks that are freely available and accessible online, and that can be adapted by teachers and learners to meet their unique needs and contexts. This article presents the findings of a research study conducted by the Institute for the Study of Knowledge Management of Education (ISKME) on CCOTP. The study examined the adoption and use patterns of teachers and learners as end users of open textbooks, finding that important initial drivers of use included reduced cost, dependable quality and ease of use, and that teachers and learners use open textbooks in ways that reflect their existing teaching and learning practices. The study also showed the potential for new teaching and learning behaviours aligned to the use of open textbooks, including increased teacher collaboration on curriculum development and the interactivity of open materials as an enhancement of student learning. In addition, the study identified challenges for the sustainability of the open textbook model, including teacher technological efficacy and professional development that supports open textbook use.

Keywords: open textbooks; OER; Community College Open Textbook Project; professional development; sustainability; teachers; learners; pedagogy; adoption; use patterns; teaching and learning

Introduction

Open textbooks are most frequently highlighted as alternatives to traditional textbooks for their cost and accessibility benefits (Allen, 2008; Seidel, 2009). Through non-restrictive licensing and accessible technology, open textbooks – like open educational resources more generally – are also oft-cited for their potential to facilitate a community of users who collaborate, share, discuss, critique, use, reuse and continuously improve educational content (Casserly & Smith, 2009; Frydenberg & Matkin, 2007; Petrides & Jimes, 2006; Petrides, Nguyen, Jimes, & Karaglani, 2008).

The Community College Open Textbook Project (CCOTP) was initiated in April 2008 to create high quality, accessible and culturally relevant open textbooks that could be made freely available for community college faculty and students to use, modify and reuse. The overarching goal of the project has been to increase academic quality while reducing the cost of textbooks to make a community college education more affordable. To attain this goal, CCOTP enlisted the expertise of educators, administrators, researchers, technology experts and leaders from community colleges

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nationwide in a process of identifying and developing an open textbook, promoting and facilitating its adoption and use by teachers and learners, and offering a model for open textbook development for other initiatives to draw upon.

In the initial pilot phase of the project work, CCOTP leaders recruited community colleges throughout the US to participate in the project, developed an existing proprietary textbook, *Collaborative statistics*, into an online open textbook, uploaded the open textbook to the open content platform Connexions, and enlisted community college instructors and their statistics students to pilot the open textbook. In the second phase of the work, the project expanded its network of teachers and learners who are using, authoring and reviewing open textbooks, funded professional reviews of more than 100 open textbooks, and implemented professional development programmes to support the authorship, use and reuse of open textbooks.

As the research partner for the CCOTP, the Institute for the Study of Knowledge Management in Education (ISKME) has sought to assess the project's process of creating and piloting the initial open textbook, facilitating faculty and student adoption and use of open textbooks, and sustaining open textbooks as a model going forward. This article reports on the findings from this research, specifically those that address faculty and student adoption and use of open textbooks, and how open textbook use informs and aligns with potentially new or existing teaching and learning practices. The sections below outline relevant literature, the research methodology used, key findings from the analysis and implications and recommendations for future open textbook projects.

Literature review

Open textbooks are textbooks that are made freely available online for faculty and students to use, modify and reuse through non-restrictive licensing (ISKME, 2008). Open textbooks emerged out of the wider open educational resources (OER) movement, which seeks to offer educational materials that are free and open for use and reuse in teaching, learning and research (UNESCO, 2006). In the face of resource constraints, such as American community colleges experiencing budget cuts, open textbooks are frequently cited for reducing costs (Allen, 2010) and increasing higher education accessibility for students (Frydenberg & Matkin, 2007; Seidel, 2009). Moving beyond the cost and accessibility argument, several scholars have begun to point to possibilities offered by open textbooks for effecting positive change on teaching and learning (Matkin, 2009; Seidel, 2009). However, there has been limited empirical research to shed light on these possibilities thus far.

