Chapter 2
OER and the Future of Digital Textbooks

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2.1 Introduction

As higher education costs continue to rise at a seemingly unsustainable rate, attention is increasingly turned towards avenues that can help mitigate such alarming financial burdens. The global textbook industry, by some estimates, will exceed $119 billion in the coming years. Digital textbooks have often been pointed to as one of the most promising platforms for large-scale open educational resources (OER). However, the much-foretold digital revolution has thus far manifested in small (albeit successful) projects, usually situated at individual universities. Open access digital textbooks continue to hold a great deal of promise in making available a wealth of online content for educators and learners worldwide, and point towards a possible direction for the still outdated models of the majority of traditional print-only textbook publishers.

Such a shift from a more print-based model to more digital and open content and access also has much larger implications, ranging from learning – not just what students learn, but *how* they learn – to the future of textbooks, the publishing industry, and how educational institutions may structure themselves in the near future. While this chapter focuses on OER use primarily in the USA – as the OER model has been more prevalent in North America – it also discusses OER adoption and attitudes in other parts of the world, such as Africa, Asia, and Europe.

With some university-specific case studies indicating that free access to online learning materials can have a positive effect on learning outcomes, the future of open digital textbooks appears promising. Even more traditional publishers, such as Cambridge University Press, De Gruyter, and Springer, have increasingly moved towards open access as a means to stay relevant in an increasingly crowded and competitive publishing space. Larger scale projects such as OpenStax as well as

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exploratory efforts such as UK Open Textbooks have shown the promise of what the near future of open access education might look like, with OpenStax alone reaching over two million students during the 2017–2018 academic year. As more universities and learning institutions take up the open access model, there could be a sizable shift in the coming years towards increasingly more open educational resources that might fundamentally change the role of textbooks in education. This chapter will survey the current state of open access digital textbooks with an aim to examine what the near future may hold for the ways in which educators, researchers, publishers, and learners use, interact with, and disseminate such resources.

2.2   The Costs and Consequences of Current Textbook Models

Before discussing the effects of OER, it is important to define and contextualise OER in today's education systems. As defined by Creative Commons (Green and Wetzler 2019), a non-profit organisation committed to building a global public commons of knowledge and culture:

> Open Educational Resources (OER) are teaching, learning, and research materials in any medium that reside in the public domain or have been released under an open license that permits no-cost access, adaptation, and redistribution by others.

Universities are increasingly using and expanding OER, which is a direct result of the financial reality that confronts students in the face of rising tuition costs and diminishing employment prospects. A contributing factor of these student burdens is the growing financial strain from coursework materials. With the estimated cost of books and supplies exceeding $1,260 for a US student (Ma et al. 2019), university students appear frustrated and are looking for ways to minimise the costs. In this effort, students often decide not to purchase coursework books on financial grounds (Borchard and Magnuson 2017; Florida Virtual Campus 2019). For instance, a survey with 2,039 students from more than 150 US university campuses found that two in three students (65%) had decided against buying a textbook because it was too expensive (Senack 2014). Interestingly, students knowingly accepted the risk of lower course grades, as an overwhelming 94% admitted that this could hurt their grades. Another common strategy to alleviate the financial burden is reducing the number of courses that students take. As a recent survey across all higher education institutions in Florida has shown, two in five students end up taking fewer courses or even dropping a course (23%; Florida Virtual Campus 2019). Similarly, a Canadian study indicated that over half of the respondents (54%) did not purchase a required textbook at least once and, due to textbook costs, students ended up earning poorer grades (30%), taking fewer courses (27%), or withdrawing from a course (17%; Jhangiani and Jhangiani 2017). Regrettably, the negative impact of textbook costs was disproportionately borne by financially disadvantaged students, including those holding a student loan or working more hours

per week (ibid) and thus further increasing the financial inequality between different populations of students. In the European context, students also appear concerned about the escalated course-related costs; a survey commissioned by the UK government has shown 58% of students report that core textbooks should be the responsibility of the higher education institution (Office for Students 2018).

In light of these concerns, the adoption and expansion of OER seems highly promising by serving as a means to alleviate students' financial worries. An important question arises however: can OER actually improve student outcomes? The following sections discuss the effects of OER on learning outcomes as well as student and faculty perceptions and attitudes towards these resources.

2.3 Effects on Learning Outcomes

The literature indicates mixed findings about the impact of OER on academic achievement. In a year-long study conducted by the Virginia State University School of Business, 991 students in nine core courses replaced traditional textbooks with openly licensed books and other digital content (Feldstein et al. 2012). This study found a positive correlation between grades and courses using open textbooks (ibid). More recent studies have also found a positive link between OER adoption and students' academic achievement in an online history course (Grewe and Davis 2017) or 'course throughput rate', as indicated by drop rates, withdrawal rates, and C or better course grades (Hilton et al. 2016).

