



**A Study on Open Educational
Resources and Their Potential
for Use at Texas Colleges
and Universities**

October 2014

Academic Planning and Policy

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Texas Higher Education Coordinating Board

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Mission of the Coordinating Board

The Texas Higher Education Coordinating Board promotes access, affordability, quality, success, and cost efficiency in the state's institutions of higher education, through Closing the Gaps and its successor plan, resulting in a globally competent workforce that positions Texas as an international leader in an increasingly complex world economy.

Vision of the Coordinating Board

The THECB will be recognized as an international leader in developing and implementing innovative higher education policy to accomplish our mission.

Philosophy of the Coordinating Board

The THECB will promote access to and success in quality higher education across the state with the conviction that access and success without quality is mediocrity and that quality without access and success is unacceptable.

The Texas Higher Education Coordinating Board does not discriminate on the basis of race, color, national origin, gender, religion, age or disability in employment or the provision of services.

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Executive Summary

During the 83rd Texas Legislature, Regular Session, the Texas Higher Education Coordinating Board (THECB or Coordinating Board) was directed to undertake a study with the Virtual College of Texas (VCT) on the availability and use of open educational resources (OER) as described in Section 52 of the General Appropriations Act. Section 52 reads, in its entirety, as follows:

Out of funds appropriated above, the Texas Higher Education Coordinating Board, in consultation with the Virtual College of Texas, shall study and recommend policies regarding the availability and use of open educational resources in Texas. Open Educational Resources include teaching, learning, and research resources that reside in the public domain or have been released under an intellectual property license that permits their free use or re-purposing by others. The report shall include recommendations for professional development programs to support faculty at institutions of higher education in using these resources. The report shall also include recommendations for how to establish a statewide digital repository for all open educational resources developed with state funds, and methods for encouraging the use of open educational resources at public and private institutions of higher education. The study results and recommendations shall be reported to the Legislative Budget Board and Governor no later than December 1, 2014.

After an analysis of the current research on open educational resources, the Coordinating Board, in consultation with the VCT, makes the following recommendations regarding the use of OER at Texas public institutions of higher education.

- Any open educational resources developed with public funds should be licensed under a Creative Commons license of Attribution-NonCommercial-ShareAlike (BY-NC-SA), Attribution (BY), or Attribution-ShareAlike (BY-SA) (see Appendix A for more information about these terms).
- Efforts made by the state or other organizations should initially focus on the development of OER content for lower-division, general education courses constituting the greatest statewide enrollments.
- Texas' public institutions of higher education should work with faculty to create policies that encourage the development and usage of OER materials. Any OER materials developed with public funds should include a policy for ongoing periodic reviews of the material to ensure they remain aligned with best practices in curriculum and instructional design.
- Texas' higher education faculty should have access to professional development materials that can assist them in developing and using open

educational resources. Higher education faculty could be made aware of these materials via an integrated resource awareness program.

- Any open educational resources developed with state funds should align with industry standards for tagging metadata and also should align with accessible design standards.
- The Coordinating Board's Learning Technology Advisory Committee (LTAC) should be involved in actively monitoring state and national developments in the field of open educational resources to make recommendations to the Coordinating Board and Texas' public institutions of higher education, as needed.
- The Texas Learning Objects Repository (TxLOR), a web application used by public institutions of higher education in Texas to review and share learning materials, should be expanded.
- Before the development of any statewide open educational resources initiative, further study of other state initiatives for the development and dissemination of open educational resources, such as those found in Florida, California, and Washington, should be undertaken.

Introduction

Legislative Direction

Section 52 of the General Appropriations Act, Senate Bill 1, of the 83rd Texas Legislature directs the Texas Higher Education Coordinating Board, in consultation with the Virtual College of Texas, to undertake a study on the availability and use of open educational resources. This section states:

Out of funds appropriated above, the Texas Higher Education Coordinating Board, in consultation with the Virtual College of Texas, shall study and recommend policies regarding the availability and use of open educational resources in Texas. Open Educational Resources include teaching, learning, and research resources that reside in the public domain or have been released under an intellectual property license that permits their free use or re-purposing by others. The report shall include recommendations for professional development programs to support faculty at institutions of higher education in using these resources. The report shall also include recommendations for how to establish a statewide digital repository for all open educational resources developed with state funds, and methods for encouraging the use of open educational resources at public and private institutions of higher education. The study results and recommendations shall be reported to the Legislative Budget Board and Governor no later than December 1, 2014.¹

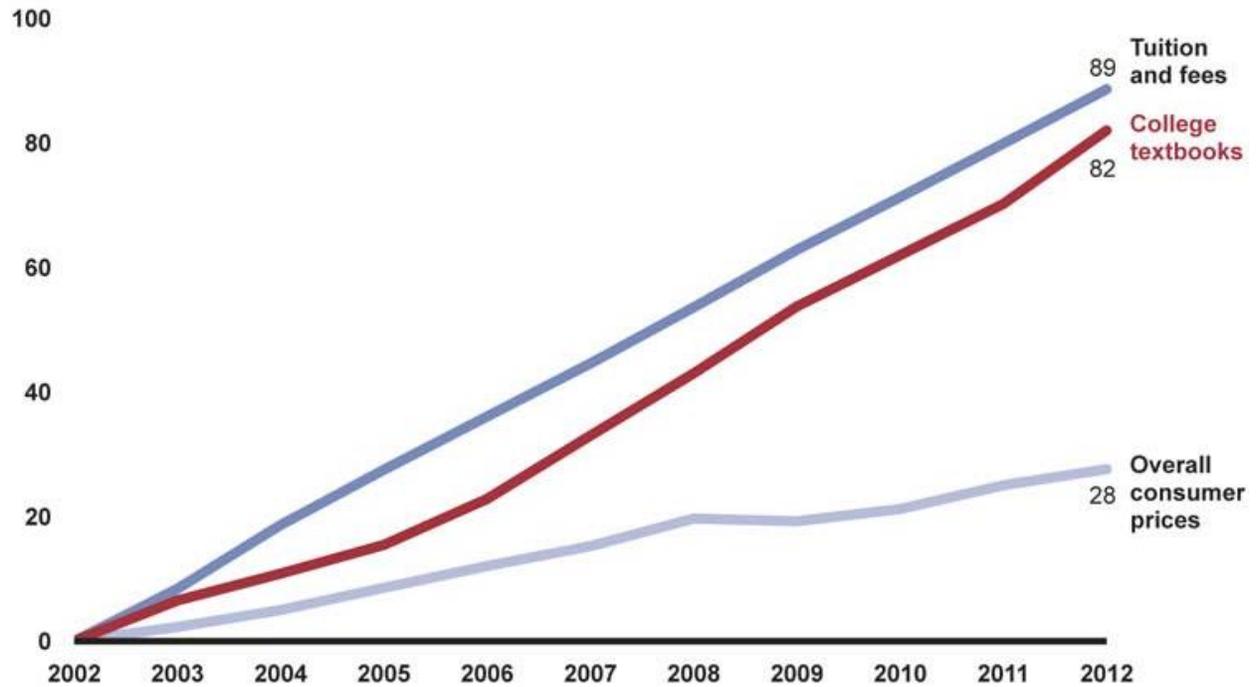
Rising Costs of Textbooks and Learning Resources

There has been a great deal of public discussion during the last several years concerning the rising costs of college attendance. These discussions have spawned a number of efforts to reduce college costs in an attempt to not only make college attendance more affordable but also more accessible. While many of these conversations focus on decreasing the cost of tuition and fees, others attempt to address the rising costs of student learning resources, especially textbooks. In a 2013 study produced to fulfill the requirements of the Higher Education Opportunities Act, the United States Government Accountability Office reported that between 2002 and 2012, textbook prices rose an average of 6 percent per year, a rate that was only slightly less than the 7 percent increase in tuition and fees. This equated to an 82 percent increase in textbook costs between 2002 and 2012, a rate that, as Figure 1 demonstrates, is significantly higher than the 28 percent increase in overall consumer prices.²

¹ From 83rd Texas Legislature, *Conference Committee Report, 3rd Printing, Senate Bill (SB) No. 1 General Appropriations Bill*, Austin, TX.

² From U.S. Government Accountability Office, 2013, p. 6, *College Textbooks: Students Have Greater Access to Textbook Information*, Washington, DC: Government Printing Office. <http://gao.gov/assets/660/655066.pdf>.

Figure 1. Estimated Increases in New College Textbook Prices, College Tuition and Fees, and Overall Consumer Price Inflation, 2002 to 2012, Percent Increase Since 2002.

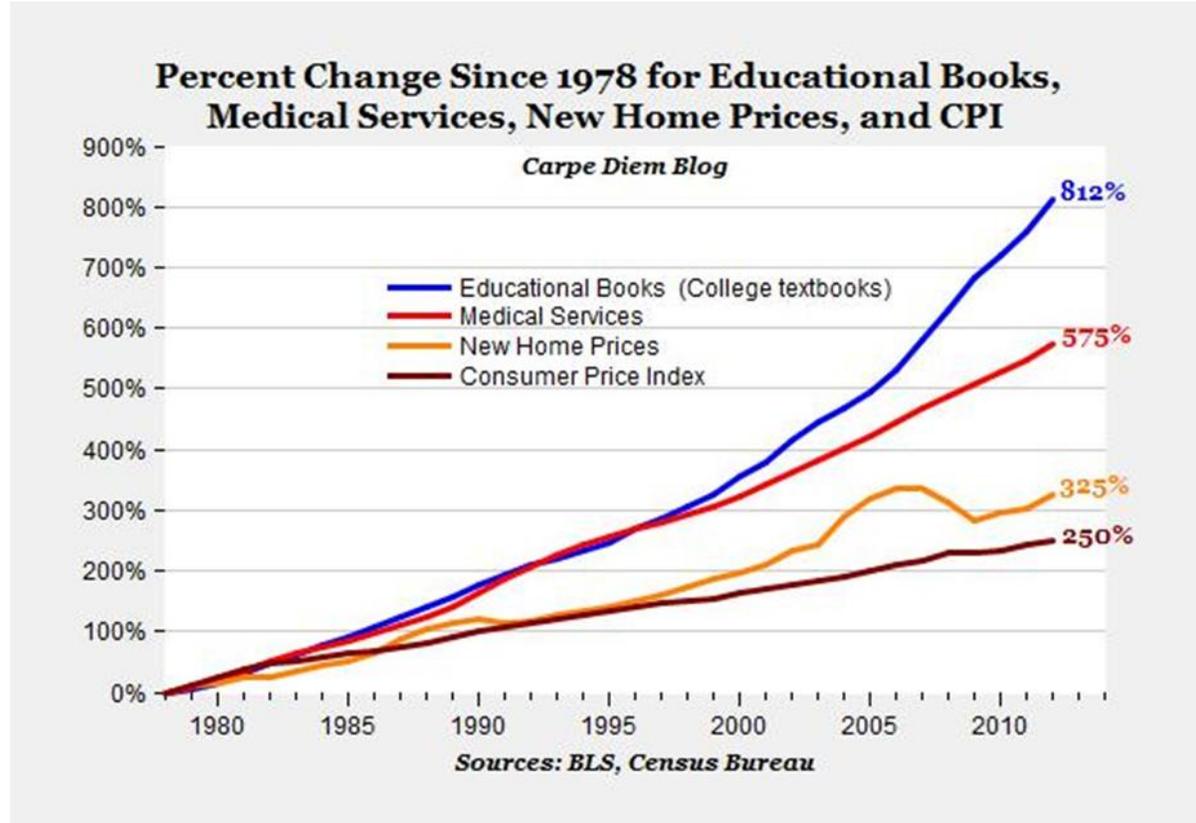


Source: Bureau of Labor Statistics' Consumer Price Index data.

