Game Changers

EDUCATION and INFORMATION TECHNOLOGIES

Edited by **DIANA G. OBLINGER**

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FROM THE EDITOR

I would like to thank the many people who made this book possible, particularly Gregory Dobbin for managing the project and Karen Mateer for her research.

—Diana G. Oblinger

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Why Openness in Education?

David Wiley and Cable Green

IN THIS CHAPTER, we explore a number of ways openness affects the practices of teaching and learning and the motivations behind supporters of these emergent practices. We discuss the three principal influences of openness on education: open educational resources, open access, and open teaching.

Open Educational Resources

"Open educational resources" (or OER) have become a widely discussed topic in recent years. Open educational resources are educational materials (e.g., course textbooks, research articles, videos, assessments, simulations, etc.) that are either (a) licensed under an open copyright license (e.g., Creative Commons[1]) or (b) in the public domain. In both cases, every person in the world enjoys free (no cost) access to the OER *and* free (no cost) permission to engage in the "4R" activities when using the OER:

- *Revise*—adapt and improve the OER so it better meets your needs.
- *Remix*—combine or "mash up" the OER with other OER to produce new materials.
- *Reuse*—use the original or your new version of the OER in a wide range of contexts.
- *Redistribute*—make copies and share the original OER or your new version with others.

Many struggle to understand why there are those who would take the time and effort to craft educational materials only to give them away without

capturing any monetary value from their work. There are several lines of thought that motivate participants in the open educational resources community. Some of these motivations are listed below.

Education Is Sharing

Education is, first and foremost, an enterprise of sharing. In fact, sharing is the sole means by which education is effected. If an instructor is not sharing what he or she knows with students, there is no education happening.

Those educators who share the most thoroughly of themselves with the greatest proportion of their students are the ones we deem most successful. Do students come away from a course in possession of the knowledge and skills the instructor tried to share? (In other words, is the instructor a successful sharer?) If so, we call the instructor a successful educator. If an instructor's attempts at sharing fail, we call that instructor a poor educator. *Education is a matter of sharing, and the open educational resources approach is designed specifically to enable extremely efficient and affordable sharing.*

Leveraging the Internet: The Internet has frequently been compared to the printing press, which was in turn frequently compared to the process of writing books by hand. Today, the cost of having a 250-page book transcribed by hand is about $250. The cost of printing that same book with a print-on-demand service is about $5. The cost of copying an online version of that same book (e.g., an ePub file) is about $0.0008. The cost of shipping either the handwritten or printed book is about $5. The cost of distributing an electronic copy of the book over the Internet is approximately $0.0007.

Clearly, the Internet has empowered us to copy and share with an efficiency never before known or imagined. However, long before the Internet was invented, copyright law began regulating the very activities the Internet makes essentially free (copying and distributing). Consequently, the Internet was born at a severe disadvantage, as preexisting laws discouraged people from realizing the full potential of the network.

Since the invention of the Internet, copyright law has been "strengthened" to further restrict the Internet's copying and sharing capabilities. While existing laws, business models, and educational practices make it difficult for instructors and learners to leverage the full power of the Internet to access high-quality, affordable learning materials, open educational resources can be freely copied and shared (and revised and remixed) without breaking the law. *Open educational resources allow the full technical power of the Internet to be brought to bear on education. OER* allow *exactly what the Internet en-ables: free sharing of educational resources with the world.*

The $5 textbook: According to U.S. PIRG,[2] college textbook prices have increased at nearly four times the rate of inflation for all finished goods since 1994. College students spend an average of $900 per year on textbooks—26 percent of the cost of tuition at a public, four-year university. And this has occurred at the same time tuition and fees at universities have blossomed 130% over the same period, while middle-class incomes have stagnated.[3] The cost of textbooks is a significant factor in the cost of higher education, growing beyond the reach of more individuals each year. OER have considerable potential to be a part of the solution to this problem.