Further studies, however, contradict those findings. A study with seven different US institutions compared 3,524 students assigned exclusively OER in their courses with 10,819 students using traditional textbooks in these same courses (Robinson 2015). Having employed propensity score matching to minimise the differences between the groups, that study found that students using OER received, on average, lower grades than students with traditional textbooks, after controlling for student- and course-level covariates. Students who used open textbooks, however, appeared to enrol in more credits than their counterparts. These findings were corroborated by an even larger study with 4,909 students in the experimental condition and 11,818 in the control group (Fischer et al. 2015). Similar to Robinson's study (2015), Fischer et al. (2015) found that students in courses using OER enrolled in significantly more credits in the next semester, which, as the authors hypothesised, may be due to cost savings associated with OER. The completion rates and course grades, however, were mixed. Finally, two US studies showed that students performed equally well across five mathematics classes (Hilton et al. 2013) and an introductory psychology course (Nusbaum et al. 2020).

Overall, the links between OER use and achievement are under-researched and most of the studies indicate that students using OER perform equally well or in some cases better than students using traditional textbooks. The lack of consensus in the literature may be due to the several confounding variables, such as course and demographics, and differences in research design, for example, experimental

studies as opposed to surveys. As one example, it might be possible that OER can be more beneficial for history or other social sciences courses, where students can easily synthesise information from a variety of sources, compared to subjects such as mathematics or science. As a result, further research is needed to examine the links between OER use and achievement in different course subject areas.

Furthermore, the majority of studies have been conducted in the USA, as the OER model has been largely restricted to North America (Pitt et al. 2019). In contrast, the relevant literature in Europe is limited, potentially due to the fact that often higher education courses in Europe do not require students to buy textbooks. Strikingly, in some countries, such as Greece, state higher education institutions supply textbooks to their undergraduate students for free, funded by taxation (OECD 2019). On the other hand, in the UK context, a survey of 96 UK educators has shown that half of the educators do not expect their students to purchase textbooks (Pitt et al. 2019) perhaps due to the variety of coursework preparation materials, such as journal papers and e-books, lessening the reliance on textbooks directly. Indeed, according to a government survey across full-time students in the UK, an average of £512 was spent on direct course costs such as books, computers, and equipment (Maher et al. 2018), nearly half compared to their US counterparts. Furthermore, financial difficulties for students might be less stark in Europe, since public universities in several European countries, such as Germany or France, charge considerably lower fees than in the USA, while some public universities in countries such as Norway, Denmark, and Greece offer completely free tuition to European nationals. As a result, the lower financial burden of books may account for the lower OER adoption rates, and subsequently research, in Europe. Acknowledging and aiming to address this fragmented and sporadic use of OER in the European context, the 'Opening up Education' initiative (European Commission 2013) included measures and proposals towards more open learning environments, such as the launch of a single gateway for OER produced in Europe. Furthermore, workshops with experts organised by the European Commission envisioned that by 2030, adaptable OER in all languages will be abundant, while knowledge and content will be accessible to all for free (Munoz et al. 2013).

2.4   Student Perceptions

Despite the mixed findings on course grades, the aforementioned studies have shown that students who have used OER view these resources in a positive light. Hilton and his colleagues (2013), for example, showed that 83% of students agree that the OER materials adequately supported the work they did in class, while three in four students would recommend these materials to their classmates. Furthermore, in another study, an overwhelming 95% of students agreed that OER materials are 'easy to use' and provide access to more up-to-date materials than print textbooks (78%; Feldstein et al. 2012). Concerning the potential for OER use, according to Florida Virtual Campus's large-scale survey (2019), most respondents were positive

and open to using them in the future. Another large US survey showed that four in five students felt they would do significantly better in a course if textbooks were available free online and buying a hard copy was optional (Senack 2014). Although UK Open University's OER Research Hub found that only 39% of students reported that their test scores actually improved, the finding that three in five students felt increased satisfaction with the learning experience thanks to OER is promising (Weller et al. 2015). Clearly, increased student familiarity and satisfaction with OER are important contributing factors, but it is possible that greater OER adoption will in turn lead to more of a focus on learning strategies to further lead towards improved learning outcomes. Providing student access to learning materials is vital, but so too is furnishing them with the skills and knowledge for how best they can make use of those materials.

Overall, students increasingly view OER positively. With students' frustrations revolving around bookstore buy-back, teachers insisting on students having the newest editions, and purchasing textbooks that are rarely used (Martin et al. 2017), OER are viewed as a promising alternative.

2.5 Faculty Perceptions

Faculty staff also appear concerned about escalating textbook-related expenses and are seeking ways to alleviate financial pressures on students. Responses from over 4,000 faculty and department chairpersons in the USA have shown that 61% of participants either strongly agree or agree that the cost of course materials is a serious problem for their students (Seaman and Seaman 2018). Department chairpersons, in particular, overwhelmingly agree that making textbooks less expensive for students would be the most significant improvement to course materials (ibid). Although it is hopeful that faculty awareness of OER has increased, with 46% of faculty now aware of OER compared to 34% three years ago, only 16% of faculty have adopted free or open textbooks (ibid). When asked whether they will use OER in three years' time, only 6% of faculty replied positively, while 32% indicated that they would consider it (ibid). Another study in a large private religious university in the USA showed that an overwhelming majority (90%) of faculty members were open to the notion of using OER as long as they were 'suitable', or at least equal in quality to what they are currently using (Martin et al. 2017). Three in four faculty members indicated that this openness to OER was mainly driven by a desire to help students save money or to alleviate the cost of education.