The drastic nature of these increases is even sharper when viewed against the rise in the Consumer Price Index between 1978 and 2012 as evidenced in Figure 2.³

³ From "The College Textbook Bubble and How the 'Open Educational Resources' Movement is Going Up Against the Textbook Cartel" by M. J. Perry, 2012, *American Enterprise Institute*.

Figure 2. Percent Change since 1978 for Educational Books, Medical Services, New Home Prices, and CPI.



Despite the fact that the National Association of College Stores reported that expenditures on textbooks finally began to decline due to students increasingly turning to textbook rentals and digital materials, the costs of textbooks remain quite high. According to 2013 data compiled by the College Board, the average amount spent by students at public and private colleges and universities on books and supplies ranged from \$1,207 to \$1,253 per year. For students at public two-year community colleges, textbooks and supplies equaled approximately 39 percent of the costs of tuition and fees.⁴

These explosive textbook costs, coupled with an even more explosive increase in college tuition and fees, have a very real impact on both student access to college and their success once enrolled in college. In a study commissioned by the U.S. PIRG Education Fund, Ethan Senack reported that 65 percent of the students surveyed for the study indicated that they had decided not to buy a textbook because it was too expensive. These students were clearly aware, however, that this choice potentially jeopardized their ability to be successful; 94 percent of the students were concerned that their grades would suffer as a result of not purchasing the textbook. Additionally, almost half of the students surveyed indicated that the

⁴ From *Trends in College Pricing* by S. Baum and J. Ma, 2013, p. 11, New York: College Board.

cost of textbooks impacted their decision to take a course, sometimes decreasing the number of courses in which they enrolled.⁵

Why have textbook costs exploded? Much of the reason can be traced to the ways in which the market for textbooks functions. To begin with, five companies currently control more than 80 percent of what is an \$8.8 billion market.⁶ In addition to these monopolies, publishing companies also utilize several tactics that have historically reduced student choice and increased cost. According to Senack these tactics include:

- New editions, which are released every three to four years at an average increase in price of 12 percent.
- Expensive bundles packaged with materials such as passcodes to online content, which may not be used in class, can increase prices by 10 to 50 percent. Furthermore, the passcodes provide access to materials for only a limited time, usually no more than one semester, and are not reusable.
- Resale sabotage in which custom editions are sold that may appear to be more affordable on the surface. Because these editions may be customized for a specific professor or institution, the resale value is often negligible.⁷

Definitions of OER

In light of the increasing expense of learning materials, more faculty, institutions, and philanthropic organizations are experimenting with the development and use of open educational resources (OER). The term OER refers to

teaching, learning and research materials in any medium, digital or otherwise, that reside in the public domain or have been released under an open license that permits no-cost access, use, adaptation and redistribution by others with no or limited restrictions. Open licensing is built within the existing framework of intellectual property rights as defined by relevant international conventions and respects the authorship of the work.⁸

According to David Wiley, a preeminent scholar in the field of OER, four key components, known as the "4Rs," of this definition are central to all OER:

- *Reuse*: the right to reuse the content in its unaltered/verbatim form (e.g., make a backup copy of the content)
- *Revise*: the right to adapt, adjust, modify, or alter the content itself (e.g., translate the content into another language)
- *Remix*: the right to combine the original or revised content with other content to create something new (e.g., incorporate the content into a mashup)
- *Redistribute*: the right to share copies of the original content, the revisions, or the remixes with others (e.g., give a copy of the content to a friend).⁹

⁵ From *Fixing the Broken Textbook Market: How Students Respond to High Textbook Costs and Demand Alternatives* by E. Senack, 2013, pp. 4-5, Washington, DC: U.S. PIRG Education Foundation and The Student PIRGs.

⁶ From "The Future of Digital Textbooks" by N. Allen, 2013, p. 10, *Public Purpose*.

⁷ Senack, p. 8.

⁸ From "2012 Paris OER Declaration" by UNESCO, *2012 World Open Educational Resources Congress*.

⁹ From "Openness as Catalyst for an Educational Reformation," by D. Wiley, 2010, p. 16, *EDUCAUSE review* 45(4).

It is important to note that open and free are not synonymous. Learning materials that are free are only “open” if users have been granted the explicit rights to reuse, revise, remix, and redistribute.¹⁰

The idea of openness in education is not revolutionary in and of itself; as Wiley wrote in a 2010 article for EDUCAUSE, “Openness is the *sole* means by which education is affected. If a teacher is not *sharing* what he or she knows, there is no education happening. ... Education is sharing. Education is about being open.”¹¹ Wiley goes on to note, though, that the nature of openness is changing.

The Internet now makes it possible for digital expressions of knowledge to have the same magical, nonrivalrous quality as knowledge itself... This ability to give expressions of knowledge without giving them away provides us with an unprecedented capacity to share—and thus an unprecedented ability to educate... [T]he only legitimate role of new media and technology in education is to increase our capacity to be generous with one another. Because the more open we are, the better education will be.¹²

National and International Usage of Open Educational Resources

A Brief History of OER

In 1998, David Wiley, then a professor at Brigham Young University, coined the term “open content,” a precursor to the term open educational resources. Wiley’s use of the term helped move an already vibrant conversation about open platforms and open source software that was taking place in technology circles to higher education. Perhaps the earliest major repository of open content is Connexions. Founded by Rice University professor Richard Baranuk in 1999, the initial purpose of Connexions was to create a “dynamic digital educational ecosystem consisting of an educational content repository and a content management system optimized for the delivery of educational content.” By allowing anyone to contribute materials, but then vetting materials through volunteer reviewers, the materials in Connexions enjoys some quality assurance, unlike some other open learning repositories. In addition to serving as a repository, Connexions also provides users with a completely open source content delivery platform that can be used to host any of the material found in the repository.¹³

One of the most important developments of the nascent OER movement was the creation of Creative Commons. Building upon the 1998 creation of the Open Publication License, Larry Lessig founded the Creative Commons in 2001, an organization that developed and advocated for the use of a new set of media usage licenses meant to be easier to understand and easier to use when licensing new content. Also in 2001, the Massachusetts Institute of Technology (MIT), partially through funding from the William and Flora Hewlett Foundation,

¹⁰ From *Ruminations on Research on Open Educational Resources* by M. S. Smith, 2013, p. 7, Carnegie Foundation for the Advancement of Teaching.

¹¹ Wiley, p. 16.

¹² *Ibid*, pp. 16-17 and 20.

¹³ From “About Us” by Connexions.

began its OpenCourseWare initiative. Designed as a program that would make the materials and lectures found in almost every MIT course available online for free, it not only established MIT as a leader in the emerging field of OER but also lent legitimacy to the idea that quality content could be made freely available.¹⁴ As Charles M. Vest, then president of MIT, explained,

OpenCourseWare looks counter-intuitive in a market driven world. It goes against the grain of current material values. But it really is consistent with what I believe is the best about MIT. It is innovative. It expresses our belief in the way education can be advanced—by constantly widening access to information and by inspiring others to participate. Simply put, OpenCourseWare is a natural marriage of American higher education and the capabilities of the World Wide Web.¹⁵

(As an aside, the OpenCourseWare initiative also served as a precursor to MIT's development of the MOOC provider, edX.)

The next year, 2002, saw further advances in the development of open educational resources initiatives. Most notably was the establishment of Carnegie Mellon University's Open Learning Initiative (OLI), also funded in part through grants from the William and Flora Hewlett Foundation. Begun initially to leverage Carnegie Mellon's expertise in cognitive tutoring, OLI focused on developing adaptive learning software that could be made freely available. As Candice Thille, the original director of OLI, wrote,

OLI courses are not mere collections of material created by individual faculty to support traditional instruction. The original and most challenging goal of the project was to develop web-based learning environments that could support an individual learner who does not have the benefit of an instructor or class, to achieve the same learning outcomes as would be expected of a student completing the traditional course at Carnegie Mellon.¹⁶

Thus, Carnegie Mellon's Open Learning Initiative made an important and unique contribution to the nascent OER movement.¹⁷

Perhaps one of the most important organizations in the development and support of the early OER movement was the William and Flora Hewlett Foundation. Not only did the Foundation support several of the highest profile, early OER endeavors such as MIT's OpenCourseWare, Carnegie Mellon's Open Learning Initiative, and Rice University's Connexions, the Hewlett Foundation also supported the development of the Open CourseWare Consortium in 2006 and OpenLearn in 2006-07. In addition to providing support for many of the early innovators in OER, the foundation also provided support for research on OER effectiveness.

¹⁴ From "Expert Meeting on Open Educational Resources" by D. Wiley, p. 1, Organisation for Economic Co-operation and Development, Centre for Educational Research and Innovation.

¹⁵ From "MIT to Make Nearly All Course Materials Available Free on the World Wide Web," 2001, Massachusetts Institute of Technology.

¹⁶ From *Changing the Production Function in Higher Education* by C. Thille, 2012, p. 5, Washington, DC: American Council on Education.

¹⁷ For more information on OLI, especially the adaptive intelligence aspects of the program, please see Thille, C. and Smith, J. (2011). "Cold Rolled Steel and Knowledge: What Can Higher Education Learn About Productivity?" *Change: The Magazine of Higher Learning*. See also Cohon, J. L. (2012). "A Game Changer: The Open Learning Initiative," *Presidential Perspectives* (6).

