anyone around the world.

Over the last decade the technical, legal, and social puzzle pieces have come together so that anyone, anywhere can now author, assemble, customize, distribute, have reviewed, and publish their own textbook in very little time and at zero or very low cost. The key enablers are:

▸ Technologies like the Internet, which enables virtually free digital content distribution; XML, which turns a monolithic textbook into a rapidly reconfigurable construction of small, reusable "modules," much as building with Lego blocks; Web 2.0 tools like wikis and semantic tagging systems, which enable real-time distributed global collaboration; advanced visualization and graphics tools, which enable immersive simulation environments; and print-on-demand systems, which enable the production of inexpensive paper books for those who prefer or need them.

▸ Open copyright licenses like the Creative Commons and GNU Free Documentation licenses, which turn once closed and static educational materials into living objects that can be continuously developed, remixed, and maintained by a worldwide community of authors and editors.

Several OER projects are already attracting millions of users per month (as of July 2008). Some, like the MIT OpenCourseWare project (mit.edu/ocw) and its OCW consortium (ocwconsortium.org), are top-down organized institutional repositories that showcase their institutions' curricula. Others, like Connexions (cnx.org), are grassroots organized and encourage contributions from all comers. Still others, like the Open University's OpenLearn project (openlearn.open.ac.uk), combine aspects of both. Wikipedia (wikipedia.org) is regularly referenced by students, teachers, and faculty and is increasingly used directly as a learning tool. A consortium of community colleges throughout California and around the U.S. is developing a suite of free, open textbooks.[2] Governments like Vietnam's are committing to OERs to help reinvent their educational systems (vocw.vn). Professional societies like the IEEE are getting involved as a way to bolster their global educational outreach (ieeecnx.org). And the Student PIRGS Open Textbooks campaign (maketextbooksaffordable.org) is working to raise awareness of both textbook costs and this new avenue to reduce them. As a sign of the maturation of the movement, delegates from around the world met in Cape Town, South Africa to develop the eponymous Declaration that was officially released in January 2008 and has already garnered signatures from more than 1,600 individuals and 165 organizations to date (see capetowndeclaration.org).

Free and Open are Just the Beginning

The most exciting thing about OERs is that free access is just the beginning. OERs will increasingly blur the lines between courses, grade levels, labs, and textbooks, turning the current textbook production pipeline into a vast dynamic knowledge ecosystem that is in a constant state of creation, use, reuse, and improvement. OERs also promise to provide each child with his or her own textbook that's tailored to the student's background and learning style (not "off the rack" as they are today) and to the institution's goals.

OERs enable the development of tighter feedback loops that immerse students in interactive learning environments and couple learning outcomes more directly into textbook development and improvement. A key online ingredient will be "Web 3.0/Semantic Web" technologies based on natural language processing, data mining, machine learning, artificial intelligence, and semantic markup languages like MathML, MusicXML, and CML (Chemical Markup Language). The result will be "textbooks" that not only deliver open content to students but also monitor their interactions with them, analyze those interactions, and then send rich feedback to the student about their learning, as well as to the communities of curriculum builders, authors, and instructors to drive iterative improvement of the learning materials. An early example that currently focuses more on student feedback than continuous iterative content improvement is Carnegie Mellon University's Open Learning Initiative (cmu.edu/oli).

The buzz surrounding the high cost, limited access, static nature, and often low quality of the world's textbooks has reached a crescendo.

Free and Open as a Business Model

OERs are not at odds with the for-profit world. Indeed, we contend that the new development and distribution models promoted by the OER movement represent the natural and inevitable evolution of the educational publishing industry in a way that parallels the evolution of the software industry (the now-mainstream Linux, Apache, and Firefox), the music industry (Radiohead's recent "pay what you like" digital album download), and the scholarly publishing industry (the U.S. government's recent mandating of free online access to all journal articles stemming from NIH-funded research). The key enabler in all of these is free Internet-based digital distribution. Chris Anderson, in his *Wired* article "Free: Why $0.00 is the Future of Business," argues that while free was once a marketing gimmick, it is now emerging as a full-fledged economic model.

This economy provides many avenues for financially sustaining myriad different OER projects. Just as for-profit companies like Red Hat, IBM, Oracle, and others charge customers for the value they add to open source software and then in turn give back to the open source community through direct financial support, programming personnel, and free marketing, value-adding for-profit organizations are emerging in the OER space. For example, non-profit Connexions' partnership with for-profit QOOP (qoop.com) enables the production of print-on-demand paper textbooks that sell for a fraction of the price of a conventional commercial publisher ($20 for a 300-page engineering textbook in regular use at Rice University; $29 for a 500-page statistics textbook in use at a number of California community colleges starting in fall 2008). A three-way revenue-sharing arrangement benefits QOOP, Connexions, and the author (if