Faculty members in the UK also appear positive about the potential of OER. As a survey among 96 UK educators indicated, the majority of educators appear open to using them in the future (Pitt et al. 2019). However, four in five (82%) do not currently use open textbooks in their teaching, while nearly half of respondents (47%) were unaware of open textbooks (ibid). Lack of awareness has also been observed in other parts of the world; 43% of Mongolian educators and administrators, for instance, have never heard of OER before (Zagdragchaa and Trotter 2017),

while 54% of Nigerian academics and librarians were not aware of their university's participation in an OER initiative (Zaid and Alabi 2020). Another study in the UK has shown that, although only 44% believed that OER use resulted in better test scores for students, two in three educators agreed or strongly agreed that OER increased student satisfaction with the learning experience (Weller et al. 2015). Furthermore, that study showed strong evidence that OER use encourages educators to reflect on their own practice.

2.6   Affordances of OER Textbooks

The benefits from OER are manifold. On the student level, replacing traditional textbooks alleviates financial frustrations and enables all students to have access to quality education. Drawing on information about OER use at more than 4,000 institutions, Allen (2018) estimated that OER have saved students, parents, schools, and governments at least $1 billion. With students increasingly choosing not to purchase textbooks, OER can help them adequately prepare for their courses and potentially encourage them to enrol in more courses. The adaptability of open textbooks as opposed to more traditional print-based texts also represents the ways in which digital textbooks can function as a form of assistive technology, by being better able to adjust to the needs of learners with disabilities (Ellcessor 2014).

At the same time, OER content creators may also benefit from finding wider audiences for their work. Not only may their work receive recognition but they may also obtain feedback on their work. Concerning educators, a key benefit of OER is their adaptability. As a result, educators will be able to compare and use a variety of materials to deliver engaging courses. Furthermore, OER materials tend to be more frequently updated and flexible compared to traditional textbooks, resulting in more up-to-date, customisable content. Given the aforementioned evidence that OER use encourages educators to reflect on their own practice (Weller et al. 2015), these resources may lead to higher quality courses. Finally, OER can facilitate remote learning and distance programmes, which may be a valuable source of funding for institutions – perhaps especially during times when physical access to places of learning is a challenge for educators and students alike.

The potential advantages of more access to learning metrics – pinpointing where and what students are struggling with before exams – can be a valuable source of data to improve learning outcomes. Studies such as Junco and Clem (2015) have provided some insights into how such data from digital textbook analytics can be used and acted upon in beneficial ways. In addition, social reading software such as Hypothesis, an open source platform that facilitates group annotations and communication between student users, are also useful for peer-based learning. In this way, digital textbook platforms can help to facilitate more discussions and social learning, affording more collaborative learning experiences.

In recent years, open source publishing tools such as Pressbooks, which feature a user-friendly blog editor-like interface, have made it easier for educators and

authors to produce and edit interactive OER textbooks that go much beyond simple PDF files that characterised many digital textbook efforts during the beginning of the twenty-first century. More widely known applications, such as Apple's iBooks Author and Amazon's Kindle Create, have also helped to significantly lower the barrier for entry of the creation and dissemination of such resources for use in classrooms and beyond. Going forward, one of the most promising aspects of OER textbooks is the ability to function across different platforms and formats so that student access and learning is not restricted to proprietary content controlled by a small number of companies or publishers. In an increasingly digital learning environment, functionality such as text search, copy and paste, and transferring notes and highlighting enables learning to occur beyond the textbook.

2.7   Limitations of OER

While OER in the form of digital textbooks have a number of advantages such as lower cost for students and schools, there are still drawbacks that are part of any decision to integrate such content into curricula. Two factors in particular are often intertwined. One is a question of access – while an increasing number of schools, students, and institutions are turning to digital content and have tablets and computer access, the question of digital access is still a pressing issue for some of the areas that need it most (Wei and Hindman 2011). Another is that for many already overtaxed educators and instructors, the learning curve for how to both find quality content and incorporate it into existing learning systems can be daunting (Grönlund et al. 2018; Petrides et al. 2011).

A number of online textbooks and courses are still only accessible with an active internet connection, which also raises questions of access for populations where continuous access to the internet is not a given; this in turn limits how much good online courseware can do for lower income populations without direct access to devices and internet. In a broader sense, even the ways in which questions of access are conceptualised by educators and policy-makers contribute to the ways in which issues are framed about how best to deal with questions of access. Attention to metaphoric language such as the 'digital divide' has interrogated the sometimes complicated ways that online and offline learning practices occur (Graham 2011).