The William and Flora Hewlett Foundation was not the only private entity interested in OER. These emerging discussions of OER became global in 2002 when the United Nations Educational, Scientific and Cultural Organization (UNESCO) held a forum in which the term “open educational resources” was first used and defined as the “technology-enabled, open provision of educational resources consultation, use and adaptation by a community of users for non-commercial purposes.”¹⁸ UNESCO continued to play an important role when its International Institute for Educational Planning launched an international discussion forum on OER, as well as publishing several overviews and reports on the OER movement.¹⁹

In September 2007, the Open Society Initiative and the Shuttleworth Foundation co-sponsored an international meeting in Cape Town, South Africa aimed at increasing the development of open educational resources, as well as the technology and educational practices needed to support their development and use. As a result of this meeting, the Cape Town Open Education Declaration was released on January 22, 2008. This declaration, signed by thousands of supporters that included numerous Americans, declared, “We are on the cusp of a global revolution in teaching and learning... These educators are creating a world where each and every person on earth can access and contribute to the sum of all human knowledge... It is built on the belief that everyone should have the freedom to use, customize, improve and redistribute educational resources without constraint.”²⁰ The declaration went on to suggest that governments and schools should make open education a “high priority” and that any policies on OER should “actively” involve both educators and learners.²¹

By 2006 and 2007, the role of OER had become widely discussed in the educational community. As a result of these conversations, additional repositories and types of open educational resources began to flourish. Perhaps one of the most famous and widely accessed repository is Khan Academy. Although not an OER learning objects repository in the strictest sense, the organization’s entire expansive video library is licensed under Creative Commons’ “Attribution-Non Commercial-Share Alike” licenses. Other major OER programs launched during this time period include OER Commons (a free digital library of OER materials), the Saylor Foundation’s Free Education Initiative, and Writing Commons, to name just a few.

As collections of OER materials proliferated, more emphasis was placed on how those materials could be woven together to create high-quality courses. For example, EDUCAUSE dedicated a cycle of its Next Generation Learning Challenges grants to the development of OER-based courses. Most notable among its funded projects was the Kaleidoscope Open Course Initiative, also known as Project Kaleidoscope. This project was a coalition of eight colleges led by Cerritos Community College in partnership with Thanos Partners and was dedicated to “working to dramatically reduce textbook costs and allow collaborative improvement of course design to improve student success.”²² In addition to developing OER materials through cross-institutional faculty teams, Project Kaleidoscope also incorporated existing OER into its redesigned courses, as well as leveraging embedded course assessments for continuous improvement and rubric-based student assessments that could result in deeper learning

¹⁸ Thille, 5.

¹⁹ From *Giving Knowledge for Free: The Emergence of Open Educational Resources*, Organisation for Economic Co-Operation and Development, 2007, p. 24.

²⁰ From *The Cape Town Open Education Declaration: Unlocking the Promise of Open Educational Resources*, Cape Town Declaration.

²¹ Ibid.

²² From *Grant Recipients: Cerritos Community College with Thanos Partners*, EDUCAUSE Next Generation Learning Challenges.

outcomes. Early project results not only showed success in reducing textbook costs but also improved student success rates 5 to 10 percent.²³

In more recent years, much of the public's attention has focused on the development of MOOCs – massive open online classes – and their potential for inexpensively scaling entire courses developed and offered by highly respected Tier One research institutions like MIT, Harvard, Stanford, The University of Texas at Austin, and others. One of the largest of the three major MOOC providers, edX, is the direct outgrowth of MIT's OpenCourseWare initiative. MOOCs are not strictly open educational resources, although they may be freely available to users.

Although MOOCs are designed for reuse – the first of Wiley's four characteristics of OER – they are not meant to be revised or remixed, and there are currently no provisions for their redistribution outside of the MOOC platforms on which they are built and distributed. MOOCs have certainly advanced the public discussion around the need to make a variety of educational resources freely available to the world, but their ease of use and the ways in which they can be adapted and used by wide numbers of institutions and faculty are problematic. Unlike OER textbooks and learning materials such as those housed in MERLOT Connexions, or Project Kaleidoscope, MOOCs are rarely licensed under Creative Commons. Furthermore, although they may be open in terms of course registration, they operate within a closed environment that does not invite faculty collaboration and the refinement or development of new resources. For example, the user license that Coursera requires all students to agree to states, "You may not otherwise copy, reproduce, retransmit, distribute, publish, commercially exploit or otherwise transfer any material, nor may you modify or create derivatives works of the material."²⁴

Creative Commons and the Licensing of OER

A key component in the use and development of open educational resources is the ability to find a copyright licensing structure that allows for ease of sharing, revision, and use. Created in 2001 with a mission to "develop, support, and steward legal and technical infrastructure that maximizes digital creativity, sharing, and innovation," Creative Commons is dedicated to "realizing the full potential of the Internet—universal access to research and education, full participation in culture—to drive a new era of development, growth, and productivity."²⁵ To date Creative Commons has released four iterations of its licenses, the first in 2003, and estimates that as of 2010 (the most recent estimation) there were over 400 million works using Creative Commons licenses.²⁶ Currently, Creative Commons offers six different types of licenses: Attribution, Attribution-No Derivatives, Attribution-Non Commercial-Share Alike, Attribution-Share Alike, Attribution-Non Commercial, and Attribution-Non Commercial-No Derivatives. Each license is comprised of three "layers" – legal code, human readable, and machine readable – in an effort to make licensing accessible to non-lawyers and to make embedding information easier so that materials are more searchable through the Internet. Appendix A outlines the characteristics of each license.²⁷ It is recommended that OER materials

²³ From "Innovative Projects by Lumen Learning," Lumen Learning.

²⁴ From "Terms of Use," Coursera.

²⁵ From "Mission and Vision," Creative Commons.

²⁶ From "Metrics/License Statistics," Creative Commons Wiki.

²⁷ From "About the Licenses," Creative Commons.

be licensed as either Attribution-Non Commercial-Share Alike, Attribution-Share Alike, or Attribution-Non Commercial for materials to have the widest possible impact.

National Repositories

There are currently several repositories and collections of national and state open educational resources that include materials that can be used by college and university faculty and students. The following list is not meant to be exhaustive but does highlight the major repositories that are currently available for faculty and/or student use.

Multimedia Educational Resources for Learning and Online Teaching (MERLOT). The Multimedia Educational Resources for Learning and Online Teaching (MERLOT) learning objects repository was created in 1999 through a consortium arrangement between the California State University Center for Distributed Learning, University of Georgia System, Oklahoma State Regents for Higher Education, University of North Carolina System, and the California State University System with an initial library of less than 4,000 learning materials. Within a year, the consortium had grown to include 23 systems and institutions of higher education. A central component of MERLOT's early development was to fund faculty from member institutions for the development of peer-reviewed digital learning materials, including the development of peer-reviewed evaluation standards for object inclusion into the repository. MERLOT currently contains more than 40,000 digital learning materials. There are currently more than 125,500 members of MERLOT and more than 80 institutional partners and affiliates; any member can contribute material. Unlike other repositories such as the National Repository of Online Courses, MERLOT functions primarily as a digital learning objects repository, and many of the materials truly are open because they can be reused, revised, remixed, and redistributed.

National Repository of Online Courses (NROC). Created by the Monterey Institute for Technology and Education, the NROC is a "community-guided, non-profit project focused on new models of digital content development."²⁸ NROC is partially funded through The William and Flora Hewlett Foundation, as well as the Bill and Melinda Gates Foundation. Although the resources in NROC and its companion site HippoCampus.org are free for both faculty and students to use, institutions also may join NROC for a fee to receive broader access to learning materials and institutionally branded content and sites that faculty and students can use. It's important to note that NROC functions as a digital repository of learning resources that are open only in the sense that they are freely available. Materials in NROC cannot be revised, remixed, or redistributed – the other three characteristics that are central in Wiley's definition of open educational resources.

Khan Academy. Created in 2008 as a 501(c)3 nonprofit organization with the goal of "changing education for the better by providing a free world-class education for anyone anywhere," Khan Academy consists of 6,000 instructional videos with 100,000 practice problems embedded into the platform.²⁹ Materials include lessons on all levels of math, biology, physics, chemistry, economics, finance, astronomy, health and medicine, economics, entrepreneurship, history, American government, music, art history, computer programming, cryptography, and test preparation materials for several tests such as the SAT, MCAT, and GMAT. Unlike NROC and some other repositories, the video materials developed at Khan

²⁸ From "About the NROC Project," by National Repository of Online Courses (NROC).

²⁹ From "Khan Academy Fact Pack as of June 1, 2014," Khan Academy.

Academy are licensed under a Creative Commons (BY-NC-SA) license, which allows users to make modifications as long as the resulting object is for noncommercial purposes and is also licensed under a BY-NC-SA Creative Commons license.³⁰

Community College Consortium for Open Educational Resources (CCOER).

CCOER was created by Foothill-De Anza Community College District in 2007 and now includes over 200 community colleges. The goal of CCOER is to “create awareness of OER and help colleges to identify, create and/or repurpose existing OER to improve teaching and learning and make education more accessible for all learners.”³¹ In 2008, CCOER launched the Community College Open Textbook Project (now branded as College Open Textbooks Collaborative (COTC)) which includes more than 230 colleges and educational nonprofit and for-profit organizations. Although technically not a repository of open textbooks, the College Open Textbooks Collaborative provides “training for instructors adopting open resources, peer reviews of open textbooks, and mentoring online professional development networks that support for authors opening their resources, and other services.”³² COTC is not a repository of sources in the traditional sense (COTC does not house the materials on their site but links to them on external sites), nor is it guaranteed that each of the linked resources will fulfill all four of Wiley’s OER characteristics, as there are no policies that require all linked resources to be licensed under Creative Commons Share-Alike licenses. CCOER is now a sustaining member of the international Open Education Consortium (OEC), an organization committed to advancing open education within a global context.³³

OpenStax. Created in 2012 as the outgrowth of Rice University’s Connexions, OpenStax develops and makes available free college-level textbooks in physics, sociology, biology, anatomy and physiology, statistics, pre-calculus, economics, chemistry, United States history, and psychology. These materials are developed and peer reviewed by college faculty and are made freely available electronically to both students and faculty. Students can also order print-on-demand copies of books or iBook versions of the materials for a small fee. As of June 2014, 694 faculty had adopted OpenStax books for course use, saving students an estimated \$11 million.³⁴ All OpenStax materials are licensed under a Creative Commons Attribution license that allows materials to be reused, remixed, revised, and redistributed (including commercially), as long as attribution is given to the authors.

Notable State and Institutional OER Initiatives

Over the last 10 years, a number of states and institutions have been engaged in large scale OER initiatives. While the list below is not exhaustive, it does highlight some of the more recent or larger initiatives.

MIT Open Courseware Initiative. Considered to be the initiative that garnered widespread academic attention to OER for the first time, MIT’s Open Courseware Initiative was launched in 2001 based on the recommendation by the MIT Council on Educational Technology, which was tasked with “provid[ing] strategic guidance and oversight of MIT efforts to develop

³⁰ From “Terms of Service,” Khan Academy.

³¹ From “It Takes a Consortium to Support Open Textbooks,” by J. Baker, 2009, *EDUCAUSE Review* 44 (1).