More generally, a growing body of literature contends that open educational resources (OER) have the potential to align with more learner-centred, interactive and self-directed pedagogical models (Conole & Ehlers, 2010; Livingston & Condie, 2006). In particular, research by Livingston and Condie (2006) sought to assess the impact of OER use on teaching and learning. Livingston and Condie assessed the efficacy of SCHOLARS, a Scottish open online learning programme comprised of a variety of OER materials – including open textbooks – for high school students. The materials were offered as supplemental content to teachers and learners in all school districts in Scotland, but only some districts chose to adopt the programme and it was ultimately up to teachers to determine how to incorporate the resources into their courses. Through analysis of student test scores, as well as interviews and surveys with teachers and students, Livingston and Condie found that achievement improved

in all subject areas for students who accessed the materials. Specifically, students who accessed the open resources did so autonomously, and engaged in self-initiated and self-directed learning – transitioning from passive knowledge recipients into independent knowledge creators. Livingston and Condie further found that the impact of the SCHOLARS programme on learning was tempered by teachers' lack of expertise in fully leveraging the open resources to assist students to become more independent learners. While many teachers underestimated the potential impact that these resources could have on student learning, others reported that they lacked the technical skills to effectively integrate the new resource into their courses.

Additional literature addressing the alignment of digital learning resources with enhanced pedagogy suggests that the impact of those resources on learning is most significant when teachers adopt new practices where they act as facilitators in collaborative peer-to-peer learning environments (Balcean, 2008; MacKnight, 2000; Mentis, 2008; Siemens, 2010). Furthermore, O'Hear (2006), as well as Livingston and Condie (2006) cited above, assert that teachers need to engage in professional development to become equipped with the skills necessary to effectively leverage digital resources or OER to enhance student learning. Other authors argue the importance of teacher engagement in collaborative online communities around digital resource use, in which they share and learn from their colleagues' experiences (Balcean & Hirtz, 2007; Bateman, 2006; Garrison, Anderson, & Archer, 2000; Tornaghi, Vivacqua, & De Souza, 2005).

Drawing on this literature, this study seeks to add weight to and further shed light on the ways that OER – and open textbooks specifically – could be aligned to enhanced teaching and learning practices. And in line with findings from extant studies on the importance of professional development and teacher communities in adopting and incorporating digital resources and OER in classrooms, the study also seeks to assess the factors that support adoption and use of open textbooks. As such, we aim to move beyond evidence of open textbooks as cost-saving mechanisms towards a consideration of how far open textbooks can effect positive teaching and learning outcomes. The section that follows outlines the methodology used in this study for addressing these research goals.

Methodology

The primary research objective for this study has been to enrich the understanding of the factors that influence open textbook adoption and use, and the potential role that open textbooks might play in enhancing teaching and learning practices. Through interviews, focus groups and survey questions, data were collected from instructors and students who have taught and participated in courses that made use of online textbooks. The interview, focus group and survey questions were designed to gather data about a broad range of issues related to the implementation and use of open textbooks, including the institutional policies necessary to support the adoption and use of open textbooks, the extent to which open textbooks are currently being created, shared and used, and ways in which open textbooks support teaching and learning.

The sections below detail the data collection goals and strategies for the study's two phases of data collection. While the pilot phase data collection was designed to provide a preliminary assessment of open textbook adoption and use patterns and impact on teaching and learning, the implementation phase data collection was intended to build on those findings with a larger group of participants across multiple disciplines.

Pilot phase data collection

In October 2008, during the pilot phase of the Community College Open Textbook Project (CCOTP), data were collected directly from a selection of the 11 community college instructors and their 680 students who piloted the *Collaborative statistics* open textbook. Specifically, interviews were conducted with the four instructors who adopted the textbook in the first term it became available as course material for a face-to-face course. The instructors were solicited directly by the Institute for the Study of Knowledge Management in Education (ISKME) through an email invitation. All had previously taught with the hard copy, proprietary version of *Collaborative statistics* before it was converted into an online, open textbook. Two of the instructors had previously taught only face-to-face statistics courses and two had taught either online or hybrid statistics courses. Data were collected directly from the four instructors through interviews approximately 40 minutes in length. Three interviews were conducted in person and one by telephone. The purpose of the interviews was to understand whether and how faculty had previously used the internet in their teaching practices if at all, their motivation for using the *Collaborative statistics* open textbook, their usage patterns, and their perceptions of the impact of open textbook use upon teaching and learning, as well as perceptions of the benefits and barriers to open textbook usage.

Also during the pilot phase of the project, ISKME conducted focus groups and interviews with a total of 11 students who enrolled in the fall 2008 statistics courses in which the *Collaborative statistics* open textbook was used as course material. The aim of the focus groups and interviews – which lasted 40 minutes to one hour – was to understand students' open textbook use patterns, perceived differences from traditional textbook use, and how open textbook use affects students' learning behaviours and engagement with course content. Focus groups were chosen as the primary method of data collection with students because they could provide a forum wherein students engage in collaborative meaning making as they participate in interactive discussions. After the instructors announced the focus groups to their classes, eight students volunteered to participate (two focus groups with four students each). Three additional students who could not attend a focus group participated in individual, face-to-face interviews. Only one of the participating students had previously used an online textbook, although some students had previously used supplemental online resources such as chapter summaries and quizzes.