It should also be emphasised that the move from print-based textbooks to digital texts brings with it a number of questions about trade-offs. One recent educational study explored the differences between comprehension and student perception of ease of use between print and digital textbooks (Singer and Alexander 2017). While the majority of students preferred digital texts and also read faster, comprehension was lower when textbooks were read on screens, with factors such as the disruptive element of scrolling and clicking as possible contributing factors in such comprehension differences. The mechanical elements – tapping, clicking, swiping – of digital navigation have been noted elsewhere (Mangen et al. 2013) and suggest that reading on screen has trade-offs that must be taken into account. Another large-scale

survey indicated that four in five students prefer to read course materials in paper format, reporting better focus and retention of information (Mizrachi et al. 2018). When reading in print, students appeared more likely to employ strategies – such as annotating, highlighting, and revisiting course materials – which facilitate metacognitive monitoring of the learning process and, subsequently, improve comprehension (Ben-Yehudah and Eshet-Alkalai 2018; Duke and Pearson 2008). Other researchers like Baron (2013) have shown that when students have indicated clear preferences for print over digital reading, factors such as tangibility of the medium and user interface may lead to further research exploration on how to reconceptualise reading strategies, given changes in the reading medium. There is much research still to be done on the effects of how the print and digital mediums shape the experience of reading.

Another important factor to consider is that reading on screens is tied to multitasking activities and potential distractions (Subrahmanyam et al. 2013), such as checking e-mail or social media notifications. According to one prominent cognitive psychology theory, the cognitive load theory, individuals have a limited processing capacity, and when unnecessary demands are imposed on the cognitive system, such as digital distractions, cognitive load is increased (Sweller 1988; Sweller et al. 2019). If cognitive load becomes too high, learning is hampered (Sweller et al. 2019). In this case, by rapidly switching between the coursework material and other websites, deep understanding of the learning materials might be compromised. Other related research has also indicated that students who transition from print-based reading to more screen-based textbook reading may require additional self-regulation skills to help mitigate multitasking and digital distraction behaviour that require different kinds of digital literacy strategies as well (Dobler 2015). There are increasing indications that some OER and digital textbook content is following the example of private textbook publishers, towards an increasing emphasis on online metrics, adaptive learning, and a more web-based model that goes beyond seemingly redundant extra digital features that traditional publishers had used to maintain their audience base in the previous decades.

E-books, however, still hold great promise and the literature has highlighted the importance of training on how to use them effectively. A usability study demonstrated a need for instruction on simple search strategies, such as spell checking, the limitations of the 'Ctrl-F' shortcut (which focuses on seeking out keywords, regardless of the context of the text as a whole), and how to develop search terms that will either broaden or narrow results as needed (Miller et al. 2019). Students who participated in that usability study overwhelmingly reported that they were more likely to use e-books in the future (ibid et al. 2019).

Finally, as already shown, faculty members are often not aware of what exactly OER are (Pitt et al. 2019) and subsequently do not understand the benefits arising from OER use to themselves, their institutions, students, and the wider community. Furthermore, they appear concerned about the quality of those resources (Martin et al. 2017). Given that the transition from traditional practices to OER is time- and effort-intensive, training and support might be essential for a fruitful incorporation of the OER into curricula (McGill 2014).

2.8 Potential Barriers

2.8.1 Funding

A significant barrier to OER adoption is financial. Although private donors, governments, and institutions are increasingly financing OER, those resources are still more prevalent in the USA. A notable moment in the OER movement was the UNESCO Paris OER Declaration in 2012, which 'calls on governments worldwide to openly license publicly funded educational materials for public use' (UNESCO 2012). The following subsections summarise key sources of funding for OER.

2.8.1.1 Private Funding

From as early as 2002, the Hewlett Foundation started funding OER programmes, being one of the first institutions to invest in this field. This foundation offers grants targeted to K-12, postsecondary education, and infrastructure development, and has donated more than $170 million so far (Bliss and Smith 2017). Aiming to promote OER in different countries, the Hewlett Foundation collaborates with UNESCO, which monitors and supports global progress in adopting OER through regional and national workshops (UNESCO n.d.). It also collaborates with the Commonwealth of Learning, an intergovernmental organisation committed to promoting and developing distance education and open learning (Commonwealth of Learning n.d.). Another significant source of financial support has been offered by The Bill and Melinda Gates Foundation, which has funded projects such as the Open Learning Initiative and the University of the People, that is, the world's first tuition-free, non-profit, online academic institution based on the principles of e-learning and coupled with open-source technology and OER (University of the People n.d.).

2.8.1.2 Government Funding

In 2015, the US Department of Education's #GoOpen initiative was launched as a means to support states and districts choosing to transition to the use of openly licensed educational resources to transform teaching and learning (Office of Educational Technology n.d.). Twenty states and 121 districts are currently participating in this initiative (ibid). OER are also widespread in Canada; in 2019, for instance, British Columbia announced a funding of $3.26 million for OER (Caldwell 2019). In the European context, however, there appears to be markedly less emphasis on OER. In the UK, between 2009 and 2012 the Higher Education Funding Council for England invested in the UK Open Educational Resources programme to promote free sharing and reuse of high-quality learning resources worldwide (JISC n.d.). Today, however, little funding is currently available for OER in the UK. Similarly, in Germany, it was only in 2016 that an important step towards OER

was taken, with the launch of the nationally funded OERinfo. Compared to the large programmes on digitisation, however, the funding for this project has been considered minimal (Hoosen and Butcher 2019).