³² From “Who Are We?,” College Open Textbooks Collaborative.

³³ From “About the Open Education Consortium,” Open Education Consortium.

³⁴ From “Yearly Progress Report,” OpenStax.

an infrastructure and initiatives for the application of technology to education."³⁵ The solution proffered up by the committee, the creation of a repository of all MIT undergraduate course materials (including lecture notes, course assignments, syllabi, reading lists, study materials, exams, problem sets, illustrations, simulations, and streaming video of in-class lectures) that would be made open and freely available to anyone in the world was, as Steve Carson wrote, "a way to marry MIT's core strength—the provision of high-quality residential education—with the Internet's strength—wide and inexpensive distribution of content... MIT set out to openly share the materials already being created on campus."³⁶

At a time when many institutions still saw the release of curriculum onto the Internet as a way of generating capital, MIT's goal was to provide free access to MIT course materials for everyone, faculty and student alike, around the world.³⁷ Rather than attempting to profit from the creation of knowledge at MIT, MIT OpenCourseWare "staked out a new model for the role of universities in a digital environment, one that reflected longstanding commitments in academia to dissemination of knowledge and shared scholarship."³⁸ As an example of that commitment to knowledge dissemination, all OpenCourseWare materials were licensed under Creative Commons' licenses of Attribution-Noncommercial-Share Alike, thus ensuring their openness and guaranteeing the widest use of the materials by faculty around the world.

In 2005, MIT OpenCourseWare evolved into the larger OpenCourseWare Consortium. This group of American, Japanese, Chinese, South Korean, Turkish, Taiwanese, and Vietnamese higher education institutions committed to "extend the reach and impact of OpenCourseWare by encouraging the adoption and adaptation of open educational materials around the world."³⁹ The role of both MIT's OpenCourseWare Initiative, as well as the subsequent OpenCourseWare Consortium, have been central in the development and maturation of the OER movement. As MIT President Charles Vest reflected,

We now have a powerful opportunity to use the Internet to enhance this process of conceiving, shaping, and organizing knowledge for use in teaching. In so doing, we can raise the quality of education everywhere... In this spirit, MIT has asked itself, in the words of T.S. Eliot, "Do I dare/Disturb the universe?" Our answer is Yes.... We see it [MIT OpenCourseWare] as opening a new door to powerful, democratizing, and transforming the power of education.⁴⁰

Carnegie Mellon University Open Learning Initiative. As discussed earlier, Carnegie Mellon University's Open Learning Initiative (OLI) began in 2002 with support from The William and Flora Hewlett Foundation to develop four open courses: Causal and Statistical Reasoning, Statistics, Logic and Proofs, and Economics. Since then, the program has expanded to 21 courses ranging from foreign languages, such as French and Arabic, to a variety of STEM courses. One of the unique features of OLI courses is the emphasis on data-driven design and use of analytics. Unlike other OER projects, OLI courses collect real-time student-use data (with students' permission) to provide course designers and learning science researchers with

³⁵ From "The Creation of OpenCourseWare at MIT," by H. Abelson, 2008, p. 165, *Journal of Science and Technology* 17(2).

³⁶ From "The Unwalled Garden: Growth of the OpenCourseWare Consortium, 2001-2008," by S. Carson, 2009, p. 25, *Open Learning: The Journal of Open Distance and e-Learning* 24(1).

³⁷ From "The Promise of Open Educational Resources," by M. S. Smith and C. M. Casserly, 2006, p. 10, *Change*.

³⁸ Carson, p. 25.

³⁹ *Ibid.*, p. 28.

⁴⁰ Smith and Casserly, pp. 11-12.

information for course refinement. OLI courses also provide learning science researchers at the Pittsburgh Science of Learning Center with the opportunity to embed experimental components into OLI courses to test various learning theories.⁴¹

The Florida Orange Grove. One of the oldest and largest statewide K-20 open educational resources' initiatives is Florida's Orange Grove. Established in 2004, The Orange Grove serves as a "repository to collect and store learning resources for use by Florida teachers, faculty, and educational institutions."⁴² Although not originally seen as a repository for online OER textbooks, The Orange Grove began adding such titles early on, and in 2009 created a unique partnership with the University Press of Florida to create Orange Grove Texts Plus. This partnership allows students to access digital copies of OER textbooks for free or, if they want a hard copy, to order a low-cost, print-on-demand copy of the book from Integrated Book Technology, the on-demand printer selected by University Press of Florida. Further growth of The Orange Grove came as the result of a 2009 legislatively mandated taskforce on open access textbooks and how they might be used to reduce textbook costs for Florida students. The taskforce recommended that efforts initially focus on the adoption of OER in large, general education courses with the highest enrollment.⁴³ Later that year, The Orange Grove received a Fund for the Improvement of Postsecondary Education (FIPSE) grant to develop a model for creating, implementing, and sustaining an open textbook initiative. As a result of that grant, the number of textbooks housed in The Orange Grove increased significantly.

Additionally, Florida launched the Open Access Textbooks site that includes lists of OER collections, professional development materials, and a number of other resources. In addition to Open Access Textbooks, Florida also launched OnCoRe Blueprint, an "initiative to develop a sustainable national model for the creation of statewide digital content repositories" that "seeks to extend the Florida 'Orange Grove' digital repository initiative to other states and entities by developing a blueprint for establishing a statewide digital content repository for all subject areas in postsecondary education."⁴⁴

Open.Michigan. Open.Michigan is a 2007 initiative that began in the University of Michigan's Medical School's Office of Enabling Technologies. The program is designed as an OER hub that assists Michigan faculty in finding, using, and creating OER materials. In addition to providing a hub for OER materials, Open.Michigan also includes efforts at developing a participatory and collaborative model for the development of OER through dScribe. dScribe functions as a workflow to assist faculty and staff with the creation of OER materials. A central component of this workflow is finding ways to use trained volunteers for metadata tagging in order to make existing and new OER materials searchable and more usable.⁴⁵

California OER Initiatives. There are a number of statewide OER initiatives that have been adopted in California. In September 2008, then California governor Arnold Schwarzenegger signed Assembly Bill (AB) 2261 into law which specifically allowed California community colleges to "establish a pilot program to provide faculty and staff from community college districts around the state with the information, methods, and instructional materials to

⁴¹ From Carnegie Mellon University, "Learn More About OLI," Open Learning Initiative.

⁴² From OnCoRe Blueprint, "Florida's Orange Grove Repository: A Sustainability Case Study," *OnCoRe Blueprint*.

⁴³ *Ibid.*, p. 2.

⁴⁴ From "An Overview," *OnCoRe Blueprint*.

⁴⁵ From "dScribe: A Collaborative and Participatory Model for Creating OER," Open.Michigan.

establish open education resources centers."⁴⁶ In an effort to further control textbook prices, the California legislature passed additional legislation in 2009 requiring that, as of January 1, 2020, all textbooks used in public and private higher education institutions must be made available in an electronic form.⁴⁷ Finally, in 2012, Senate Bill (SB) 1052 and SB 1053 were passed creating the California Open Education Resources Council (COERC) and the California Open Source Digital Library.⁴⁸ Five million dollars of state funds were appropriated for the development of open textbooks and the Open Source Digital Library, which were matched by the Bill and Melinda Gates Foundation and The William and Flora Hewlett Foundation. COERC will be responsible for selecting up to 50 lower-division courses for open textbook development, for promoting OER strategies and production, for creating and administering a quality review process for OER, and for exploring the revival of select out-of-print textbooks in open source formats.⁴⁹

Washington Open Course Library. Started in 2010, this ongoing effort focuses on making free or low-cost learning materials available for the 81 most popular classes in Washington's 34 public community colleges. OER materials were developed and/or adapted by teams of Washington community college faculty funded by the Washington State Board for Community and Technical Colleges and the Bill and Melinda Gates Foundation. Materials placed in the library must cost students no more than \$30.⁵⁰ As of April 2013, the project had generated an estimated \$5.5 million in savings.⁵¹ OER materials developed under the program include open textbooks, syllabi, supplemental materials, lessons, presentations, and test banks. Courses covered by the project include accounting, anthropology, art, several foreign languages, biology, chemistry, communications, English composition, theater, economics, history, mathematics, physics, government, psychology, sociology, and a number of developmental education courses.⁵²

The Open Education Initiative @ UMass Amherst. Started in spring 2011 as a small, \$10,000 initiative funded by the Provost and Director of Libraries, the program has resulted in an estimated \$1,000,000 in student savings. Faculty are incentivized to participate through the use of small awards that offset faculty time needed to find and/or develop quality OER materials for their classes. In addition to providing faculty awards, the Amherst library also developed an online guide to OER that aggregated many national collections, as well as conducted faculty workshops and one-on-one training. The program is currently focusing on introductory-level general education courses with high enrollments.⁵³

University of Minnesota Open Textbook Library. Initially developed in the College of Education and Human Development at the University of Minnesota in April 2012, the Open

⁴⁶ From "Bill Enabling Community Colleges to Establish OER Pilot Program is Signed into Law," by J. Park, 2008, Creative Commons.

⁴⁷ From "California Law Encourages Digital Textbooks by 2020," by M. H. Miller, 2010, *The Chronicle of Higher Education*.

⁴⁸ From "Free digital textbooks offered as Gov. Jerry Brown signs bills," 2012, *Los Angeles Times*.

⁴⁹ From "About the Project," California Open Source Digital Library.

⁵⁰ From "State of Washington to Offer Online Materials as Texts" by M. A. Overland, 2011, *The Chronicle of Higher Education*.

⁵¹ From "Washington State Community and Technical Colleges Announces 81-Course Library of Free and Low-Cost Educational Resources," Washington State Community and Technical Colleges, 2013.

⁵² From "Courses," Open Course Library.

⁵³ From "Open Educational Resources as Learning Materials: Prospects and Strategies for University Libraries" by M. S. Billings et al., 2012, *Research Library Issues*, (280).

Textbook Library serves as an index of open textbooks in accounting and finance; business, management, and marketing; computer science and information systems; economics; general education; humanities and language; law; mathematics and statistics; natural and physical sciences; and social sciences.⁵⁴ In addition to linking to open textbooks, the site also provides peer reviews of the materials by faculty users.⁵⁵

Maryland Open-Source Textbook (MOST) Initiative. In spring 2014, the University of Maryland System conducted an OER pilot with 11 faculty participants spread out over several institutions. Rather than attempting to build in-house open resources, the Maryland project depends upon a partnership with Lumen Learning, an educational technology startup that assists faculty in finding OER materials that can be used in their courses. The University of Maryland System estimates that the spring 2014 pilot resulted in 1,100 students saving \$130,000; the pilot was enthusiastically supported by students, including the University of Maryland, College Park's Student Government Association.⁵⁶

Oregon State University. Oregon State University also launched an open textbook initiative in spring 2014. This collaboration between Oregon State University Libraries, Oregon State University Press, and Oregon State University Extended Campus provided faculty with technical and editorial support in developing open textbooks. The project began by selecting four faculty to develop the first textbooks in biochemistry, animal and rangeland sciences, wood science and engineering, and horticulture.⁵⁷ When completed, the textbooks will be available in several formats, including print-on-demand for students who wish to have a hard copies of textbooks.