Faculty, governments, and foundations are building and/or commissioning and sharing high-quality, openly licensed textbooks with the world. Many open textbook projects allow the textbooks to be used free online and provide a method for purchasing a printed copy for those who prefer printed books. Examples of open textbook providers include Flat World Knowledge (http://www.flatworldknowledge.com) in the postsecondary space and CK–12 (http://ck12.org) in the K–12 space. Utah recently demonstrated that high school science textbooks starting from CK–12's open textbooks can be aggregated, printed, and delivered to thousands of students for less than $5 per book. The Open Education Group at Brigham Young University also found there was no difference in learning outcomes between students who used open textbooks and students who used traditional, proprietary textbooks.[4] In an era of stagnant or shrinking education budgets, open textbooks seem to be a simple solution to an expensive problem. *Open educational resources provide an immediate, proven way to make education significantly more affordable and accessible for students.*

Continuous quality improvement: For as long as we can remember, instructors have been "supplementing around" problems with textbooks. When we can't find a single textbook that meets our needs, it is not uncommon for us to assign two or more textbooks, intending only to use parts of each. Because printed, copyright-protected learning materials are not easily (or legally) revised and remixed, it is unthinkable that we might simply start taking books apart in order to assemble exactly what we want and exactly what our students need. Instructors and students are constantly "making do" with suboptimal materials—and spending more than necessary as they do so.

Under the current copyright laws, instructors are essentially powerless to legally improve the materials they use in their classes. *OER provide instructors with free and legal permissions to engage in continuous quality-improvement processes such as incremental adaptation and revision, empowering instructors to take ownership and control over their courses and textbooks in a manner not previously possible.*

Buy one, get one: The "buy one, get one" sale has become a fixture in American advertising. Implied in the special offer is the promise that when you buy one item, like a pizza or T-shirt, you'll get a second one free. However, there is a more literal way of interpreting the phrase: when you buy something, you should actually get the thing you paid for. Imagine paying in advance for a week's vacation in a cabin by a beautiful lake, only to be charged a second time when you arrive and check in. You would never stand for such a thing, because everyone understands that when you buy one, you should get one.

State and federal governments frequently fund the development of education and research resources through grants made by the National Science Foundation, the Departments of Labor, Education, Energy, and other entities. Through these grants, state or federal governments commission the creation of these resources using taxpayer dollars. In other words, when the National Science Foundation gives a grant to a university to produce a pre-engineering curriculum, you and I have already paid for it. However, it is almost always the case that these products are commercialized in such a way that access is restricted to those who are willing to pay for them a second time. Why should we be required to pay a second time for the thing we've already paid for? Or worse—if every school district in your state pays to license the curriculum, you've now paid for it 250 times.[5]

Governments and other funding entities that wish to maximize the impacts of their education and research investments are moving toward open policies. National/state/provincial governments and education systems all play a critical role in setting policies that drive education investments and have an interest in ensuring that public funding of education makes a meaningful, cost-effective contribution to socioeconomic development.[6] Given this role, these policy-making entities are ideally positioned to encourage or require recipients of public funding to produce educational resources under an open license. Open policies typically embrace the concept that all publicly funded education and research resources should be openly licensed resources.

Because the bulk of education and research funding comes from taxpayer dollars, it is essential that OER and open access have open policies. As governments move to require open policies, hundreds of billions of dollars of educational and research resources will be freely and legally available to the public that paid for them. *Every taxpayer has a reasonable expectation of access to educational materials and research products whose creation tax dollars supported.*

Early collections of open educational resources include Rice University's Connexions project (http://cnx.org) and MIT's OpenCourseWare (http://

ocw.mit.edu). More recent examples include the state of Washington's Open Course Library (http://www.opencourselibrary.org).

Open educational resources represent multiple opportunities to innovate in the teaching and learning context, including the ability to dramatically improve the affordability of education and enable better personalization of instruction.

Open Access

"Open access" refers to research articles that are freely and openly available to the public for reading, reviewing, and building upon. From one perspective it can be seen as a special case of the "buy one, get one" example just described. But there are other reasons why many support the open access model. A brief parable illustrates the point:

> Once upon a time there was a brilliant inventor who one day had a "eureka!" moment. She sketched out the design of her breakthrough product and worked and reworked the design. When she was satisfied that the design was ready to take to production, she began contacting potential funders. After a long process, she acquired the funding needed to put her ideas to work.
>
> Money in hand, she began searching for employees—production specialists, designers, marketing experts, and others. They all set to work. They persevered through false starts and breakthroughs, and finally the day arrived when they had a product ready to ship! Relieved, the inventor began contacting shipping companies. To her disbelief, the shipping companies would only deliver her goods under the following conditions:
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> - The inventor had to agree to ship her product via the one shipping company exclusively.
> - This exclusive shipping deal had to be a perpetual deal, never subject to review or cancelation.
> - The inventor had to sign over to the shipping company all of the legal rights to her product.
> - The shipping company would be the seller of her product to the public, and it would retain all the profits from these sales.