2.8.1.3 Institutional Funding

Open Education Global is an important network, which, consisting of hundreds of higher education institutions, aims to support the development and use of open education around the world (Open Education Global n.d.). One of its sustaining members is the Massachusetts Institute of Technology (MIT), whose MIT OpenCourseWare (OCW) offers the materials from 2,400 undergraduate and graduate courses to be used by anyone. This initiative started in 2002 and has fuelled the OpenCourseWare movement, which aims to supply online lectures, readings, and other high-quality educational resources to anyone for free. There are currently several universities offering OpenCourseWare materials, such as the University of Michigan, Carnegie Mellon University, Yale, and Open University. Another major initiative is OpenStax, a non-profit educational initiative based at Rice University, aiming 'to give every student the tools they need to be successful in the classroom' (OpenStax n.d.). OpenStax publishes openly licensed college textbooks, which have been estimated to have saved 9 million students over $830 million since 2012 (Ruth 2019). In Asia, China was one of the first countries to adopt and promote OER, where the China Open Resources for Education was established in 2003; 222 members of this consortium have made available materials from 750 courses (OECD 2007). Finally, in the UK context, the Open University launched the OpenLearn platform in 2006, which currently includes over 900 short courses free of charge.

2.8.2 Copyright and Open Textbooks

Open that allow for the ability to share, reuse, and amend content is a central principle upon which OER are built. Awareness of educators at the secondary and higher education levels about copyrighted textbooks seems to vary, while the awareness of Creative Commons licensing has shown a slow but steady increase over recent years (Seaman and Seaman 2017). Some guiding principles on copyright and what defines successfully 'open' content are outlined by Wiley (2014) in the Five R's (Retain, Revise, Remix, Reuse, Redistribute), which also explains that the initial technical choices about format and editing and sourcing can have longer term repercussions for the open content; open content must be able to evolve along with the platforms that contain it. Examples of governmental efforts to stimulate further growth towards initiatives such as the U.S. Affordable College Textbook Act (2019) have generated a debate about the potential for further OER adoption.

2.8.3 Dissemination and Resource Sharing

One of the strengths of OER is the potential for wide dissemination far beyond geographical boundaries. Beyond private and government funding, the future of OER likely depends on the growth of such communities that can increase awareness and continue to provide an open-source approach to learning and education practices. In one such example, librarians in British Columbia formed a community of practice that allows for greater advocacy of OER materials, knowledge sharing, and faculty outreach and awareness (Smith and Lee 2017). Non-profit organisations such as ISKME (the Institute for the Study of Knowledge Management in Education) and their OER Commons database serve as excellent examples for the kind of far-reaching effects that connected networks of educators and teachers can accomplish together. In addition, international efforts such as SPARC (the Scholarly Publishing and Academic Resources Coalition) show the rapidly growing desire to increase access and awareness of OER best practices, spanning collaborations from North America, Europe, Africa, and Asia. Larger tech companies such as Amazon and the Amazon Inspire platform (Young 2018) have the potential to reach large online audiences, but also sit uneasily between the non-commercial nature of OER and the private business models of such large companies.

2.8.4 Textbooks and Courses

As textbooks become more web-like, another question for the near future is whether textbooks will continue to be conceptualised as textbooks as we currently know them. Following other forms of online content – such as the disaggregation of music content from albums as the unit of purchase to individual songs – digital textbook content may follow a similar model (Bakos and Brynjolfsson 2001). Perhaps of even greater implication, the lines between online textbooks and online courses may continue to become blurred, and it may become harder to distinguish where a textbook as a form of content begins and ends within the context of an online course shaped around that textbook structure.

OpenStax, one of the most prominent providers of OER textbooks, has also in recent years experimented with a blending of their open textbook offerings with a more comprehensive online course called OpenStax Tutor (n.d.). At the time of publication, this program is still in Beta and content primarily consists of Physics, Biology, and Sociology. What such experiments suggest for the near future, however, is a reconceptualisation of how textbook content may become increasingly more interchangeable with online and Massive Open Online Course (MOOC) content. Related to our earlier discussion of content, the question of use and copyright again poses future questions that trouble the relationship of OER material to more commercial kinds of educational content: for example, what happens when openly accessible material under Creative Commons licence is in turn used as part of a paid

access online course? These potential ethical concerns have already manifested in a small number of lawsuits between content creators and companies, the outcomes of which are pending.

One of the barriers to more widespread OER digital adoption is where it fits within already existing curricula and plans already being used in classrooms and courses. Traditional publishers such as Pearson and other content providers such as Cengage gravitate towards all-inclusive access models, sometimes referred to as a 'Netflix for textbooks' which would encourage classes and entire institutions to subscribe to large-scale commitments for access to entire catalogues of textbooks.