Advantages, Disadvantages, and Challenges of Open Educational Resources

Before exploring the advantages, disadvantages, and challenges of using open educational resources, it is useful to consider the extent and use of their current adoption. In a study for The William and Flora Hewlett Foundation, the Boston Consulting Group identified three usage models for OER that range from a low level of disruption to the educational process to a high level of disruption to the educational process. These usage levels are outlined in Figure 3 (Boston Consulting Group, 2013).⁵⁸

⁵⁴ From "Open Textbooks Could Help Students Financially and Academically" by D. Perez-Hernandez, 2014, *The Chronicle of Higher Education*.

⁵⁵ From "Home Page," University of Minnesota, Open Textbook Library.

⁵⁶ From "New Strategy Would Drop College Textbook Costs to Zero" by C. Wells, 2014, *The Baltimore Sun*.

⁵⁷ From "OSU Open Textbook Initiative Aims to Reduce Student Costs, Enhance Learning," Oregon State University, 2014.

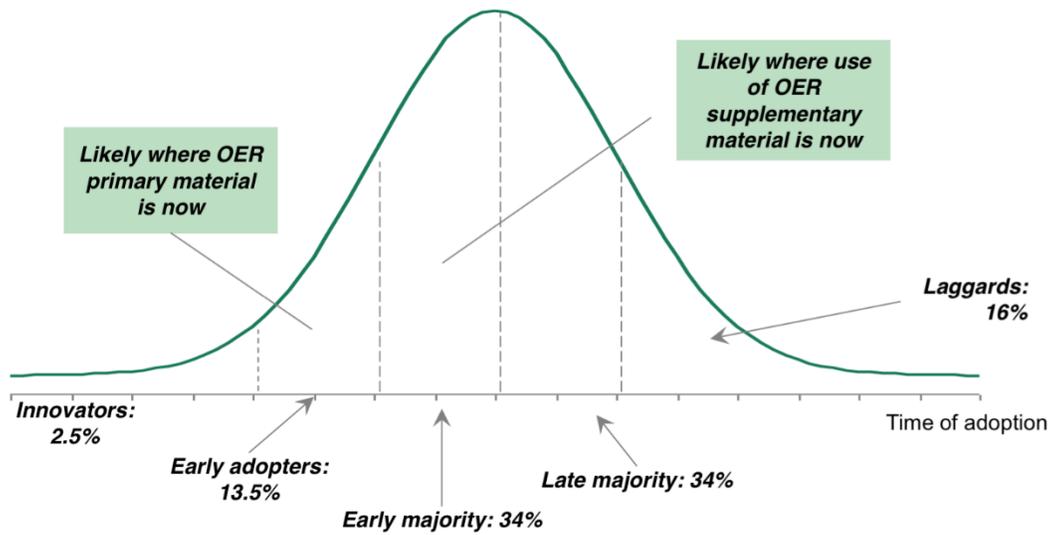
⁵⁸ From "The Open Education Resources Ecosystem: An Evaluation of the OER Movement's Current State and Its Progress Toward Mainstream Adoption," Boston Consulting Group, 2013.

Figure 3. Usage Levels of Open Educational Resources

	OER Enriches Existing Resources	OER Used as Primary Material	OER Helps “Flip” Classroom
Role of OER	<p>OER reinforces existing content, but remains supplementary</p> <ul style="list-style-type: none"> • E.g., teachers use standard textbook but assign Khan videos as homework 	<p>OER primary instructional material in the classroom</p> <ul style="list-style-type: none"> • Teachers start by using off-the-shelf OER products, then remix and share their own content 	<p>OER allows for individualized in-classroom learning</p> <ul style="list-style-type: none"> • Personalized content delivered via learning platforms • OER significant portion of overall content
Role of Teacher	<p>Teacher engages in some remixing and sharing of content</p> <p>Teaching methods remain largely the same</p>	<p>Teacher remixes and shares content</p> <p>Teaching methods remain largely the same</p>	<p>Teacher remixes and shares content</p> <p>Teacher serves as coach rather than lecturer</p>
Level of Disruption	Low	Medium	High

Additionally, Boston Consulting Group also indicated that 40 percent of the faculty surveyed were using OER as supplemental materials, as opposed to only 10 percent who were using OER as primary teaching materials. Figure 5 provides a visual of this adoption pattern that indicates the likely timeline for more widespread adoption of OER by faculty (2013).⁵⁹

⁵⁹ Ibid.

Figure 4. Adoption Patterns for Open Educational Resources

Advantages

A careful study of the literature on open educational resources reveals a number of potential advantages associated with their use, and on which students, faculty, and institutions could capitalize.

Student Advantages

Cost. One of the greatest advantages of OER, and the element that has garnered the most attention, is the lower cost of open educational resources for students. Although still early in the implementation process, several institutions have reported preliminary student cost data that show savings. The Washington Open Course Library (OCL) reports that OER materials developed for the OCL cost 90 percent less than the materials previously used in those courses (approximately \$96 per course). Washington estimates that this has resulted in student savings of \$5.5 million and has more than tripled the state's initial \$1.8 million investment.⁶⁰

These cost savings appear to be replicated in the research done by the Kaleidoscope Initiative involving a consortium of eight community and state colleges. This project found that textbook costs for introductory-level courses ranged from \$36.54 to \$102.00, with an average of \$65.93. At Cerritos College alone, the numbers equated to a potential student savings of \$104,253.57 over two semesters. Across all of the Kaleidoscope Initiative colleges, potential savings were estimated to be \$338,333.74.⁶¹

Open educational resources are largely able to be provided at significant cost savings to students because they are digital resources first and hard-copy optional resources second. The

⁶⁰ From *Affordable Textbooks for Washington Students: An Updated Cost Analysis of the Open Course Library* by N. Allen, 2013, Washington, DC: PIRG.

⁶¹ From *Dramatically Bringing Down the Cost of Education with OER* by D. Wiley, C. Green, and L. Soares, 2012, Washington, DC: Center for American Progress.

cost of distributing an electronic version of a textbook via the Internet is approximately \$0.0007.⁶² Students who wish to use a hard copy of the text can either print on their own or sometimes are able to order on-demand printing by a third party at a greatly reduced price. In addition to increasing student access to learning materials, this sort of choice in the delivery mechanism of the material also effectively places purchasing power back in the hands of students.⁶³

Access. Not only does OER reassign purchasing power to students and drastically reduce the cost of learning materials, it also has the potential of improving student access to materials. As discussed earlier, a significant number of students have reported that their inability to purchase textbooks has either limited the number of courses in which they enroll or negatively impacted their performance in their courses. The reduced cost of OER, in addition to its immediate on-demand nature via the Internet, provides students with the materials that they need to be successful in a course from day one. This immediacy, coupled with the ease at which OER can be modified and updated, “bring[s] continuously improving, high-quality courses within reach of more community college students, including at schools that might not otherwise be able to offer those courses.”⁶⁴

Performance. Although data on student performance in courses utilizing OER are still scarce, preliminary studies indicate that, at worst, there is no appreciable difference between students using OER and those using traditional textbooks.⁶⁵ Some scholars posit that quality OER materials may improve student learning by increasing student accessibility to the material. For example, because OER are just that – open – and student access to the materials is not based on a subscription as it is with many electronic resources published by textbook publishers, students are able to access the material in perpetuity. This allows students to return to the material over and over until they have mastered its content. Additionally, “students and self-learners can repeat their exposure to different lessons as many times as needed, including lessons about the same subject offered by different instructors, in order to facilitate a deep understanding of the material. OER tools can also be used to form virtual study groups, which accelerate learning.”⁶⁶

Improved access and performance would be irrelevant if the OER materials were not of similar or higher quality than the traditional textbook resources. Both students and faculty have reported that they perceive OER material to be of equal or greater quality than the traditional textbooks used in their courses. When asked why they believed the OER materials to be superior, faculty cited lower costs, customization, and general quality, whereas students cited technical advantages such as the ability to search texts, customization and content alignment to the course, the presence of learning aids, lower costs, greater access, and general quality.⁶⁷

⁶² Ibid.

⁶³ From Saneck, p. 5.

⁶⁴ From *free to learn: An Open Educational Resources Policy Development Guidebook for Community College Governance Officials* by H. Plotkin, 2010, San Francisco, CA: Creative Commons.

⁶⁵ From “Cost-Savings Achieved in Two Semesters Through the Adoption of Open Educational Resources” by J. L. Hilton III, et al., 2014, p. 69, *The International Review of Research in Open and Distance Learning* 15(2)..

⁶⁶ Plotkin, p. 5.

⁶⁷ From “An OER COUP: College Teacher and Student Perceptions of Open Educational Resources” by T. J. Bliss, et al., 2013, pp. 14-15, *Journal of Interactive Media in Education*.

Faculty Advantages

Improved pedagogical practices. Just as there are numerous potential benefits of OER for students, there are also a number of potential faculty benefits from using OER in courses. As Lisa Petrides, the founder of the Institute for the Study of Knowledge Management in Education, writes, "The real promise of OER is not just the free high-quality learning materials and textbooks. It's the process itself, how the materials are created, used, adapted and improved that creates a whole new set of possibilities."⁶⁸ One such possibility is that faculty have readily available access to the materials and methods used by other faculty teaching similar courses. As a result, the access "supports the more rapid transfer of high-impact teaching methods than would otherwise occur."⁶⁹ As one study of Tufts University faculty found, the use of OER had multiple benefits, including providing additional resources, increasing faculty knowledge in new areas, and emphasizing the use of instructional technology in course development.⁷⁰

Community development. A central part of the pedagogical benefit of OER for faculty is the development of communities of practice outside of their own institutions. By providing faculty with the ability to share their materials and teaching methods within their fields, OER offers "a new collaborative model that builds cooperating communities of teachers and learners [that] is augmenting the old 'silo' model of education."⁷¹ Not only does OER create collaborative communities, but it can also provide faculty with the opportunity to develop relationships outside their institutions that can lead to publishing opportunities, grant proposals, and a conduit for the dissemination of research.⁷²

Institutional Advantages

Finally, institutions of higher education also have the potential to benefit from the development and use of open educational resources. For many institutions, such as community colleges or land grant institutions that have deep histories of community outreach, incentivizing the development of OER materials by their faculty fits with their historic mission of making learning and knowledge available to everyone, including those learners who are outside of their campus communities. Furthermore, as Anne Margulies points out, the development and advocacy of OER may also "enhance the institution's image, generate pride in the community, and stimulate innovation." Additionally, OER development and use also may be used as both a student and faculty recruitment tool to foster collaboration and enhance the development of institutional learning communities.⁷³

⁶⁸ Plotkin, p. 1.

