The Evolution of an OER Platform and Its Users: An Embedded Mixed-Methods Study of EdTech Books

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5 Rs OER Transformative Learning

This embedded mixed-method study used surveys, interviews, and website analytics to understand the experiences of open educational resource (OER) authors and adopting instructors as they used the EdTech Books (ETB) open publishing platform. Participants reported various motivations for using ETB, namely reducing student costs, a commitment to openness, a vision of an OER community, and the platform's improving usability. They also indicated that the process demanded more resources than institutions provided and identified several unique and unexpected challenges to OER work. These findings are expected to be useful for developers and administrators of OER authoring platforms as well

as potential OER authors, their institutions, and instructional support personnel by helping to identify challenges and potential solutions within such efforts.

Introduction

Although the term "open educational resource" (OER) has been in circulation since the 1970s, it was not fully embraced until 2002 at a UNESCO Forum (UNESCO, 2019). This forum paved the way for OER to move closer to an agreed-upon definition by developers, early adopters, and contributors. For the purposes of this study, we define OER as educational resources that are free of cost and open to the public (Hewlett Foundation, n.d.; Wiley, 2014.). Openness, as defined by Wiley, is a resource's ability to meet the "5R" standards of Retain, Revise, Remix, Reuse, and Redistribute (Wiley, 2014), and some of the most common licenses used for these open publications include the six Creative Commons (CC) licenses (i.e., CC BY, CC BY-NC, CC BY-SA, CC BY-NC-SA, CC BY-ND, and CC0), which define how a resource can be used "openly" by the public (Apfelbaum & Stadler, 2021). The CC licenses specifically speak of OER being free of cost but also embrace the idea of "free culture," wherein creators participate to create a more open and sharing world (Creative Commons, 2023).

Previous studies have found that some of the greatest barriers to OER creation and adoption are perceived ease-of-use of authoring and sharing tools, perceived availability and quality of resources, and lack of time among would-be authors and adopters (Kimmons, 2015; Kimmons & Hall, 2016). Couple this with historic changes in platforms over time to be less free (e.g., PressBooks, FlatWorld Knowledge), and it is no surprise that frustrations might arise as potential adopters and authors work on OER. EdTech Books (edtechbooks.org) was developed as a free platform for creating OER (article under review) in response to these frustrations and now maintains a resulting OER library with the collaboration of hundreds of authors and editors. Though it has evolved over time in response to contributor needs, the platform's two main goals are (a) to establish a resource that can be truly open and free to all educators and learners, and (b) to support a community of creators in their efforts to produce high-quality educational materials. However, little is known about how platforms like EdTech Books emerge and evolve and what roles they are finding to play within the OER ecosystem. The purpose of this study is to understand how ETB is experienced by authors and instructors and to understand how the real experiences of users reflect its goals. Using an embedded mixed-methods approach (Creswell, 2008), we conducted surveys and interviews with authors, adopters, and students, to allow participants to share their experiences with the platform in a holistic and rich manner, and we also used descriptive web analytic data for triangulation purposes. By studying this platform and users' experiences, we hope to improve our understanding of how to design effective OER tools and resources to better address weaknesses and barriers to OER creation and adoption.

Literature Review

Before 2002, the OER movement began with the rebranding of the General Public License (GPL) in 1998 as the Open Source Definition (Wiley & Gurrell, 2009). Over the next few years, Wiley and O'Reilly drew from that inspiration to create the Open Content License and the Open Publication License (Wiley & Gurrell, 2009). Other notable contributions to the development of open educational resources included the advent of Wikipedia in 2001 (Wikipedia, 2023), the creation of the Creative Commons in 2001 (Wiley & Gurrell, 2009), and the launch of MIT OpenCourseWare in 2002 (D'Antoni, 2009). These innovations continue to impact formal and informal learning, although the potential for progress and adoption of OER, in general, has been relatively slow (Mishra, 2017). Then in 2002, OER was more fully defined at the UNESCO conference. In 2008, as the use and development of the internet grew, the term "massive open online courses" (MOOC) was coined (Moe, 2015). Across this time, many tools, sites, and repositories were developed to create and share educational resources and experiences more openly, and against this backdrop, the first tweet mentioning "edtechbooks.org" was posted, and the first capture of EdTech Book's (ETB) homepage through the WayBack Machine, was archived in 2018 (Romero-Hall et al., 2018; West, 2018). To understand the existence of such platforms and the factors influencing their development, we must first understand (a) why people adopt and create OER via open platforms like ETB, (b) what are the factors preventing these activities, and (c) what OER platforms should do to better support professionals working in these spaces.

Adoption and Creation of OER via Platforms

Authors and editors begin using an OER platform for a variety of reasons, including (a) personal motivation, (b) collaborations in communities, and (c) institutional support. First, the internal motivators leading to OER work come in many forms but generally represent altruism, reputation gain, or a combination of both (Farisi, 2013; OECD, 2007; Pirkkalainen et al., 2014). Altruistically, authors seem to gravitate toward OER as they seek to take their knowledge and skills and freely provide them to the world out of generosity or moral interest in others' wellbeing (Jensen & Kimmons, 2022). However, openness can also be enticing as a means for increasing visibility, as removing access barriers to scholarly and other creative works may increase the likelihood that they may be read, cited, and shared. In either case, the appeal of openness seems to revolve around its removal of economic or other barriers that might prevent educational materials from reaching or being recognized by their intended learners. This suggests that successful OER platforms first align themselves to both encouraging altruism and supporting impactful sharing for reputation gain, such as via impact metrics analytics, scholarly indexing, DOIs, and so forth.