2.9   Conclusion: Looking Towards the Near Future of OER Textbooks

Textbooks have been traditionally the dominant pedagogical tool in higher education institutions. The financial burden of purchasing textbooks, however, has been increasingly afflicting students. Struggling to cope with these costs, students often decide against buying coursework materials, take fewer courses, or even drop classes. OER have often been considered as a solution to this problem and over the last two decades, private donors and governments have been increasingly funding OER initiatives. Although such initiatives have been spotted worldwide, the OER model is more prevalent in the USA. The higher costs associated with book supplies for the US students compared to other parts of the world might be a key motivating factor for the OER trend in the USA. Both students and faculty members appear to view these resources in a positive light. The adoption rates, however, are low and subsequently the impact of OER use on student outcomes is under-researched. Although there are currently barriers and potential drawbacks to OER use, their affordances are vast and OER hold a tremendous promise for more open education, breaking down financial and accessibility barriers.

The worldwide COVID-19 pandemic during 2020 has shown, with the restriction of access to physical library collections and physical learning spaces, what the near future of OER might look like. With changes to how users and students now access textbooks and learning content, research concerning how best to utilise and disseminate digital educational content best practices feels more pressing than ever before. Our intention in this chapter has been to provide some context of current OER projects and to suggest ways that future research can continue to understand the still changing landscape of learning in an increasingly digital context. Some possible areas to consider include: what might different platforms enable and yet restrict for users of different demographics and levels of accessibility? What barriers still exist in terms of education, policy, and technology that can be explored and worked through in the near future? As publishing models continue to evolve with digital technology, what will incentivise high-quality publications to continue to be created and disseminated? Will an increasingly online educational community mean that an 'economy of sharing' can continue to expand the reach of OER?

The tagline for the SPARC Europe website (n.d.) is an apt closing thought: 'Setting the Default to Open'. Could there be a time in our not so distant future in which OER are the default? What changes to learning and life might this entail for our world's populations? All of these questions are an evolving process. We hope that this chapter will be a bridge between what work has been done with current OER projects and the near future of what might be to come.

References

Affordable College Textbook Act, S. 1036, 116th Cong. (2019–2020). Retrieved from https://www.congress.gov/bill/116th-congress/senate-bill/1036/text

Allen, N. (2018). $1 billion in savings through open educational resources. *SPARC*. Retrieved from https://sparcopen.org/news/2018/1-billion-in-savings-through-open-educational-resources/

Bakos, Y., & Brynjolfsson, E. (2001). Aggregation and disaggregation of information goods: Implications for bundling, site licensing, and micropayment systems. In H. Werthner & M. Bichler (Eds.), *Lectures in e-commerce* (pp. 103–122). Vienna: Springer.

Baron, N. S. (2013). Redefining reading: The impact of digital communication media. *PMLA, 128*(1), 193–200.

Ben-Yehudah, G., & Eshet-Alkalai, Y. (2018). The contribution of text-highlighting to comprehension: A comparison of print and digital reading. *Journal of Educational Multimedia and Hypermedia, 27*(2), 153–178.

Bliss, T. J., & Smith, M. (2017). A brief history of open educational resources. In R. S. Jhangiani & R. Biswas-Diener (Eds.), *Open: The philosophy and practices that are revolutionizing education and science* (pp. 9–27). London: Ubiquity Press.

Borchard, L., & Magnuson, L. (2017). Library leadership in open educational resource adoption and affordable learning initiatives. *Urban Library Journal, 23*(1), 1–13.

Caldwell, J. (2019, September 4). $3.26M pledged to OER to enable student savings throughout the province. *BCcampus.* Retrieved from https://bccampus.ca/2019/09/04/3-26m-pledged-to-oer-to-enable-student-savings-throughout-the-province/

Commonwealth of Learning. (n.d.). *About the commonwealth of learning*. Retrieved from https://www.col.org/about/

Dobler, E. (2015). E-textbooks: A personalized learning experience or a digital distraction? *Journal of Adolescent & Adult Literacy, 58*(6), 482–491.

Duke, N., & Pearson, D. P. (2008). Effective practices for developing reading comprehension. *The Journal of Education, 189*, 107–122.

Ellcessor, E. (2014). < ALT="Textbooks">: Web accessibility myths as negotiated industrial lore. *Critical Studies in Media Communication, 31*(5), 448–463.

European Commission. (2013). 'Opening up education': Innovative teaching and learning for all through new technologies and open educational resources. *EUR-Lex*. Retrieved from http://ec.europa.eu/education/news/doc/openingcom_en.pdf

Feldstein, A., Martin, M., Hudson, A., Warren, K., Hilton, J., & Wiley, D. (2012). Open textbooks and increased student access and outcomes. *European Journal of Open, Distance and E-learning*. Retrieved from https://www.eurodl.org/?p=archives&year=2012&halfyear=2&article=533

Fischer, L., Hilton, J., Robinson, T., & Wiley, D. (2015). A multi-institutional study of the impact of open textbook adoption on the learning outcomes of post-secondary students. *Journal of Computing in Higher Education, 27*(3), 159–172.