Implementation phase data collection

In the spring and summer of 2010, ISKME conducted an additional 27 phone interviews with faculty users of open textbooks. The interviews sought to assess how instructors had integrated open textbooks into their course materials, how the interactivity of online materials impacts teaching and learning, the extent to which online and distance learning drives open textbook use, and how authorship and peer reviews may contribute to the durability of open textbook models.

Faculty interview participants were selected using the snowball sampling method, a non-probability sampling method in which a set of participants is interviewed, who then provide referrals for additional subjects through their social networks. ISKME requested interviews with a list of 12 faculty users initially provided by the CCOTP leaders and partners; two of these users were part of the pilot group interview

participants. Those who chose to participate went on to recommend additional users for ISKME to interview. Between fall 2009 and spring 2010, CCOTP partners provided additional names as they came across new users of open textbooks. One of the project partners, an online textbook repository, provided ISKME with the names of nearly 500 open textbook faculty users; five participants were randomly selected from this list to complement the set of participants provided by other CCOTP partners. The sample was also constructed to include instructors teaching a wide range of academic disciplines. A majority (21) of the faculty interviewed were using open textbooks in online or hybrid courses.

Data were also collected from 34 students using *Collaborative statistics* in the fall of 2010; none of the students had been previously exposed to open textbooks. The students were recruited through their instructor, who offered to host a data collection session during one of her class periods. At the start of the 45-minute session, researchers administered a short survey to collect basic data on student open textbook use patterns, and student interest in using open textbooks for other classes in the future. Immediately following the survey, researchers facilitated a group discussion with small, interactive groups of eight to nine students focusing on questions specifically related to the impact of open textbooks on their study, assignment and learning practices. The students reported their small-group discussions back to the wider group at the end of the discussion session.

Findings

Factors influencing open textbook adoption and use

Analysis of data collected from faculty interview participants revealed cost, content quality, and ease of use as factors influencing adoption of open textbooks. Cost, portability and ease of use surfaced as important factors for students in their adoption of open textbooks.

Cost reduction for students was the most significant factor influencing faculty adoption of open textbooks. One faculty participant reported that, for many classes, textbooks were more expensive than tuition, and therefore served as a significant obstacle to college access. Another explained that the inclination to adopt the textbook was rooted in a sense of personal responsibility for students' success, as the cost of textbooks was a determining factor in that success. A third faculty participant pointed to both cost and access as factors influencing open textbook uptake, and added:

I like the fact that on day one of the class everyone has the book. With regular textbooks there's hemming and hawing, students will say: 'I don't have the book, it hasn't arrived at the bookstore yet.'

Perceived quality of the content also influenced faculty decisions to adopt open textbooks. Perceptions of quality derived from various sources, including recommendations from trustworthy faculty colleagues, a personal relationship with the author, and a first-hand review of the textbook to determine its quality and pedagogical approach. Additionally, prior knowledge that the textbook was peer-reviewed influenced faculty decisions to adopt it.

Finally, ease of use emerged as an important factor influencing faculty decisions to adopt and use open textbooks – specifically in terms of the portability offered by an online textbook, which eliminated the burden of carrying a heavy copy of the book to

and from work. Additionally, ease of use for faculty involved the ability to integrate the new resource into their existing course materials. For example, some participants reportedly moved pieces of content so that the textbook material was organised according to the order in which they preferred to present it to the class, while others took material they had created and added it to the textbook. One faculty participant reported:

I didn't know or think about this before I started using this book, but I've changed around the book so it's in the order I like. I've added material to it. I like making it fit to the way I want to teach.

Although the time and effort needed to integrate open textbook material was identified as a potential challenge to open textbook use, several faculty participants indicated that such time and effort would be required any time a new textbook was adopted, including new editions of traditional textbooks.

In turning to students participating in the study, the analysis of the survey data revealed reduced cost as the most commonly reported benefit of open textbooks. When asked whether they used printed or online versions of the open textbook in their current class, 74% (20) indicated that they use the book online. When further asked why they had decided to use the textbook online, 73% (11) of students who responded to the question reported cost as a reason. Furthermore, 8% (24) of the students reported they would prefer to use open textbooks over traditional textbooks in the future, and 33% (8) stated that cost was a factor contributing to their preference for open textbooks.