Personal motivators alone, however, may not be sufficiently sustaining for OER work to proliferate or for such platforms to be used. Lane et al. (2009) explained that "OER on their own appear to be insufficient to provide most people with a meaningful learning experience. They need access to appropriate tools and other users" (p. 7) to form a sustainable OER community, such as through social media, conferences, or collaborative grants. Wenger et al. (2002) defined the idea of an online, distanced learning community as the "basic building blocks of a social learning system" (p. 229), which may be a necessary springboard for OER work. Successful OER platforms, then, will likely provide community-building and support

tools to users, such as via collaborative mechanisms, endorsing, rating, commenting, and so forth.

Not all of these supports need to come from an ad hoc community, however, as most would-be authors of OER operate in university or college settings that might encourage their participation or provide necessary mentoring. For instance, Belikov and Bodily (2016) suggest that institutional support might sometimes "come in the form of circular research assistance, department policy allotting specific time for evaluating new resources, or library support in choosing high caliber OER" (p. 243), and in some initiatives, institutions have provided financial funding to faculty in the form of stipends or course releases to create OER (Lashley et al., 2017; Zapata, 2020). Studies have shown that the tuition revenue retained from lower drop rates and higher enrollment in OER-use courses can offset these upfront costs for the instructors to assemble their texts (Carson et al., 2012; Wiley et al. 2016). Recognizing this, successful OER platforms will likely provide ways to connect with and leverage institutional supports when available, such as by providing university branding, utilizing single sign-on, aggregating and organizing resources institutionally, and showcasing appropriate credit to funding institutions.

Factors Preventing OER Proliferation

In contrast to these motivators, various factors are impeding OER efforts and platform utilization, as many faculty members, departments, and higher education institutions are interested in openness but are unable to implement OER, do not know how to make the transition to OER, and/or are unable to sustain these efforts (de Jong et al., 2019). This may partially be because open approaches to education are quite different from previous models that people are familiar with and require different skills, mindsets, and literacies (Kimmons, 2015; Schuwer & Jannsen, 2018). There is also a lack of cohesion among proponents of open education regarding what it can be and what its goals should be (Belikov & Bodily, 2016; Wiley, 2020), which can make messaging and framing of efforts confusing. Even the term "open" is contested because we do not share a common definition or language regarding many aspects of it (Casey et al., 2022; Kimmons & Hall, 2016; Mishra, 2017; Pomerantz & Peek, 2016; Weller, 2014; Wiley et al., 2016).

Other external barriers include a general lack of institutional and legislative support (Kimmons & Hall, 2016; Pirkkalainen et al., 2014), lack of time, and perceptions of poor quality. Without institutional and legislative support, there is a lack of funding, time, motivation, technology infrastructure, and community buy-in to do OER work, which directly affects usage and collaboration around OER (Kimmons & Hall, 2016; Jensen & Kimmons, 2022). In addition, various studies have shown that the primary barrier to openness identified by would-be authors and adopters continues to be time constraints (Kimmons & Hall, 2016; Mason & Kimmons, 2018), wherein faculty, for instance, do not believe they have sufficient time to engage in OER creation and curation. When understood systemically, however, perceptions of lack of time seem to be more aptly designated as misalignment between institutional personnel expectations and openness, wherein faculty, for instance, do not believe they have time for OER simply because their institutions do not value this work in evaluations, promotion, and tenure decisions, and faculty must, therefore, focus their time only upon "what counts" at their institutions, such as basic research (Boyer, 1990).

The perception of OER as being of poor quality also remains a persistent barrier (Kimmons & Hall, 2016; Mason & Kimmons, 2018) and may be particularly insidious. Studies have consistently shown no significant decline in academic performance between groups that used commercial textbooks and those that used OER (Clinton, 2018; Hilton & Laman, 2012; Hilton et al, 2013; Nusbaum et al., 2020), and in some cases, OER-using students outperformed those using commercial textbooks. Moreover, there is no significant difference in student perceptions between using commercial textbooks and OER (Nusbaum et al., 2020), so why do such perceptions exist among faculty and other would-be adoptees? Though part of this phenomenon may be explained by a simple consumerist mindset wherein would-be adopters are acclimated to equating cost with quality, this also presents a particular challenge for OER, because OER quality can only be improved through buy-in, effort, and continuous improvement (Jensen & Kimmons, 2022; Bodily et al., 2017; Wiley et al., 2021). So, if professionals do not engage with OER because of a low-quality stigma, and OER can only become high-quality if professionals work on them, then OER development and the platforms that sustain them may become locked in a low-quality spiral.

Improving OER Platform Designs to Support Authorship and Adoption

For educators, the potential benefits of using OER come in the form of improved time management (de Jong et al., 2019), decreased dependency on textbook publishers (Nusbaum et al., 2020), student pedagogical benefits (Belikov & Bodily, 2016), ease of use (Petrides et al., 2011), and institutional support (Belikov & Bodily, 2016). The aforementioned “obstacles that prevent [OER] from becoming mainstream in higher education” (de Jong et al., 2019, p. 394) stymie our collective advancement in this regard. Recognizing this, OER platforms should respond to these barriers in several ways and may provide solutions in the form of improved design, features, and offerings. Some specific areas of emphasis include (a) improving usability and flexibility, (b) highlighting resource impacts, and (c) increasing the production quality of resources.

Improving Usability and Flexibility

Because OER users represent varied and unpredictable demographics and needs, OER platforms must provide flexibility, modularity, and adaptability to various needs and situations. Simply providing a PDF of a book, for instance, is insufficient because it prevents users from strategically retaining the parts that they want, revising the parts that need updates, remixing the contents into different forms, and engaging in a variety of other valuable open activities. Similarly, placing OER behind a login wall, rigidly constructing them within a course framework, or hiding them deep within institutional repositories prevents them from being widely accessed, shared, and improved upon (Rodríguez et al., 2017). In response, OER platforms can focus more on modularizing content into discrete chunks (or learning objects) that are properly tagged and adaptable for a variety of purposes. Much of this approach aligns directly with work on information accessibility (Dubois & Dubois, 2012; Rodríguez et al., 2017) because the principles are the same: by making content more usable, it can be adapted to meet the needs of more people. In practice, OER platforms might use this guidance to organize content into well-tagged micro-content, such as chapters, that are

then automatically adapted into various formats for reuse, such as new translations, audio conversions, editable downloads, etc.