Florida Virtual Campus. (2019). *2018 student textbook and course materials survey: Results and findings*. Tallahassee, FL: Florida Virtual Campus. Retrieved from https://dlss.flvc.org/docu

ments/210036/1314923/2018+Student+Textbook+and+Course+Materials+Survey+Report
+%2D%2D+FINAL+VERSION+%2D%2D+20190308.pdf/07478d85-89c2-3742-209a-9
cc5df8cd7ea

Graham, M. (2011). Time machines and virtual portals: The spatialities of the digital divide. *Progress in Development Studies, 11*(3), 211–227.

Grewe, K., & Davis, W. P. (2017). The impact of enrollment in an OER course on student learning outcomes. *The International Review of Research in Open and Distributed Learning, 18*(4), 231–238.

Green, C., & Wetzler, J. (2019). We support the UNESCO Recommendation on OER. *Creative Commons*. Retrieved from https://creativecommons.org/2019/10/24/we-support-unesco-oer/

Grönlund, Å., Wiklund, M., & Böö, R. (2018). No name, no game: Challenges to use of collaborative digital textbooks. *Education and Information Technologies, 23*(3), 1359–1375.

Hilton, J., Gaudet, D., Clark, P., Robinson, J., & Wiley, D. (2013). The adoption of open educational resources by one community college math department. *The International Review of Research in Open and Distributed Learning, 14*(4), 38–50.

Hilton, J., Fischer, L., Wiley, D., & Williams, L. (2016). Maintaining momentum toward graduation: OER and the course throughput rate. *The International Review of Research in Open and Distributed Learning, 17*(6), 18–27.

Hoosen, S., & Butcher, N. (2019). *Understanding the impact of OER: Achievements and challenges*. Moscow: UNESCO. Retrieved from https://iite.unesco.org/wp-content/uploads/2019/04/Understanding_the_impact_of_OER_2019_final.pdf

Jhangiani, R., & Jhangiani, S. (2017). Investigating the perceptions, use, and impact of open textbooks: A survey of post-secondary students in British Columbia. *International Review of Research in Open and Distributed Learning, 18*(4). Retrieved from http://www.irrodl.org/index.php/irrodl/article/view/3012/4214

JISC. (n.d.). Open education. *JISC*. Retrieved from https://www.jisc.ac.uk/rd/projects/open-education

Junco, R., & Clem, C. (2015). Predicting course outcomes with digital textbook usage data. *The Internet and Higher Education, 27*, 54–63.

Ma, J., Baum, S., Pender, M., & Libassi, C. (2019). *Trends in college pricing 2019*. New York: College Board. Retrieved from https://research.collegeboard.org/pdf/trends-college-pricing-2019-full-report.pdf

Maher, J., Rooney, K., Toomse-Smith, M., Kiss, Z., Pollard, E., Williams, M., ... Hunt, W. (2018). *Student income and expenditure survey 2014 to 2015*. London: Department of Education. Retrieved from https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/693184/Student_income_and_expenditure_survey_2014_to_2015.pdf

Mangen, A., Walgermo, B. R., & Brønnick, K. (2013). Reading linear texts on paper versus computer screen: Effects on reading comprehension. *International Journal of Educational Research, 58*, 61–68.

Martin, M. T., Belikov, O. M., Hilton, J., Wiley, D., & Fischer, L. (2017). Analysis of student and faculty perceptions of textbook costs in higher education. *Open Praxis, 9*(1), 79–91.

McGill, L. (2014). Open educational resources (OERs). *JISC*. Retrieved from https://www.jisc.ac.uk/full-guide/open-educational-resources#

Miller, E., Rodriguez, A., & Smith, S. (2019). Assessing information interaction to improve library ebook collections and services. *Journal of Electronic Resources Librarianship, 31*(2), 66–78.

Mizrachi, D., Salaz, A. M., Kurbanoglu, S., & Boustany, J. (2018). Academic reading format preferences and behaviors among university students worldwide: A comparative survey analysis. *PLoS One*, *13*. Retrieved from https://journals.plos.org/plosone/article?id=10.1371/journal.pone.0197444

Munoz, J. K., Redecker, C., Vuorikari, R., & Punie, Y. (2013). Open education 2030: Planning the future of adult learning in Europe, open learning. *The Journal of Open, Distance and e-Learning, 28*(3), 171–186.

Nusbaum, A., Cuttler, C., & Swindell, S. (2020). Open educational resources as a tool for educational equity: Evidence from an introductory psychology class. *Frontiers in Education, 4*(152), 1–8.

OECD. (2007). *Giving knowledge for free: The emergence of open educational resources*. Retrieved from http://www.oecd.org/education/ceri/38654317.pdf

OECD. (2019). *Education at a glance 2019*. Retrieved from https://www.oecd.org/education/education-at-a-glance/EAG2019_CN_GRC.pdf

Office for students. (2018). *Value for money: The student perspective*. London: Trendence, UK. Retrieved from https://studentsunionresearch.files.wordpress.com/2018/03/value-for-money-the-student-perspective-final-final-final.pdf

Office of Educational Technology. (n.d.). *#GoOpen States*. U.S. Department of Education. Retrieved from https://tech.ed.gov/open/states/

Open Education Global. (n.d.). *What we do*. Retrieved from https://www.oeglobal.org/about-us/what-we-do/

OpenStax. (n.d.). *Access. The future of education.* Retrieved from https://openstax.org/details/books/

OpenStax Tutor. (n.d.). *Discover a new frontier in education.* Retrieved from https://tutor.openstax.org

Petrides, L., Jimes, C., Middleton-Detzner, C., Walling, J., & Weiss, S. (2011). Open textbook adoption and use: Implications for teachers and learners. *Open Learning: The Journal of Open, Distance and e-Learning, 26*(1), 39–49.