A significant majority, 65% (17) of students on the survey reported a preference for using open textbooks in the future because they are generally easier to use. For example, one student reported that the online textbook was better organised than the traditional textbook. This student also reported a preference for directly accessing specific pages in the text using links provided by the instructor.

Finally, 33% (5) of students cited portability as a factor influencing their decision to use an open textbook in their current course, and 30% (8) cited portability as a factor influencing their preference for using open textbooks over traditional textbooks in the future. One student indicated on the survey: 'I don't have to carry it around with me everywhere.' The focus group data added weight to this finding. For example, one student reported that the ability to easily access the online textbook from multiple locations – from a lab, in the classroom, on public transport, during class breaks – allowed students to better manage their time in light of their busy school, family and work schedules.

Ways teachers and learners used open textbooks

Analysis of the data collected from faculty and student participants revealed that both used open textbooks to facilitate or build upon existing teaching and learning practices, and that open textbook use patterns were aligned to existing comfort levels in using technology.

Faculty with limited or no prior experience incorporating interactive web-based materials into classroom instruction reported that they used the open textbook in ways similar to a standard textbook – for example, by orally announcing assignments from the open textbook to students as they had done with traditional textbooks in the past.

On the other hand, faculty participants who had previously taught online or hybrid courses, and who had experience using the internet, email and listservs to post course materials and communicate with students, reported that they incorporated the open textbook into those practices. One participant reported sending students weekly emails that included a link to a specific page of the open textbook as a way to remind and direct students to the homework assignment. Another participant who had prior experience integrating the internet into classroom instruction reported projecting the open textbook onto a screen during class.

Faculty further reported that students in online and hybrid courses were more likely to use the textbook online and that this use varied by discipline. For example, students in mathematics and computer science courses tended to exhibit greater comfort with online versions of the textbook due to their previous experience using online tools and materials in discipline-specific coursework.

All of the faculty participants expressed interest in broadening their use of the tools, technology and pedagogical practices associated with open textbooks in the future. Specifically, one participant indicated an interest in facilitating and supporting online, collaborative homework groups for students and another in forming online faculty workgroups for collaborative curriculum sharing and development and for coordinated exam preparation.

Analysis of data collected specifically from students revealed that they incorporated the open textbook into their current learning practices, specifically with regard to technology use. Several students indicated that the open textbook was well suited to their current habits and learning practices. Focus group data revealed one student had a strong preference for working online and that the open textbook was well aligned to that preference, and another student agreed, explaining that open textbooks are a good alternative for students, because 'students are always on computers now'.

Focus group data further reflected a range of technical proficiency and access to technology. One student who used a laptop every day reported using the textbook exclusively online; another student indicated downloading a copy of the textbook to a mobile device, an iPod Touch. Others reported infrequent access to computers and the internet at home and at school, hindering their use of the online version of the open textbook. Survey data supported the focus group data, revealing that 77% (23) of students had never taken a laptop to school and that they preferred to use a hard copy or a printout of the open textbook for use during class time.

Asked how they typically accessed the open textbook, 50% (11) of student survey respondents reported using the table of contents to navigate, while 68% (15) reported using links provided by the instructor to access a certain page or section. A mixed method employing both navigation strategies was reported by 18% (4). When asked whether they access printouts, 23% (7) of student survey respondents reported that they either print out the complete textbook or that they print out parts of book but not the entire thing. Five of the seven students who reported that they accessed printouts also reported that they used the online version of the open textbook.

Impact of use on teaching and learning

Use of the open textbook was reported by study participants as positively impacting both teaching and learning. Both faculty and students observed that the open textbook supported increased interactivity with course materials, noting the potential for open

textbooks to stimulate collaboration around content as well as to enhance study and pedagogy.

Analysis of data collected from faculty participants revealed that the use of open textbooks allowed faculty to support students' increased interaction with information presented in the course materials, and with fellow students, resulting in new approaches to teaching. One faculty participant reported in the interview how the use of an interactive textbook generated a more interactive learning, altering the approach to teaching:

I'm now offering students the ability to interact with information and their interaction is what leads the classroom. It's not just the method of information that's being changed, it provides the opportunity for students to access more original material in a way that promotes interactive learning.

One faculty member further reported that when students engaged with the interactive resources in the open textbook, they were empowered to pursue their own course of inquiry by following links embedded in the text and using the internet to further research topics of interest. In response, the faculty member transitioned to a new approach to teaching that allowed students to lead the course of inquiry.