As another solution to encourage more OER collaborators and users to make and adapt content, OER developers are increasingly incorporating usability features (Dubois & Dubois, 2012; Rodríguez et al., 2017). Rodríguez et al. (2017) created a table by which usability can be evaluated into three categories: effectiveness, efficiency, and satisfaction. These three categories act as functions and can be used to measure the usability of an OER platform. It is by these measures that OER platforms have begun developing authoring tools to streamline the creation process, language translations, and other assistive technologies such as text-to-speech (TTS), thereby broadening their collaborator and user reach and practices. In their current form, however, most OER platforms do not provide much guidance on how to make content accessible or utilize technologies or web development practices that inhibit accessibility (e.g., those that release content only as PDFs).

Highlighting Resource Impacts

OER research has historically fallen into one of four categories of the COUP (cost, outcomes, usage, and perceptions) framework (Bliss et al., 2013), with most published articles focusing on cost and outcomes or what might be termed impacts. This phenomenon aligns with traditional interest in scholarly work as a means for improving society and progressing knowledge, which is often measured in terms of citation counts, h-indices, and other so-called impact metrics. Similarly, research on the benefits of open access has historically attempted to justify the scholarly value of openness in terms of the same impact metrics, such as by measuring the effect that open access has on citation counts (Langham-Putrow et al., 2021). However, OER provides new opportunities for scholarship by reconsidering what we mean by impact and by providing new, more robust indicators of scholarly work impacts on desired audiences (Kimmons, 2015; Romero-Peláez et al., 2019). As such, OER platforms should empower authors to track and highlight the impact of the work they create by collecting click-level analytics, user behaviors, and other metrics in addition to traditional citation counts. In their current form, however, most OER platforms do not provide any such analytics or other data to authors.

Increasing Production Quality

Third, although the perception of quality remains a major barrier for OER, it seems that this barrier might be limited to faculty and not other stakeholders, such as students. For instance, Sansom et al.'s (2021) study on a soft adoption of OER concluded that there was no difference in quality perception and its impact on learning outcomes among students in an introductory chemistry course, but if an OER is visually disorganized, untidy, or inaccurate, this might impact both student and faculty perceptions of the overall quality of the product (Ikahihifo et al., 2017). The reason for this is likely because traditional publishers invest heavily in providing diverse skill expertise in the form of graphic design, editing, and other supports to their authors, while much of OER is created by faculty and other experts with a single skillset in their subject areas. For this reason, OER platforms should also focus on providing features and services that improve the perceived production value of resources with limited expertise, such as by providing copyediting, graphic design, indexing services, and other supports that are typically outside the realm of author subject matter expertise. In

their current form, however, such platforms generally do not provide any such support but rather leave these considerations unaddressed or wholly the responsibility of content authors.

EdTech Books as a Response to These Needs

Given this backdrop, it is clear that OER platforms must evolve in a variety of ways to better support authors and students if OER is to proliferate. EdTech Books was specifically designed to respond to these barriers and has sought specifically to improve upon previous platform designs in the ways outlined above.

Methods

In this study, we attempted to answer the following questions: (a) how ETB users developed and adopted OER, (b) how they perceived platform responses to their needs over time, (c) what effects the creation and use of these resources have had on student learning outcomes, (d) what skills, attitudes, literacies, and perceptions were developed or evolved as they used the platform, and (e) what external barriers were faced throughout this process and whether/how they were overcome. To answer these questions, we used an embedded mixed-method approach (Creswell, 2008), which relied primarily upon interviews but then used survey responses and web analytics data to supplement results (Kimmons & Johnstun, 2019, paragraph “Embedded”). To be clear regarding our goals, this study aims to be a case of “research to improve” rather than “research to prove” (Honebein & Reigeluth, 2021), wherein we are not attempting to determine whether ETB is superior to alternatives but to determine what features and emphases are valuable in an OER platform to improve future design work in this space.

Data Collection

Data collection primarily consisted of user interviews and surveys, but we also retrieved web-based analytics data of platform use for triangulation purposes.

Surveys

The surveys for this study were created in Qualtrics and sent to all users who were registered on ETB as authors or instructors (N = 842). Four of the researchers compiled a list of questions, which was then checked with colleagues for surface trustworthiness. The first section of the survey collected general demographic data. A section for instructors and/or authors was then displayed based on the participants' self-described use of the platform (e.g., content creator vs. instructor). The instructor section included seven questions about motivations, experience, impact, and barriers. The author's section consisted of 11 questions about the platform's usability, motivations, and barriers. Two final questions were included for all participants regarding the 5Rs of openness and the perceived quality of the materials.

Samples of the survey questions included the following:

> *Did you create any content for an EdTech Books chapter as part of your course?*
>
> *How would you rate the quality of the content on EdTech Books compared to other textbooks you have used?*
>
> *You indicated that you had usability issues with the site. Explain the usability concern you had. How was your experience with resolving your concern?*
>
> *Have you seen a dif erence in your educational experience with the use of the EdTech Books material?*

An email was initially sent to these users along with one follow-up. A response rate of 15% was anticipated, which is the middle range for similar surveys (Delimont et al., 2016). We received 88 survey responses from faculty and authors, which calculated into an actual response rate of 10%. Of the respondents to the faculty and author survey, 51% identified as female and 49% as male. The ethnic makeup of the participants was 74% White, 8% Asian, and 6% Hispanic or Latino, with the remaining participants representing other groups or choosing not to disclose this data. The faculty and authors who participated in the survey represented 45 different institutions and a wide range of roles.