Pitt, R., Farrow, R., Jordan, K., de los Arcos, B., Weller, M., Kernohan, D., & Rolfe, V. (2019). *The UK open textbooks report*. Open Education Research Hub. Retrieved from http://oro.open.ac.uk/61587/1/UK%20Open%20Textbook%20Report%20.pdf

Robinson, T. (2015). *The effects of open educational resource adoption on measures of postsecondary student success*. Brigham Young University thesis. Retrieved from https://scholarsarchive.byu.edu/cgi/viewcontent.cgi?article=6814&context=etd

Ruth, D. (2019). More than half of all colleges and 2.94 million students using free OpenStax textbooks this year. *OpenStax*. Retrieved from https://openstax.org/press/more-half-all-colleges-and-294-million-students-using-free-openstax-textbooks-year

Seaman, J. E., & Seaman, J. (2017). *Opening the textbook: Educational resources in US higher education, 2017*. Babson Survey Research Group. Retrieved from https://files.eric.ed.gov/fulltext/ED582411.pdf

Seaman, J. E., & Seaman, J. (2018). *Freeing the textbook: Educational resources in U.S higher education, 2018.* Babson Survey Research Group. Retrieved from https://www.onlinelearning-survey.com/reports/freeingthetextbook2018.pdf

Senack, E. (2014). *Finding the broken textbook market: How students respond to high textbook costs and demand alternatives*. Washington, DC: The Student PIRGs. Retrieved from https://uspirg.org/sites/pirg/files/reports/NATIONAL%20Fixing%20Broken%20Textbooks%20Report1.pdf

Singer, L. M., & Alexander, P. A. (2017). Reading across mediums: Effects of reading digital and print texts on comprehension and calibration. *The Journal of Experimental Education, 85*(1), 155–172.

Smith, B., & Lee, L. (2017). Librarians and OER: Cultivating a community of practice to be more effective advocates. *Journal of Library & Information Services in Distance Learning, 11*(1–2), 106–122.

SPARC Europe. (n.d.). *Setting the default to open.* Retrieved from https://sparceurope.org

Subrahmanyam, K., Michikyan, M., Clemmons, C., Carrillo, R., Uhls, Y., & Greenfield, P. (2013). Learning from paper, learning from screens: Impact of screen reading and multitasking conditions on reading and writing among college students. *International Journal of Cyber Behavior, Psychology and Learning, 3*(4), 1–27.

Sweller, J. (1988). Cognitive load during problem solving: Effects on learning. *Cognitive Science, 12*, 257–285.

Sweller, J., van Merriënboer, J. J. G., & Paas, F. (2019). Cognitive architecture and instructional design: 20 years later. *Educational Psychology Review, 31*(2), 261–292.

UNESCO. (2012). *The Paris OER declaration 2012*. Retrieved from https://en.unesco.org/oer/paris-declaration

UNESCO. (n.d.). *Open educational resources*. Retrieved from https://en.unesco.org/themes/ict-education/oer

University of the People. (n.d.). *University of the people: The education revolution*. Retrieved from https://www.uopeople.edu

Wei, L., & Hindman, D. B. (2011). Does the digital divide matter more? Comparing the effects of new media and old media use on the education-based knowledge gap. *Mass Communication and Society, 14*(2), 216–235.

Weller, M., de los Arcos, B., Farrow, R., Pitt, R., & McAndrew, P. (2015). The impact of OER on teaching and learning practice. *Open Praxis, 7*(4), 351–361.

Wiley, D. (2014) The access compromise and the 5th R. *Open content.* Retrieved from https://opencontent.org/blog/archives/3221

Young, J. (2018). Amazon's education hub, Amazon Inspire, has quietly restored 'sharing' function. *EdSurge*. Retrieved from https://www.edsurge.com/news/2018-01-11-amazon-s-education-hub-amazon-inspire-has-quietly-restored-sharing-function

Zaid, Y. A., & Alabi, A. O. (2020). Sustaining open educational resources (OER): Initiatives in Nigerian universities. *Open Learning: The Journal of Open, Distance and e-Learning*, 1–18.

Zagdragchaa, B., & Trotter, H. (2017). Cultural-historical factors influencing OER adoption in Mongolia's higher education sector. In C. Hodgkinson-Williams & P. B. Arinto (Eds.), *Adoption and impact of OER in the Global South* (pp. 389–424). Cape Town & Ottawa: African Minds, International Development Research Centre & Research on Open Educational Resources.