⁶⁹ From "Openness, Dynamic Specialization, and the Disaggregated Future of Higher Education," by H. Plotkin, D. Wiley and J. Hilton III, 2009, p. 5, *International Review of Research in Open and Distance Learning* 10(5)11.

⁷⁰ Plotkin, p. 6.

⁷¹ Ibid., p. 5.

⁷² Ibid., pp. 6-7.

⁷³ From *Models of Open Educational Resources: OpenCourseWare, Sofia, and the Open Learning Initiative* by A. Margulies, V. Sinou, and C. Thille, 2005, pp. 9-10, Boulder, CO: EDUCAUSE Center for Applied Research.

Disadvantages

Despite the evangelizing of OER proponents, the development and use of OER materials are not without disadvantages. OER materials are not easy for faculty to create without some of the institutional support structures that traditional publishing houses provide, nor is it easy to find and determine the quality of OER materials. Additionally, OER developers and users will quickly learn that, although OER may be free to the users, they are certainly not free to create or maintain and may be rife with hidden costs for institutions.⁷⁴

Faculty Problems in Creating and Using OER

Publisher services. Textbook authors are subject matter experts first and authors second. On the practical front, this means that faculty authors may be extraordinarily well-versed in their field but sadly deficient in navigating the challenges of publication such as editing, illustration, rights acquisition, and marketing. Textbook publishers, however, are able to draw upon their vast resources to streamline the publication process and provide expert services. Rather than a faculty author needing to worry about running down copyright permissions for the use of illustrations, sources, etc., that vital function is performed by a stable of lawyers employed by the publishing house specifically for that purpose. Publishers are able to provide professional editorial services to faculty and enhance their content with professional illustrations, maps, and other graphics.⁷⁵ And, perhaps most importantly, publishing houses have the ability to launch large marketing campaigns to reach the widest possible audience of potential adopters.

Quality Assurance. Additionally, publishing has long been associated with the vetting of quality through external peer-review processes.⁷⁶ No textbook is published until it is carefully vetted by external peer evaluators. This vetting is not the only part of the quality assurance process, however. In addition to careful copyediting, publishing houses employ teams of internal reviewers who assure that all of the material in the text is clear and accurate. These services are often missing from the publication of OER materials, in part because they are being provided free of charge. The result is that not only is it more difficult for faculty to develop OER materials, but it may also be more difficult for faculty to find and adopt quality materials for use in their classes.

Structural Limitations for the Development and Use of OER

Availability and unintended market decline. Closely associated with the problems in the creation and dissemination of OER materials explored above, there are still fundamental challenges with the availability of high-quality OER materials. As pointed out in a comprehensive report on OER developed for The William and Flora Hewlett Foundation, "OER does not yet include a full set of high-quality materials for everyday use by educators in the most widely taught K-12 and post-secondary subjects."⁷⁷ In part, this lack of material is due to the challenges of developing OER materials in some disciplines. Although there are some disciplines where there are already an abundance of public domain and Creative Commons-licensed

⁷⁴ Smith, pp. 16-17.

⁷⁵ From "7 Things You Should Know About Open Textbook Publishing," *EDUCAUSE Learning Initiative*.

⁷⁶ Ibid.

⁷⁷ From *Open Educational Resources: Breaking the Lockbox on Education*, William and Flora Hewlett Foundation, 2013, p. 10.

resources, there are other disciplines in which those sorts of primary documents are much more difficult to find. For example, it is fairly easy to find public domain historical sources for developing OER for an United States History course (the Library of Congress and many other archives have extensive digital collections of these primary documents), but it may be much more difficult to find materials that can be used for the development of an economic text where no such open archival collections exist.⁷⁸ As a result, OER offerings for many large introductory courses, where they would have the greatest impact, may still be unavailable.

Furthermore, the adoption and widespread use of OER materials may have unintended economic consequences at institutions with campus bookstores.⁷⁹ Although a decreasing number of institutions own and operate their own campus bookstores, the contracts that outsource that service are still lucrative for many colleges. Unless alternative revenue streams can be identified for these bookstores, a key income stream for smaller institutions may be lost.

Hidden costs. As Kenneth C. Green, author of the 2013 Campus Computing Survey puts it, "Open-source is not a free beer; it's a free puppy. If I give you a free puppy, well, you have got some significant costs for that puppy in terms of attention, care, maintenance, and support."⁸⁰ Effective OER must include provisions for several cycles of update and improvement.⁸¹ Each of these cycles requires sustaining funds to ensure that materials remain relevant and usable.

Technical infrastructure development. Finally, there are often significant technological challenges with the dissemination and use of open educational resources. Because many OER resources are being built without significant technological support and scaffolding, it may be difficult for faculty to use materials they do find. For example, some OER may not be built to the technical specifications necessary to be easily digested into a variety of learning management systems. Without knowledge of these technical specifications and the skills to conform to them, even quality materials will be worthless.⁸²

Challenges

Further development and widespread adoption of open educational resources will require meeting a number of short-term and long-term challenges. Not only will advocates of OER need to develop better strategies to incentivize faculty development of these materials, but a better technical infrastructure must be built to house and provide ease of search for these materials. Additionally, faculty must also be provided with opportunities for professional development around the development and effective use of OER materials in their classroom. And, perhaps most challenging of all, the current culture of intellectual property must shift to one that embraces and rewards the development, revision, and use of quality open materials.

Development Challenges

⁷⁸ Plotkin, p. 28

⁷⁹ Ibid.

⁸⁰ From "Open-Source Software for College Administrators Reaches 'Tipping Point' After 10 Years" by M. O'Neil, 2014, *The Chronicle of Higher Education*.

⁸¹ Smith, p. 12.

⁸² Ibid., p. 35

Incentivizing development. Effective use of open educational resources means that not only must such resources exist, but faculty must also know how to effectively use the materials in their courses. One of the biggest challenges is to find ways to incentivize faculty to develop and share high-quality OER materials. Traditionally, publication of scholarship and, to a lesser degree, textbooks and learning resources, long has been a significant factor in determining tenure and promotion. Under the current tenure and promotion environment, faculty are not incentivized to spend any of their limited time and resources in producing non-peer-reviewed materials. As a result, it will be necessary to find ways to incentivize faculty to develop OER.⁸³ Such incentives might include monetary incentives to offset the lack of royalties from published works or positive consideration of OER development during tenure and promotion reviews. These incentives, however, may be difficult for institutions to fund and sustain.⁸⁴

Revising, not just reusing, materials. The very dynamic nature of open educational resources relies upon such materials being constantly revised, remixed, and reused. This means that it is not enough for high-quality materials initially to be developed, but other faculty also should be incentivized to revise, remix, and reuse such materials. Currently, revising and remixing OER remains problematic. As Hilton, Wiley, and Lutz point out in their research, "Although little research has been done in this area, the literature indicates that when OER are used, they are typically adopted wholesale (reused), and not revised or remixed."⁸⁵ One study suggests that of 3,519 OER modules studied, only 6 percent of the collection was ever revised or remixed.⁸⁶ For OER to remain dynamic and relevant, user modifications and revisions are necessary. Thus, it is not enough just to incentivize faculty initially to produce OER materials; institutional policies also must be created that incentivize faculty to take existing OER materials and modify, reuse, and share those materials with the field.

Need for faculty technical knowledge. Higher education faculty are, first and foremost, subject matter experts in their fields of study. And although they are highly trained in the development of scholarship in their fields of study, this does not always equate into training about how to develop curriculum materials, especially materials that are designed to be readily accessible across a multitude of learning management systems. The skills necessary for the development of high-quality OER materials surpass the high level of content knowledge that many faculty possess. Faculty members developing high-quality OER must, at minimum, understand digital accessibility design, as well as have a technical understanding of metadata tagging, learning management systems, and, increasingly, rudimentary coding abilities. Also, because of the dynamic nature of the Internet, this knowledge must be constantly updated.

Usage Challenges

Finding quality resources. One of the most significant barriers to OER use is the size of and ease in finding suitable materials. As Senack indicates, "While the current supply of open textbooks is expanding quickly, they still cover only a fraction of all college courses ... The second barrier to widespread use is to demonstrate the quality and usability of open textbooks to faculty members."⁸⁷ The most fundamental part of this challenge is constructing an indexing

⁸³ Plotkin, p. 20.

⁸⁴ *Ibid.*, p. 18.

⁸⁵ Hilton, Wiley, Lutz, p. 47.

⁸⁶ *Ibid.*, p. 48.

⁸⁷ Senack, pp. 13-14

mechanism that makes finding OER materials fast and easy. One such mechanism for doing this is the construction of digital learning object repositories. Through careful use of metadata tagging, these repositories can house large collections of OER that are easily searchable. One challenge, however, is that most of these repositories operate independently of each other. As a result, faculty must locate possible repositories and spend hours sifting through the materials in each separate repository – a painstaking and time consuming process in which many faculty may not have time to engage.

MIT's experiences are instructive. One of the earliest lessons learned during the infancy of the MIT OpenCourseWare initiative was how problematic the release of a large number of materials can be. Despite the release of high-quality OER materials, the inability of faculty to sift through and quickly find materials prevented a wider use of the materials. As Plotkin describes, "[D]espite the increasingly frequent availability of better, cheaper, more robust and dynamic learning materials, the typical college and university instructor continues to rely today, often with little enthusiasm, on conventional commercial learning materials, including old fashioned textbooks, which do not pose similar adoption hurdles."⁸⁸

Additionally, most repositories still do not provide any indication of the quality of the resources housed within them. Quality assurance is one of the most challenging aspects of OER development and use. As Bliss, Robinson, and Hilton point out in their scholarly work on faculty and student perceptions of OER, "The OER movement also needs better, more timely and cost-efficient methods to convey information about quality and course-level applicability to end-users of OER, including derivative OER."⁸⁹

Under the traditional scholarly publication model, publishers carefully vet materials using panels of external subject matter experts. One potential way to address and ensure that open educational resources are of quality is to replicate this traditional model by substituting the higher education institution for the publisher. In this way institutions are made responsible for ensuring the quality of any materials created by their faculty "by using a carefully vetted, top-down authoring system in which an institution places educational learning resources that carry its brand into an open format for free use, re-mixing or adaptation by others."⁹⁰ A second way in which the quality of OER might be refereed is through a less hierarchical model akin to that used by the open source software community, where an unlimited number of contributors and authors work together to develop and referee materials. A third method might involve increasing the role of external groups, such as professional organizations and subject-specific academic organizations, to assess and certify the validity and quality of OER.⁹¹

Clearly, OER development is not a "build it and they will come" endeavor. It is not enough to incentivize the development of materials without also addressing how quality assurance will be preserved. Developing ways in which end users can quickly and effectively locate resources also must be considered. For OER to gain broader usage, both the development and accessibility challenges must be met.