Interviews

Participants were selected for interviews using a purposeful informant sampling method based on criteria to cover a range of roles and experiences using the EdTech Books platform (Jensen & Kimmons, 2022). All interview participants were informed about the study and invited to participate via email. They were not provided any incentives for participation. Table 1 shows that participants intentionally included early adopters of the platform, instructor users, student authors, instructors using the platform to engage in open pedagogy in their courses, and non-academic departments from different universities. Eleven potential participants were contacted through email, and eight agreed to be interviewed. Of the eight interviewed participants: 25% identified as males (2) and 75% as females (6). Four researchers conducted the interviews, and all interviews were conducted over Zoom and recorded for audio transcription and auditability. Each semi-structured interview lasted between 30–45 minutes, during which participants were asked similar questions about their involvement, motivations, and overall experiences with the platform, along with their perceptions of accessibility, usability, and barriers.

Table 1

Profiles of the Interviewed Participants

Pseudonym	Institution	Institutional Role
Alexander	Public research university with an enrollment of over 21,000 students, located in the central-southeastern region of the United States	Faculty Member

Pseudonym	Institution	Institutional Role
Benjamin	Public research university with an enrollment of almost 30,000 students, located in the western region of the United States	Faculty/Administrator
Claire	Public university with an enrollment of over 6,000 students, located in the midwest region of the United States	Faculty
Caroline	Private research university with an enrollment of over 33,000 students, located in the western region of the united States	Adjunct faculty/Administrator
Emma	Public research university with an enrollment of over 35,000 students, located in the midwestern region of the United States	Graduate Student
Eleanor	Public university with an enrollment of over 25,000 students, located in the central-southeastern region of the United States	Graduate Student
Madeline	Private intensive English program with an enrollment of about 200 students, located in the western region of the United States	Graduate Student
Rachel	Private research university with an enrollment of over 33,000 students, located in the western region of the United States	Faculty

After the interview transcripts were cleaned, four researchers open-coded each excerpt. A total of four main categories emerged. The same group of four researchers completed a second level of axial coding to group the quotes, which produced ten themes. A third level of coding was then conducted for which seven major themes were agreed upon after combining three from the second level of axial coding (Table 2). Codes were then shared and discussed with the remaining researchers who provided feedback, suggestions, and support on the results.

Table 2

Samples of Thematic Analysis

Transcript Quote	Open Code	Axial Code Thematic Code
The immediate versus the future design. And not knowing what those future designs might look like, was a kind of interesting design thing that we came across that I hadn't considered	Designing for future iterations	Future-focused Adaptable design by authors
Even when I have to read journal articles for class, the length matters. So people coming in, just out of their own curiosity are not going to read that for 40 minutes. Unlikely, but they might skim and look at something but no one's gonna read that whole thing. Alright, very few, I think.	Predicted skimming as a user	Design for Adaptable design informal users by authors
After a certain amount of time, the research we were doing in the lessons you were teaching did start having an effect, and we felt positive	Content able to have the intended impact	Impact on students Impact of materials
Like when we first started this project, paper books were much more preferred by students. But that's definitely changed in the time that we've been writing it and so I don't think people mind reading it online anymore.	Increasing online reading	Student outcomes Impact of materials
It's really gratifying to know that we can make it really fun conversational and visual. And it's really fun to read and participate in. That was really gratifying, and that is something that you can only do in online books.	gravity work	personal values stewardship
I guess it just seems the right thing to do	The right thing	Ethical motivation Stewardship

Analytics

Three analytics sources were also considered in this study—ETB built-in analytics, Google Analytics, and Google Search Console Analytics—and were used to observe general patterns of use on the platform and to triangulate findings (Jensen & Kimmons, 2022). The surveys and interviews indicated an intended openness for a wide range of potential users, and the analytics provided a way to quantify the use of the materials after publication on ETB. The

Google Analytics and Google Search Console Analytics included a window of time from November 1, 2020, to January 31, 2023, while the ETB analytics covered the project's entire life. These sources provided basic information on reader demographics and use trends. Since the site does not require users to log in for access, limited demographic information was available for anonymous users. According to the demographic details gathered by Google Analytics, the top three countries of origin for users of ETB were the United States (33%), the Philippines (15%), and India (6.5%). By January 31, 2023, there were 152 published books on the site, and a total of 442 books had been created. Of the published books, 47% had been downloaded by users as PDFs or Word documents. There were 6,493 published chapters out of a total of 8,256 created chapters. In the case of these published chapters, 62% had been downloaded by users. By the time of the study, the site was averaging around 1.5 million unique readers each year, or 120,000 per month. These data indicated that a wide range of intended and unintended users of the textbooks have been accessing the open materials (e.g., formally, informally, and non-formally). Not only does it appear that they view the content, but there is evidence through the downloads and copying features that the users were taking advantage of the retention and redistribution aspects of these resources.

Rigor

Researchers employed several strategies to ensure the trustworthiness of findings, according to common qualitative standards (Guba & Lincoln, 1989; Lincoln & Guba, 1985). One strategy was to use multiple sources of data—analytics, survey responses, and interviews—to triangulate the results and minimize bias. Additionally, participants were engaged in member checking and were given the opportunity to review and validate the findings. During peer debriefing, researchers discussed potential themes for the codebook, had two people code interviews, and purposefully sought to identify any flaws, inconsistencies, or biases by analyzing memos and documentation of design decisions.

Findings

As major themes emerged from the interviews, we found that they could be categorized under three meta-themes: motivations, platform perceptions, and challenges (see Table 3). Motivations included authors (a) needing adaptable design solutions, (b) expressing a desire for collaboration, (c) identifying a need for community, and (d) feeling a sense of stewardship or responsibility. Platform perceptions focused on (a) the creation process, (b) evolving usability, and (c) evolving user attitudes and skills. Challenges included (a) lack of impact and (b) lack of institutional support.