The parable is, of course, analogous to a researcher and her interactions with the academic-journal publishing industry. Under the traditional system,

journal publishers hold the legal rights to reproduce and distribute the research results published in their journals. A comparison of the relative effort and intellectual contribution invested by the researchers and the publishers, however, suggests an imbalance.

In terms of effort of contribution, the researcher is responsible for

- generating original, significant ideas for new research,
- competing for and winning grant funding for the research,
- identifying and hiring highly qualified students and other professionals to conduct the research,
- rigorously and responsibly carrying out the program of research, and
- writing up the results of the research in a communicative manner.

In terms of effort of contribution, the publisher is responsible for

- coordinating volunteers who review the merits of the research results (these volunteers are other researchers who review at no cost to the publisher),
- making a publication decision about the research results,
- copyediting and formatting the final version of the research results, and
- publishing and distributing the results.

The researcher is responsible for the overwhelming majority of the effort that goes into conceiving, conducting, and reporting the research. The publisher is responsible for only the portion of effort that goes into publication. The publisher makes a much less significant intellectual contribution to the papers it publishes (note again that the publisher itself does not review the written results for intellectual rigor and quality; rather, it coordinates the review efforts of other researchers who volunteer to perform the reviews). At the end of the lengthy research process in which the publisher mainly makes coordinating and editorial contributions, the publisher then requires exclusive legal rights to control the reproduction and distribution of the researcher's work's results. And, publishers often also charge the original researcher for copies of his or her work. Many feel that this represents a scholarly publishing status quo that is completely out of balance and that the researcher should control the reproduction and distribution rights to his or her work.

We can conduct a similar analysis from a financial perspective. The average annual dollar value of a National Institutes of Health (NIH) grant is between $210,769[7] and $239,826.[8] The scholarly published output of the average NIH grant is approximately 1.6 research articles per year.[9] This puts the average financial cost of generating a research article somewhere between $105,385 and $119,913 per article. By contrast, the average cost for a

traditional, high-quality journal to publish an article, including administrative and other costs, is $2,750.[10]

In terms of average financial investment per article, the publisher is responsible for 2–3 percent of the overall investment. Because of this imbalance, and the desire and right of individual researchers to control the reproduction and distribution rights of their own work, thousands of open journals (7,459 listed in the Directory of Open Access Journals, http://www.doaj.org, as of February 2012) have emerged to host openly licensed research articles. Faculty are also responding by voting to support "open access policies" at their universities (see http://roarmap.eprints.org), which typically grant the university the rights necessary to archive and make articles written by faculty freely and openly available on the Internet.

Open Teaching

"Open teaching" began as a practice of using technology to open formal university courses for free, informal participation by individuals not officially enrolled in the course. In the university context, open teaching involves devising ways to expose the in-class experiences to those who are not in the class so that they can participate as fully as possible. Some popular strategies include

- posting syllabi in publicly viewable blogs or wikis, where everyone can view them;

- assigning readings that are freely and openly available, so that everyone can access and read them;

- asking students to post homework assignments and other course artifacts on publicly viewable blogs or wikis, so they can catalyze further discussion of relevant topics; and

- using a wide range of traditional and social media, including e-mail, microblogging, and blog comments, to carry on the course discussion.

Early examples of open teaching include Utah State University's Introduction to Open Education course (http://opencontent.org/wiki/index.php?title=Intro_Open_Ed_Syllabus); recent examples include Stanford's Introduction to Artificial Intelligence (AI) course (https://www.ai-class.com).

Some open teaching courses have provided alternative credentials to participants as well. Informal participants in both the Introduction to Open Education course and the Stanford AI course who successfully completed the assigned work could receive certificates of completion from the faculty. It is

critical to note here that the certificates are not issued by the faculty member's university and do not bear any credit toward graduation or anything else. They are simply statements of achievement signed by the faculty members.