Changing pedagogies. Challenges around the faculty usages of OER are not confined to the ability to easily find high-quality resources; faculty also must understand the most

⁸⁸ Plotkin, p. 7.

⁸⁹ Ibid, p. 20.

⁹⁰ Ibid., p. 6.

⁹¹ Ibid.

effective ways to incorporate the materials into their courses and how OER might change their current pedagogies. Initial studies of OER usage indicate that a large number of faculty who have experimented with incorporating OER materials into their courses report that it increased the amount of preparation time needed for those courses. This increase in the amount of preparation time might reflect identifying materials, adaptation of materials, or the development of new materials. Regardless of the reason for the increased preparation time, the impact is clear: “despite the many clear advantages of OER, obtaining instructor buy-in could be hindered by the reality of increased preparation time.”⁹²

In addition to the increase in classroom preparation time, there are other pedagogical issues that must be addressed when incorporating OER into existing courses. For example, one study noted that 75 percent of the faculty surveyed stated that the use of OER changed their instructional practices, including a change in the use of technology in the classroom. Plus, although many faculty indicated they were more effectively using technology as a result of incorporating OER, a minority reported that the increased use of technology actually served as a “barrier” and hindered teaching and learning.⁹³ Thus, any wide scale incorporation of open educational resources also must involve providing faculty with adequate professional development, pedagogical resources, and time to substantially revise existing courses.

Philosophical and Legal Challenges

Intellectual property. Another significant challenge in developing, revising, and using OER materials are the philosophical and legal challenges associated with our current understandings of copyright and fair usage. Although there has been a greater discussion of intellectual property and usage rights during the last decade, many institutions still have ambiguous policies in place regarding whether faculty members of the institution own the copyright on any faculty-created material.⁹⁴ Additionally, even if an institution has a clear intellectual property policy in place, there remain challenges over how the development of derivative work is addressed. Despite the fact that Section 101 of the 1976 U.S. Copyright Act allows for the legal development of derivative work, the development, use, and, most importantly, sharing of such material continues to occupy a gray area that has restricted the development and use of OER materials.⁹⁵ One way to address this set of challenges is to ensure that all OER materials are licensed using Creative Commons licenses.

Institutional policies. Copyright policies are not the only institutional policies that must change if OER is going to play a greater role in the classroom. As Plotkin observes in his study of open educational resources, there are three main institutional factors that impact the development and use of OER: cultural, chronological, and systemic. Culturally, the use of OER represents a new practice that flies in the face of many of the practices within our “tradition-bound higher education enterprise.” As a result, “many instructors operate in environments that leave little room for innovations ... and provide even less support for any attempts to expand successful classroom innovations to a larger scale.”⁹⁶

⁹² Bliss, p. 6.

⁹³ Ibid.

⁹⁴ From “Open Educational Resources: Enabling Universal Education” by T. Caswell, et al., 2008, p. 9, *International Review of Research in Open Education and Distance Learning* 9(1).

⁹⁵ From “Impediments to Learning Object Reuse and Openness as a Potential Solution,” D. Wiley, 2009, p. 8, *Revista Brasileira de Informática na Educação* 17(3).

⁹⁶ Plotkin, p. 4.

Chronologically, OER advocates often find themselves in conflict with senior administrators, board members, and other educational leaders who may be less comfortable with technology and OER. Such individuals are in the strongest position for crafting policies that incentivize the development and use of OER but may be the least aware of such materials and the least comfortable in exploring the replacement of traditional academic classroom sources.

Finally, there are also systemic challenges in the development and adoption of OER at many institutions. Most notably, OER development and adoption is difficult at resource-challenged institutions. Although the use of OER might make the greatest student impact at these institutions, they largely lack the resources and structures to address systemic issues such as ensuring that any OER materials comply with the federal regulations outlined in the Americans with Disabilities Act and the Federal Rehabilitation Act.⁹⁷

Catherine Casserly, former executive director of Creative Commons, sums up these challenges:

First, the field must learn how to balance the rapidly growing organic system that encourages the free flow of information with the norms of accountability and quality required for widespread adoption and institutional acceptance.... In the long term, the capacity to create new OER content must increase. Policy can accelerate or impede the adoption, and creation, of OER. We have seen recent success by OER advocates in encouraging the use of open licenses for all publicly funded material. There must also be some policy shift to create incentives for faculty and teachers to contribute openly-licensed courses and materials. With respect to research, a better understanding and demonstration of how OER improves the efficacy of teaching and learning is needed to advance adoption and use. Lastly, the field needs greater understanding of the revenue generating models that can be built around OER while ensuring the widest distribution without impeding quality. Moving to scale will require collaboration with commercial educational content providers and college bookstore managers, as well as with public and private funding sources that can support maintenance and updating of these resources and supporting technologies.⁹⁸

In short, institutions must be willing to address numerous challenges if they are to effectively support the development and usage of open educational resources. Institutional leaders must be willing to openly engage faculty in developing OER policies and incentives, as well as provide the needed professional development.⁹⁹ As Martha Kanter, former Chancellor of Foothills-DeAnza Community College System and former Under Secretary of Education explains:

The starting point is the faculty, supported by excited, web-enabled deans and vice presidents. You really have to engage your faculty and find ways to get the OER discussion started. You will find faculty leaders right away. Let them loose to share what they know. Support them to have the conversations, review the draft policies and procedures, share OER sites and curriculum, attend conferences and engage in OER professional development through sabbaticals, growth awards and other available resources. You really have to reach out to

⁹⁷ Ibid.

⁹⁸ Ibid., p. 16.

⁹⁹ Senack, p. 6.

your faculty to bring this type of policy to your board of trustees. Learning materials are inherently a faculty issue so it is all about identifying the faculty leaders who want to increase quality and reduce the cost of a college education for their students... OER is clearly an area of great faculty interest and excitement. It's about what is happening in their classrooms, in their courses, with their students. Senior community college administrators have a great opportunity to open the door to this conversation and then to help the faculty champions move the conversation to action.¹⁰⁰

Current Use of Open Educational Resources at Select Texas Institutions of Higher Education

Although there is currently no comprehensive data on Texas faculty development and usage of open educational resources, anecdotal conversations indicate that a number of faculty across the state are using OER materials in their courses as either supplemental or primary materials. The most well-known of these programs are the previously discussed Connexions and OpenStax projects at Rice University. The following list of projects are not comprehensive but are meant to highlight some of the largest projects at Texas' institutions of higher education.

Alamo Colleges

In 2012, Alamo Colleges was awarded a Trade Adjustment and Assistance Community College and Career Training (TAACCCT) grant by the United States Department of Labor as a part of a consortium led by Henry Ford Community College in partnership with community colleges from Kentucky, West Virginia, Virginia, Alabama, Michigan, Tennessee, Ohio, and Illinois. Alamo Colleges has used the grant funds to assist in developing an Advanced Manufacturing Technician program, purchase simulation hardware, and assist in the development of an OER based curriculum.

Austin Community College

In 2012, Austin Community College was awarded a TAACCCT grant by the United States Department of Labor as a part of a consortium led by Northern Virginia Community College. The purpose of the project was to develop latticed pathways for adults in science and health fields. As such, Austin Community College has been involved in the redesign (or in some cases new development) of courses in key science areas, including anatomy and physiology, to assist students in earning a credential in nursing or surgical technology. All materials developed with grant funds are licensed using Creative Commons and are freely available. In addition to its participation in the biosciences consortium, Austin Community College also was awarded another TAACCCT grant to participate in a consortium led by Sinclair Community College to develop a competency-based curriculum in various information technology fields. As with the Northern Virginia Community College led project, all materials developed with grant funds are licensed using Creative Commons. To date Austin Community College has created 25 competency-based distance education courses that will be made freely available to any individual wishing to work through the curriculum.

¹⁰⁰ Plotkin, pp. 24-25.

Center for Open Educational Resources and Language Learning (COERLL), The University of Texas at Austin

The University of Texas at Austin's Center for Open Educational Resources and Language Learning (COERLL), is one of 15 national centers funded by the Department of Education to improve the teaching and learning of foreign languages. COERLL currently develops and distributes a number of OER materials directed at helping faculty develop effective foreign language courses. To date they have developed OER materials to support the teaching of American Sign Language, Arabic, Chinese, French, German, Hebrew, Hindi, Italian, Japanese, Latin, Malayalam, Persian, Portuguese, Russian, Spanish, Turkish, Yiddish, and Yoruba, as well as professional development materials, open badges, instruments for assessing language dominance, and a photo database.

Collin College

In 2011, Collin College was awarded a TAACCCT grant by the United States Department of Labor. Collin serves as the lead institution in a consortium that includes Bunker Hill Community College (Massachusetts), Moraine Valley Community College (Illinois), Del Mar College (Texas), Salt Lake Community College (Utah), Bellevue College (Washington), and Rio Salado College (Arizona) and that is responsible for developing information technology OER materials. Specifically, Collin has been involved in developing materials in programming, networking, cybersecurity, and geospatial technology. As a condition of the TAACCCT grant, all materials are licensed under a Creative Commons Attribution license that allows any entity to modify, remix, or redistribute the materials. To date Collin has been involved in developing 34 courses that can currently be found on the Department of Energy's National Training and Education Resource (NTER) digital platform. All of the materials also will be ingested into, and searchable through, MERLOT.

Houston Community College

Houston Community College is a member of the Community College Consortium for Open Educational Resources, as well as the OER Consortium. As a member of the Community College Consortium for Open Educational Resources, Houston Community College has access to a variety of online resources, including the OpenCourseWare (OCW) Consortium toolkit and various professional development opportunities for faculty and staff. As a member of the OER Consortium, Houston Community College receives access to technical assistance on implementing OER usage, in addition to curated content. Additionally, library staff at Houston Community College have developed a popular library guide that provides faculty and students with an introduction to OER, as well as links to major repositories and organizations.

Navarro College

In 2011, Navarro College was awarded a TAACCCT grant as a part of the Pennsylvania College of Technology Consortium. The goal of the consortium is to provide entry-level certifications and a job placement system for individuals wishing to work in oil and natural gas production. As a part of this ShaleNET US consortium, Navarro College has assisted in developing a series of credit-based stackable certificate and degree programs designed to prepare individuals for jobs in the four primary components of oil and natural gas production: upstream, midstream, downstream, and instrumentation/electronics. The programs include OER

curriculum leading to certificates for floor hands and for instrumentation and electronics operators.