Table 3

Themes from Interview Data

Theme	Definition	Example Transcript Quote
Motivations		

Theme	Definition	Example Transcript Quote
Adaptable design by authors	Designing for the unknown/unplanned users and their unique needs, adapting to the 5Rs	And so, if a teacher did see something that was out there or any educator, whether it's a librarian or what have you. How would they bring in other content, so that they can align it? (Alexander)
Collaboration	Working with others to create materials and being invited tocreate	I felt I had more credibility with the faculty. I said, Well, you know, this is how you do it. (Benjamin)
Community	Supportive relationship in creating resources and responding to needs on the platform	Especially with those emerging needs, you know the team was incredibly responsive. (Alexander)
Stewardship	A sense of responsibility to create and maintain for the users	I don't think we really had any institutional support per se. Not that they weren't supportive, but we didn't ask for time. We've been doing the work of editing just on our own time, which is often on the weekends and evenings, and summers, those sorts of things. (Claire)
Platform Perceptions		
Creation process Evolution of platform/usability	Highlights the finding, creating, and maintaining of content; time limits	We tried to finish it in one summer right? And we did finish it. And it was so many hours every week spent on getting that done. (Rachel)
Evolution of the user	Designing for designers, simplifying authoring tools	As an author, I found it pretty intuitive. And I know it has changed but I could do pretty much what I needed it to do. (Eleanor)
Challenges		

Theme	Definition	Example Transcript Quote
Impact of materials	Discussion of the impact on outcomes, costs, usage, perceptions; lack of impact	I think I was concerned about my students having to spend so much money (Rachel)
Institutional support	External policies/practices, pushes/support, funding	We got some funds, small funds, to basically develop an awareness campaign (Benjamin)

Motivations

When asked why participants developed and adopted OER on ETB, we found that these motivations ranged from collaboration with others who were already developing OER content to a desire to increase student benefits to a belief that education should be open to anyone. All authors mentioned reducing textbook costs for their students as a major motivation. This finding was expected from the literature (Belikov & Bodily, 2016; Bliss et al., 2013) and corroborated in the survey results, where the highest-ranking motivation for both authors and instructors using ETB was reducing costs. The matter of money was also an emotionally compelling one for some authors. Poignantly, Rachel described a moment when she saw the reality of her students' financial situation:

> *I had a student in my office last week, and she said, "I have a graphing calculator, but I lost the charging cable and the charging cable costs $20, and I don't have $20 because I have to eat." She said, "Literally, I have to buy food." I just feel, that if there's one student who doesn't have to be hungry because I put in this effort, that makes it worth it.*

Another motivation for using ETB was its commitment to openness. Caroline, for instance, started creating her OER on a different platform, but she switched to ETB when she perceived the other platform to become more profit-seeking than truly open. Benjamin also felt like ETB matched his position to openness. He described discovering the platform as the result of a long wait: "This is why I had been waiting, not because I didn't have time, but because I didn't want to publish it behind a paywall… I wanted to create it in a format that would be wide open." These authors expressed a sense that OER platforms have different levels of openness. Notably, ETB does not require the materials it hosts to be licensed openly, such as by mandating a particular CC license, but allows authors to decide how open to make their content. Simultaneously valuing author autonomy and openness seemed to be of high importance to authors who wanted to be open but might have differing perceptions of what openness means.

A third motivation for using ETB was the developer's vision for the platform and his ability to assist authors in developing a vision for individual resources. Claire mentioned the following:

> *We might have been the first of this type of book. [The developer] still had a really clear understanding of how to use the website, and how it could fit our project, and just meeting with him made it clear. I could envision from the beginning how the book would come to be.*

In the survey, authors were fairly equally divided between not needing technical support and needing to contact the site administrators for assistance. In the explanations about the need for technical support, the participants frequently commented on the quick response and helpful solutions. Several participants even indicated that specific features were enabled or created specifically in response to their needs as authors. Thus, connecting with the developer was often an important part of the authors' experience both for solving technical problems but also for developing and maintaining project vision.

Taken together, these findings seem to suggest that OER platforms must lean into the cost savings and other benefits of openness while also being responsive to user needs and inspiring a vision within authors of what they might be able to create.

Perceptions of the Platform

We then considered how ETB authors and users perceived responses to their needs and what skills, attitudes, literacies, and perceptions were developed or evolved as people used the platform. The majority of survey respondents and interview participants gave positive ratings and praise on both of these topics. Eleanor reported that using ETB was "intuitive," and 84% of authors in the survey rated the authoring tools as "good" or "excellent." Many of these authors felt empowered as they gave feedback on the ETB platform and expressed appreciation for the collaborative community it provided. Most also felt that they were empowering their students by providing cost-free, open educational materials. As many users (37.1%) access ETB through a mobile device, its design enables the site's responsiveness to be user-friendly for more users. The site infrastructure also enhances SEO compliance by using abstracts, keywords, and metadata. In addition, ETB pages include accessibility features for users with disabilities, such as text-to-speech, and the site runs a comprehensive accessibility test that ensures WCAG compliance. One of the main reasons to use OER is related to the ability to manipulate content and adapt it to users' needs. In that sense, allowing authoring tools and removing barriers for remixing, authoring, etc., seems necessary for increasing OER adoption. Applying the 90-9-1 phenomenon (Carron-Arthur et al., 2014) to ETB, results indicated that there are 2.25 million total users but only 1,029 authors (less than 1%) on the platform. Two things can be assumed from this. First, ETB provides a user-friendly platform that allows users to quickly and conveniently access information. Additionally, by using multiple modalities for different learning needs, ETB is reaching more users in this capacity. Second, there is always room for more creative contributions (i.e., getting more people to participate in more of the Rs of openness), and platforms should refine features and tools to guide more users in these activities.