The open teaching model has also been applied to structured learning experiences that did not begin as university courses. These tend to be gathered under the moniker "Massive Open Online Course," or MOOC. An example of a MOOC is Welcome to Change: Education, Learning, and Technology (http://change.mooc.ca). MOOCs are typically based on a "connectivist" philosophy that eschews educator-specified learning goals and supports each person in learning something different. One way of understanding the MOOC design is to say that it applies the "open" ethos to course outcomes. In other words, students are empowered to learn what they need/want to learn, and the journey of learning is often more important than any predefined learning outcomes.

Additional teaching and learning models such as Peer 2 Peer University (http://p2pu.org), OER university (http://wikieducator.org/OER_university/Home), and University of the People (http://www.uopeople.org) are emerging, and they synthesize OER, open textbooks, open access, Open Badges (https://wiki.mozilla.org/Badges), open tutoring, and open teaching. It is an exciting time for education. *Open teaching provides individuals who might otherwise never have the opportunity to experience postsecondary learning a free and open chance to participate.*

Conclusion

Openness is impacting many areas of education—teaching, curriculum, textbooks, research, policy, and others. How will these individual impacts synergize to transform education? Will new and traditional education entities leverage the Internet, the affordances of digital content (almost cost-free storage, replication, and distribution), and open licensing to share their education and research resources? If they do, will more people be able to access an education and, if so, what will that mean for individuals, families, countries, and economies? If scientists and researchers have open access to the world's academic journal articles and data, will diseases be cured more quickly? Will governments require that publicly funded resources be open and free to the public that paid for them? Or will openness go down in the history books as just another fad that couldn't live up to its press? Only time will tell.

Notes

1. Creative Commons licenses are typically used to openly license educational and research resources. For more information, go to http://creativecommons.org/licenses.
2. U.S. PIRG, "New Report Shows College Textbook Costs Increasing Sharply Ahead of Inflation: Publishers Engage in Practices That Needlessly Drive Up Textbook Costs for Students" (2005), http://studentpirgs.org/news/new-report-shows-college-textbook-costs-increasing-sharply-ahead-inflation.
3. Annalyn Censky, "Surging College Costs Price Out Middle Class," CNN Money (June 13, 2011), http://money.cnn.com/2011/06/13/news/economy/college_tuition_middle_class/index.htm.
4. David Wiley, John Hilton, Shelley Ellington, and Tiffany Hall, "A Preliminary Examination of the Cost Savings and Learning Impacts of Using Open," International Review of Research in Open and Distance Learning (forthcoming).
5. U.S. Census Bureau, Population Division, "Number of School Districts and Distribution of the School-Age Population by the Total School District Population: 1990 and 2000," (Table 10, June 3, 2004), http://www.census.gov/population/www/documentation/twps0074/tab10.pdf.
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7. A. Gass, "Paying to Free Science: Costs of Publication as Costs of Research," *Serials Review* 31, no. 2 (June 2005): 103–6, available for purchase online at http://www.sciencedirect.com/science/article/pii/S0098791305000432.
8. B. G. Druss and S. C. Marcus, "Tracking Publication Outcomes of National Institutes of Health Grants," *The American Journal of Medicine* 118, no. 6 (June 2005): 658–63, http://www.amjmed.com/article/S0002-9343%2805%2900101-4/abstract.
9. Ibid.
10. Wellcome Trust, "Costs and Business Models in Scientific Research Publishing" (September 2003), http://www.wellcome.ac.uk/About-us/Publications/Reports/Biomedical-science/WTD003185.htm.

David Wiley *is Associate Professor of Instructional Psychology and Technology in the David O. McKay School of Education at Brigham Young University. Wiley also serves as Associate Director of the Center for the Improvement of Teacher Education and Schooling with responsibility for the research unit, where he directs the Open Education Group.* **Cable Green** *is the Director of Global Learning for Creative Commons. Green works with the global open community to leverage open licensing, open content, and open policies to significantly improve access to high-quality, affordable education and research resources so everyone in the world can attain all the education they desire.*