Texas Learning Objects Repository (TxLOR)

In 2009, the Texas Learning Objects Repository was created at The University of Texas System TeleCampus and jointly was funded through grants by the Texas Higher Education Coordinating Board and The University of Texas Health Sciences System after a successful pilot project led by Dr. William Moen at the University of North Texas. After the closure of the TeleCampus, TxLOR was transferred to The University of Texas at San Antonio. The goal of TxLOR is to create a “web application that provides a method for Texas higher education institutions to review and share a variety of learning materials,” especially materials associated with general education and developmental education courses taught across Texas.¹⁰¹ As of August 31, 2014, TxLOR contained 1,328 learning objects, an increase of 25 percent from the 1,065 objects contained in August 2013. Since its launch in April 2011, TxLOR has seen 5,045 searches resulting in 7,256,808 bitstream views that correspond to the download and usage of thousands of learning objects. Among the objects with the most usage are materials associated with United States History I and II, Chemistry, and Statistics. The average views per item was 225. As of August 2014, TxLOR has 55 users registered as contributors or administrators from 23 Texas institutions and several contributors from outside Texas (such as SUNY Binghamton). The 23 Texas institutions include:

- Frank Phillips College
- Galveston ISD
- Houston Community College
- Howard Community College
- Jefferson ISD
- M.D. Anderson Cancer Center
- The University of Texas Health Science Center Houston
- Midwestern State University
- Texas A&M University
- Texas A&M University-Commerce
- Texas State University
- Texas Tech University
- The University of Texas at Austin
- The University of Texas at San Antonio
- The University of Texas at Tyler
- The University of Texas Health Science Center at San Antonio
- The University of Texas Medical Branch (Galveston)
- The University of Texas of the Permian Basin
- The University of Texas-Pan American
- The University of Texas Southwestern Medical Center
- The University of Texas System
- University of Houston
- University of Houston-Downtown

¹⁰¹ From “Welcome to TxLOR,” Texas Learning Objects Repository (TxLOR).

The storage and delivery capacity of the repository is almost infinite because the underlying technology of TxLOR was designed specifically for scalability.¹⁰²

The University of Texas at Arlington

Through its Learning, Innovation, and Networked Knowledge (LINK) Research Lab, The University of Texas at Arlington is sponsoring the development of an on-campus Professional Learning Community for the 2014-15 academic year. This community focuses on exploring and implementing strategies, activities, and projects that improve the use of open educational resources at the institution. In addition to campus activities, including consultation with Dr. David Wiley, a noted expert in open educational resources, faculty and staff participating in the project will also attend the 11th Annual Open Education Conference. The University of Texas at Arlington Library also has provided the campus community with an introduction to OER and an annotated listing of major repositories.

Tyler Junior College

In 2012, Tyler Junior College was awarded a TAACCCT grant as a part of the four-state consortium with Alaska, California, and Oregon. The ACT-On Retail Management Careers Project currently is developing an industry recognized credential in retail management. When completed in fall 2015, the curriculum will be licensed through Creative Commons and will be available online for national use. Once nationally available, the Creative Commons licensing will allow other institutions to customize the curriculum as necessary. Development of the curriculum and piloting is ongoing with completion targeted for September 2016.

University of North Texas

The Universities Libraries at the University of North Texas (UNT) currently sponsor Open Access @ UNT, an initiative to provide faculty with information regarding open access and open educational resources. As a part of this initiative, the University of North Texas adopted a policy on open access for scholarly materials in 2011. The university supports the maintenance of the UNT Data Repository and UNT Scholarly Works repository as digital repositories dedicated to long-term preservation and access to UNT faculty research and also sponsors an annual symposia on Open Access.

¹⁰² From dSpace, the system architecture for TxLOR, hosted on the Amazon EC2 elastic cloud platform; it has a storage and delivery capability several orders of magnitude larger than its current usage.

Conclusion and Recommendations for OER Usage at Texas Institutions of Higher Education

The current literature on the usage of open educational resources indicates promising results in both the quality of resources and the ability of such material to lower student learning material costs. In 2012, the United Nations Educational, Scientific and Cultural Organization (UNESCO) sponsored an international congress on open educational resources and released the *2012 Paris Open Educational Resources (OER) Declaration*, which recommended that nations commit to the following:

- Foster awareness and use of OER.
- Facilitate enabling environments for use of Information and Communications Technologies (ICT).
- Reinforce the development of strategies and policies on OER.
- Promote the understanding and use of open licensing frameworks.
- Support capacity building for the sustainable development of quality learning materials.
- Foster strategic alliances for OER.
- Encourage the development and adaptation of OER in a variety of languages and cultural contexts.
- Encourage research on OER.
- Facilitate finding, retrieving, and sharing of OER.
- Encourage the open licensing of educational materials produced with public funds.

Recommendations

It is in the spirit of the *2012 Paris OER Declaration* that the Coordinating Board, in collaboration with the VCT, makes the following recommendations regarding OER development and usage at Texas' colleges and universities.

- *Any open educational resources developed with public funds should be licensed under a Creative Commons license of Attribution-NonCommercial-ShareAlike (BY-NC-SA), Attribution (BY), or Attribution-ShareAlike (BY-SA) (see Appendix A for more information about these terms).* Using one of these licenses for publicly funded OER will ensure materials can be freely distributed; can be tweaked, modified, remixed, and/or redistributed by faculty; and can be made freely available for public educational use.
- *Efforts made by the state or other organizations should initially focus on the development of OER content for those lower-division, general education courses with the greatest statewide enrollments.* During the last three years, the Coordinating Board has convened faculty committees to develop common learning outcomes for the most widely taught general education courses. These learning outcomes can be found in the *Lower-Division Academic Course Guide Manual (ACGM)* and should serve as a part of the foundation for the development of general education OER materials. Furthermore, these efforts not only should be confined to the creation of textbooks, but also should include the creation of ancillary materials such as presentations, slide decks, syllabi, assignments, and test banks.

- *Texas' public institutions of higher education should work with faculty to create policies that encourage the development and usage of OER materials. Any OER materials developed with public funds should include a policy for ongoing periodic reviews of the material to ensure they remain aligned with best practices in curriculum and instructional design.* Any institutional policy regarding OER development and usage not only should include faculty buy-in, but also faculty input into the policy's language. Additionally, institutions should find ways to reward faculty for their development and/or usage of open educational resources. These incentives could include grants for OER development, release time to develop and/or adapt OER materials for use in their courses, or performance evaluations that contain an OER development factor as part of tenure and promotion reviews.
- *Texas higher education faculty should have access to professional development materials that can assist them in developing and using open educational resources. Higher education faculty could be made aware of these materials via an integrated resource awareness program.* Because the use of open educational resources can significantly impact classroom teaching, the adoption and creation of OER materials will require faculty support through professional development. This development might include materials on how to find and evaluate OER, how to incorporate OER into a course, or how to develop and distribute OER. Because of its statewide nature, the Virtual College of Texas is in a unique position to develop and provide such materials and services, perhaps in cooperation with other statewide organizations such as the Texas Community College Teachers Association, the Texas Distance Learning Association, the Northeast Texas Consortium, the Texas Association of College Technical Educators, the Texas Faculty Association, and Starlink. Recordings of webinars and other presentations and professional development materials should be included in the Texas Learning Objects Repository.
- *Any open educational resources developed with state funds should align with industry standards for tagging metadata and also should align with accessible design standards.* For OER materials to gain the widest usage, it is imperative that they conform to industry standards for tagging metadata. Doing so will ensure that OER materials can be easily ingested into repositories, easily found through the use of search engines, and easily ingested into institutional learning management systems. Additionally, all OER content should conform to current accessibility guidelines to allow for their usage by the greatest number of students.
- *The Coordinating Board's [Learning Technology Advisory Committee](#) (LTAC) should be involved in actively monitoring state and national developments in the field of open educational resources to make recommendations to the Coordinating Board and Texas' public institutions of higher education, as needed.* Additionally, the LTAC may find it useful to create recommended OER development and usage guidelines, assist VCT in reviewing or developing professional development materials, and/or make general recommendations about the development and use of OER in Texas' higher education institutions.

- *[The Texas Learning Objects Repository \(TxLOR\)](#), a web application used by public institutions of higher education in Texas to review and share learning materials, should be expanded.* In 2009, the Texas Learning Objects Repository was created at The University of Texas TeleCampus and jointly funded through grants by the Coordinating Board and The University of Texas Health Sciences System. After the closure of the UT TeleCampus, TxLOR was transferred to The University of Texas at San Antonio. Not only should any new OER materials funded through public funds be placed in TxLOR, but the repository should be expanded so that it can serve as a portal to other national and regional repositories. This expansion will allow staff to explore ways in which the repository can partner with other state and institutional repositories to increase the amount of material available to Texas faculty. This path also will allow TxLOR to become the state's primary source for faculty wishing to locate open educational resources and repositories. Additionally, TxLOR, working with VCT and other interested organizations, should develop quality assurance standards for OER content. It is important to note, however, that for TxLOR to reach these goals, especially the expansion of the repository, funds will need to be secured.
- *Before the development of any statewide open educational resources initiative, further study of other state initiatives for the development and dissemination of open educational resources, such as those found in Florida and Washington, should be undertaken.* The OnCoRe Blueprint Project, developed by Florida through support by a grant from the Fund for the Improvement of Postsecondary Education, provides a blueprint for the development of a statewide open educational resources policy and digital repository. Although Texas already has a statewide digital repository, the Texas Learning Objects Repository, expansion of TxLOR and the coordination of the development of OER materials will need to occur for any statewide policy to be successful. Florida's experiences may serve as an important blueprint, especially around statewide implementation and sustainability issues. The experiences of Washington's statewide community and technical college initiative also may provide valuable lessons for OER development and adoption at community and technical colleges.

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Appendix A, Creative Commons Licensing Options

License	Abbreviation	Redistribute	Remix	Change	Other Forms of Building Upon Work	Commercial	Non-Commercial	Requires Attribution to Original Creator
Attribution 	CC BY	YES	YES	YES	YES	YES	YES	YES
Attribution-No Derivatives 	CC BY-ND	YES	NO	NO	NO	YES	YES	YES
Attribution-Non Commercial-Share Alike 	CC BY-NC-SA	YES	YES	YES	YES	NO	YES	YES
Attribution-Share Alike 	CC BY-SA	YES	YES	YES	YES	YES, MUST LICENSE ANY NEW MATERIALS UNDER IDENTICAL TERMS	YES, MUST LICENSE ANY NEW MATERIALS UNDER IDENTICAL TERMS	YES
Attribution-Non Commercial 	CC BY-NC	YES	YES	YES	YES	NO	YES, ANY NEW MATERIALS MUST REMAIN NON-COMMERCIAL	YES
Attribution-Non Commercial-No Derivatives 	CC BY-NC-ND	YES	NO	NO	NO	NO	YES	YES



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