Even though most found ETB intuitive and beneficial to their students, a few mentioned that there was a learning curve. Several authors said the platform evolved to become more user-friendly as the developer responded to their needs. One early author said that ETB was originally a little clunky. To use it, she had to think like a programmer and noted that it would have been much harder for less skilled or persistent authors. In creating two books on the

platform, a different author explained that “it was much easier the second time.” A third author suggested that this improvement was a direct result of continued development: “building in more advanced features and more advanced components of the system based on what we were finding out in the design.” In sum, the improved usability and continuous improvement of the platform attracted and retained these authors, which suggests that OER platforms should make continuous improvement a visible priority to users and nurture their creative efforts through responsiveness to needs.

Challenges

Our study also revealed some significant challenges resulting from creating OER in ETB. Finding funding was a real concern for almost every author we interviewed, suggesting that free OER does come with a price tag. Many of the authors on ETB were graduate students, adjunct faculty, or faculty working outside their traditional job descriptions, and they had to seek grants or awards to afford to spend the time on their materials. One adjunct author reported feeling burnt out after spending so much effort on the platform and feeling underappreciated. She said, “I put my heart and soul into this, and I really spent a lot of time, especially over the summer.” It was clear in many interviews—and in the survey results—that creating OER was a major commitment of time, energy, and resources.

Unfortunately, this commitment was not always acknowledged or supported by the authors’ institutions. Commonly, authors reported that their institutions claimed to support OER but provided few resources for the creation process. A department might support “in spirit” but not follow through with financial commitments. One participant described “a dance” with the campus bookstore because of conflicting interests. Another participant regretted that her colleagues believed OER to be low-quality resources, and a survey response suggested that faculty members need to have tenure to use OER credibly. When given institutional directions on which textbooks to use, this respondent said, “I just send an angry email every semester about why I am not going to comply. Tenure is pretty awesome.” One challenge of shifting to open among faculty is that institutions struggle to follow through with the resources and policies needed to support OER creators.

This struggle may be especially harmful because our findings suggest that the creation of OER in ETB requires collaboration and community. The aforementioned commitment of time and energy is best spread across several creators. When present, this community helped our participants make better design decisions and overcome institutional barriers. One participant was part of an OER working group on her campus. Others mentioned attending OER conferences and building networks of supportive colleagues at their institution. When creators lacked support, they found the work overwhelming. Even with his enthusiasm, Benjamin noted that he would like to recruit a co-author or co-editor for his next project to help distribute the workload.

Other challenges with creating OER included finding existing open content to reuse, revise, and remix. Among the interviewees, there was an early expectation of being able to grab content and reuse it easily, but the actual design process was not that simple. One individual in the survey needed specific content for a South African and African context, which could not be found. Another interviewee could not find open chemistry diagrams. Others discovered that external video links would stop working or that there was no relevant content

available to use. Madeline said that this lack of persistent resources on the internet "created a lot of work," explaining that she would have to change her lesson plan if a link broke. Reusing content was also challenging because of each revision's complicated relationship with ownership.

Eleanor reported that, at first, her authoring "was really just regurgitating other people's stuff." Later, however, she found that adding new content helped her feel more ownership over her open text. She also said that she could see how her involvement in creating OER was improving the ETB platform for other authors as she requested new features: "It was really nice to be able to feel like I was helping with the development of the platform itself, as well as publishing." Eleanor was feeling a sense of stewardship for the platform. At the same time, updating content and requesting new features require even more human resources. Caroline described her experience with updates as "periodic." She said, "I need to do it more…but like I said, in my priority list, it goes down a lot because I just don't have time, and it's not something that I'm being paid for, so it would just be volunteer." These experiences suggest a tension between the ideal application of the 5Rs and the reality of reusing content.

With this tension in place, we noticed that our participants were aware that others may want to reuse, revise, and remix their content. This awareness pushed them to consider more adaptable designs. When shown their analytics, several interviewees were surprised to realize that unanticipated users were accessing their texts. Alexander commented,

> *One thing that I hadn't just anticipated was that we had to think about how other people might adopt and adapt it… We're designing on two different plans: [not just] the immediate need, but [also] the future design that someone might iterate from.*

He was mindful of designing his text in a way that is conducive to the 5Rs. Others noted that the COVID-19 pandemic exposed their text to more people "almost in any country" as schools turned to easily accessible online resources. Many of the materials on ETB are accessed through search engines rather than through learning management systems, suggesting that informal learners may be looking for OER or that formal learners are supplementing their course content with OER. Claire said, "There are always just things that you don't know that you need to know. How do you change something or include something that is not expected?"

Another question asked is what external barriers were faced when implementing OER in courses and how they were overcome. Our study showed that many of these external barriers ranged from finding appropriate, high-quality resources that aligned with the curriculum to technology and departmental or institutional support. A few participants mentioned accessibility concerns. Participants were able to overcome many of these external barriers by switching to ETB as a medium for already available content or as a platform for creating new resources in collaboration with others that are better aligned with their standards and learning objectives. The goal in overcoming these external barriers was to sustain OER content and use.

Discussion

Based on these results, we conclude that limited institutional and technical support, insufficient time, and difficulty in finding appropriate materials continue to pose obstacles to wider OER adoption. However, to sustain and overcome barriers, OER platforms need to increasingly meet the needs of their users in a few key ways. ETB had a perceived positive effect on authors as it was able to evolve as an OER platform and respond to the feedback and needs of its growing audience. As OER platforms attempt to overcome barriers and sustain educational openness, we make the following recommendations based on the results of this study: (a) encourage collaborative, sustainable communities; (b) encourage institutional support, especially for pre-tenure and non-tenure authors; (c) continue to embrace openness as a central value; and (d) proactively engage in continuous improvement to make processes ever more user-friendly.