Faculty participants further discussed how they built upon existing collaborative practices to assist them to make better use of open textbooks as a way to enhance approaches to teaching. To coordinate course preparation and lesson planning around the open textbook, one faculty participant observed that colleagues drew upon the prior practice of collaborating to create course syllabi and course materials each term to partner further on ways to integrate the open textbook into their course plans going forward. Another faculty member stated: 'My colleagues and I collaborated to integrate the book with our existing syllabi and course curriculum.... Now we meet regularly to talk about lesson plans.'

In order to support faculty in adapting their teaching methods to make better use of open textbooks, faculty participants highlighted the need for technical training for new online practices, from basic technical support for incorporating the internet into the classroom, to more complex activities allowed by open online textbooks. One participant explained, for example, the need for training on how to use associated online platforms, as well as for professional development that focused on the innovative ways to use the open textbooks with students. Such training was requested to affect teaching practices and to provide teacher support for students who also need help in adjusting to online open textbook use.

The analysis of the student focus group data found that students perceived a positive impact on their study habits as a result of the increased interactivity of the course materials in the textbook. For example, one student participant observed that the open textbook increased one's ability to focus while doing homework by facilitating the ability to view homework assignments and relevant passages from the textbook on a single screen. Several students reported that the open textbook has made it more convenient for them to access other students and the text, which in turn made it easier for them to complete their homework.

Analysis of the focus group data suggested that use of the open textbook inspired further interest in interactive educational resources on behalf of students. For example, one student focus group participant stated that the open textbook could be improved by adding annotation capabilities, and specifically 'the ability to write side notes, questions, and concerns alongside problems'. Focus group participants also suggested

that interactivity could be improved by adding more ‘step-by-step problem solving’ to the text, with ‘explanations to wrong answers’ that would shorten the assessment loop by quickly correcting any misunderstandings while alerting them to gaps in their knowledge.

Students also suggested increasing the audio-visual components of the open textbook, recommending video chapter summaries to make the text more ‘dynamic and interesting’ and assist students who are ‘visual learners’. Students reported that increased online interaction with instructors would be a beneficial addition to the open textbook. In this regard, one participant suggested that weekly office hours in the form of ‘online live chat with tutors’ would be helpful.

Conclusions and implications

This research has revealed that, while cost savings and ease of use initially attracted both faculty and students to adopt open textbooks and use them to facilitate existing teaching and learning practices, opportunities nonetheless exist for engaging and building upon open textbook use to increase interactivity and enhance teaching and learning for users. As indicated by study participants, these potentially include more interactive and collaborative teaching and learning activities, such as online participatory homework facilitation and in-class discussions led by students, supported by web-based interactive technologies.

As evidenced by the fact that faculty with lower comfort levels with using online technology made use of open textbooks in ways that exemplified more traditional ways of working with materials, there exists a need to build on the technology, practices and tools made possible by open textbooks to enhance teaching and learning practices. Furthermore, the research illuminates the potential importance of leveraging teachers’ existing curriculum needs, teaching practices, and technological efficacy and expanding professional development to facilitate future open textbook use. More specifically, this development should allow teachers to draw on their existing ways of working as they engage with open textbooks and associated social networking tools, and encourage them to further develop, practice and model new behaviours and tools with their students.

In addition, this study’s findings on the potential development of collaborative groups of teachers who meet and discuss curriculum materials and teaching practices adds weight to the conceptualisation of OER as a support and facilitator of teacher knowledge sharing and collaborative resource development. Further research is needed into the ways in which open textbooks can promote these collaborative activities and inspire new teaching practices.

For students as users of open textbooks, this research likewise points to students’ current technology behaviours as an enabler of open textbook adoption, and as a point of departure for more complex open textbook use patterns, including increased online interaction with instructors. Taking advantage of these opportunities, however, implies students’ further exposure to web-based technologies and tools specifically around open content use, for instance, through teachers modelling complex open textbook use behaviours in the classroom.

Beyond the practical implications, this study suggests the need for further research showing how user experience can inform how faculty and students are engaged in the adoption and use of open textbooks. In particular, given the student interest in improving and augmenting the interactive features of the open textbook, it is clear that this

line of research can also provide a better understanding of how to best support and engage faculty and learners in the full range of possibilities offered by open content – namely, the ability to collaborate to create content, to collaborate across knowledge areas, and to share, remix and reuse content based on unique teaching and learning contexts.

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