Collaborative and Sustainable Communities

When their institutions were unsupportive, the majority of ETB creators developed communities of support and sought assistance directly from the platform developer. This access to other users through collaboration and the building of an OER community is foundational to the expansion and sustainability of OER platforms (Lane et al., 2009; Wenger et al., 2002). Our study showed that many ETB creators were drafted into this community by other ETB creators. As ETB creators use the platform to produce content more aligned with their curricula, users are then invited to participate in the process of creating new OER content. Analytics revealed that the number of ETB creators has increased to over 400, representing more than 100 institutions, within the last five years. These numbers indicate that ETB is growing and increasingly needs to be able to adapt to the needs of an increasingly diverse community.

Institutional Support

Collaboration and community building within OER greatly stem from a sense of altruism and doing what is beneficial for students, users, and other authors. These motivations may deviate from the common norms at educational institutions such as tenure, financial benefit, and prestige. Such challenges make it difficult for faculty members to seriously embrace OER, especially when there is limited institutional support. Our findings aligned with those of other studies and confirm the need for institutional support in the form of increased funds for graduate students, incentives for publishing on an OER platform, allotted time to produce OER content, assistance in finding high-quality educational resources, and technical training on OER platforms (Belikov & Bodily, 2016; Henderson & Ostashewski, 2018; Petrides et al., 2011). Institutions that provide support and encouragement for faculty members to use or contribute to OER have the potential to provide a greater influence on the expansion of OER usage and collaboration.

Embracing Openness

Even with community and institutional support, the issue of poor adoption may also be more deeply rooted in the definition of “open” and how it is interpreted among OER authors and users (Casey et al., 2022; Mishra, 2017). However, there seems to be a consensus that openness is desired and beneficial. In this study, openness was one of the leading motivations for authors using OER and creating new content on the ETB platform. Some

authors intentionally switched to ETB as other OER platforms no longer embraced, in their estimation, a true open philosophy. This emphasis on openness also expected freedom to determine "what openness means in my case," as authors valued the ability to decide upon the level of openness they felt comfortable with.

Continuous Improvement

Responsiveness to ever-changing needs and ongoing improvement seemed to be a foundational consideration valued by participants. "If I'm doing all of this work to do things outside of my comfort zone," authors might be characterized as saying, "then I expect the tools and platforms I use to do the same." By working in a platform that evolved and advanced with their needs over time, the experience of authors seemed to provide an unexpected sense of excitement, vision, and even community. Not only was openness seen as a community project among authors, but it was a joint project between authors and platform developers, thereby reaffirming buy-in and increasing confidence. Although it is challenging for OER platforms to try and account for all potential needs, use cases, and users, this study shows that communication with the author community as continuous improvement occurs can provide one more source of encouragement and sustenance to authors as they grapple with emerging unknowns and daunting tasks.

Limitations

The purpose of this study was to provide rich, descriptive, and accurate information on the experiences of those who use ETB. The boundaries set for this embedded mixed-method should be seen more as delimitations rather than limitations. Future studies might focus on students' perceptions of using OER platforms, instead of strictly those of faculty members or authors. Additionally, this study was conducted within a four-month period, which makes it difficult to conclude the sustainability of these goals. Future studies may consider conducting a longitudinal study by resurveying or reinterviewing participants after an extended time to check for sustainability and interest in platforms over time.

Implications for Practice

We suggest that these findings reveal a few clear implications for practice. First, OER platform developers and OER creators should see their work as a joint community effort wherein tools are continuously designed and re-engineered to address emergent needs. Second, OER platform developers should understand the barriers faced by potential OER authors and seek to provide solutions whenever possible. Beyond just providing the ability to publish content online, this means that such platforms should do things like add production value to these resources, legitimize author efforts as legitimate scholarship through impact indicators, and so forth. Third, trust between authors and platform developers seems to be an important part of a winning OER recipe. Authors need to know that their vision of openness will be valued and supported by those who are creating their tools, and they should be able to look to platform developers not just as software engineers or UXD professionals but as joint contributors to a more open world.

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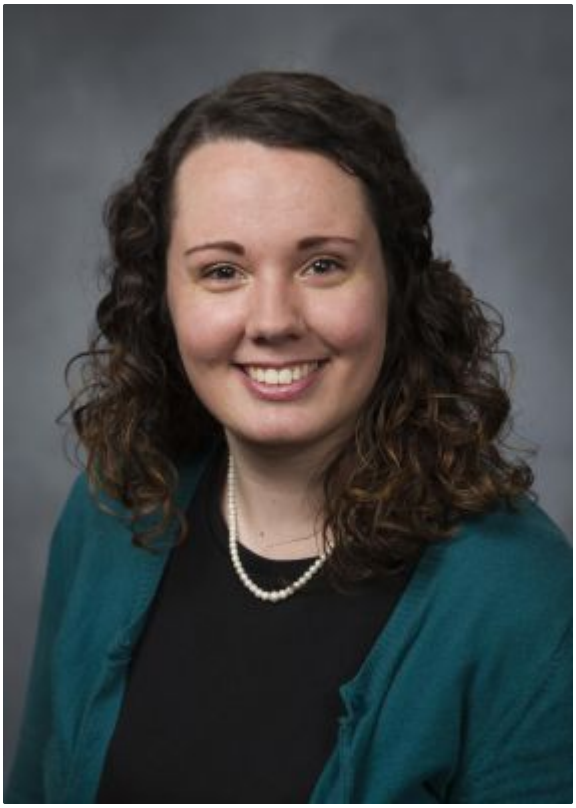

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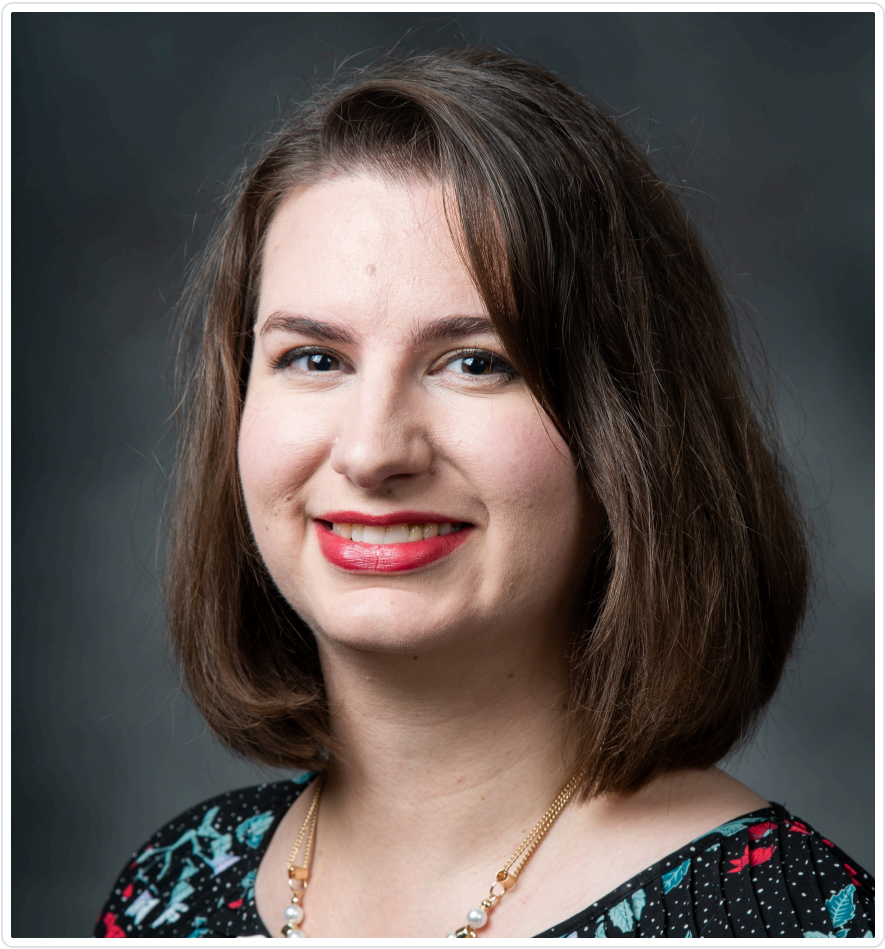

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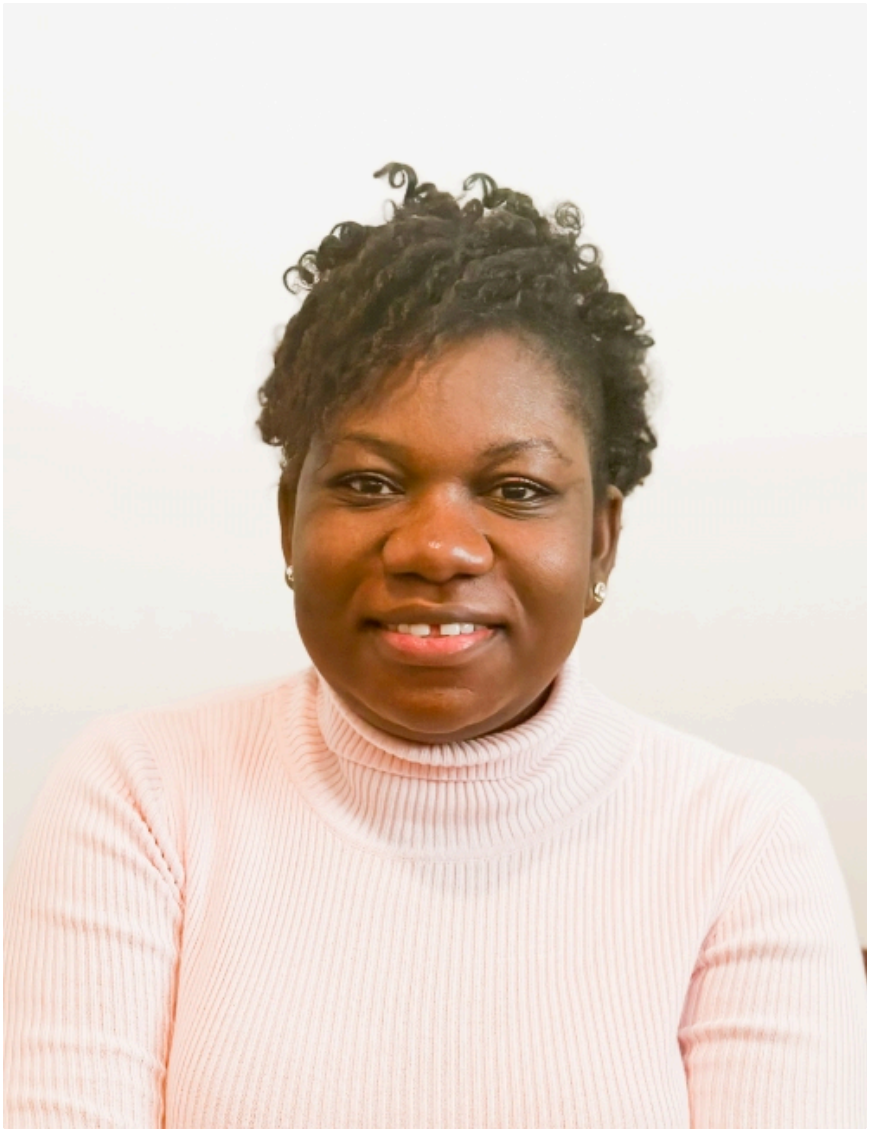

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