

SPORE* SERIES WINNER

MIT OpenCourseWare: Unlocking Knowledge, Empowering Minds

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As the global economy increasingly demands an educated workforce, school systems in the United States and abroad find themselves overwhelmed by student demand. Particularly in the developing world, there are not enough seats in classrooms with qualified teachers to make high-quality education opportunities available to every student. In places ranging from China to India to Turkey, only a small percentage of qualified students are accepted into university programs, especially those in science and technology fields. Existing institutions are under enormous pressure, and the needs of talented and motivated learners are not being met. Making headway against these formidable challenges will require rethinking traditional educational approaches and will call for the use of innovative technologies to scale up global capacity for providing high-quality education.

In 2000, a faculty committee at Massachusetts Institute of Technology (MIT) was charged with answering two questions: How will the Internet change education? and What should MIT do about it? Many of the Institute's peers were already launching distance-learning ventures, and it was expected that this committee would propose a similar endeavor. Instead, after a summer spent studying options, the committee came forward with a startling proposal. Rather than using the Internet to make money through distance learning, MIT should simply take the core academic materials already created on campus—the syllabi, lecture notes, assignments, and exams—and share them with the world. This suggestion seemed counterintuitive, given the prevailing direction of U.S. higher education at the time, but the profitability of distance learning was unclear, and the committee's proposal was far more consistent with MIT's mission to disseminate knowledge. To facilitate use of this content, they proposed publishing the materials using open licenses like those that had allowed open-source software to flourish (1).

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Ten years later, MIT OpenCourseWare (OCW), available at <http://ocw.mit.edu>, contains the core academic content used in ~2000 classes, presenting substantially all the undergraduate and graduate curriculum from MIT's 33 academic departments. A selection of courses, including introductory physics, math, and engineering, contain full video lectures. Partner organizations have created more than 800 translations of OCW courses in five languages. The OCW team has distributed over 200 copies of the entire Web site on hard drives primarily to sub-Saharan Africa, where Internet access is limited. OCW has grown into a global educational resource.

An early challenge for the program was to figure out exactly who was using the site and how. The committee that proposed the project imagined it would largely be used as a resource for educators who would download and adapt the materials for use in their own classes. Even from the beginning, however, it was clear that OCW appealed to wider audiences. Early surveys indicated that educators at other universities represented about 15% of the audience. Students from other universities, another expected audience, made up another 35%. The largest portion of the visitors, however, came from an unanticipated group: 50% of visitors self-identified as independent learners unaffiliated with a university. Although OCW was not structured as a distance-learning program, it became clear that OCW did support independent learning.

OCW currently receives upwards of 1.5 million visits each month from ~900,000 unique individuals (2). Students have grown to 42% of the audience, and educators and independent learners now constitute 9% and 43% of visitors, respectively (3). Twelve percent of educators responding to a March 2010 visitor survey indicated that they do incorporate OCW materials into their own content as anticipated, but educators more frequently use OCW for personal learning (37%), to adopt new teaching methods (18%), and as a reference for their students (16%). Students were

A collection of more than 2000 course syllabi, lecture notes, assignments, and exams is provided free of charge.



Case study. Haitian entrepreneurs used OCW to bring solar-powered streetlights to Cité Soleil, one of Haiti's poorest shantytowns.

largely expected to use the site as a supplement to materials they received in their own classes, a use identified by 40% of students. Just over 43%, however, indicated that they also use OCW for personal learning beyond the scope of their formal studies, and a further 12% use it as an aid in planning their course of study. Independent learners use OCW in a variety of personal (41%) and professional (50%) contexts, including home-schooling children and keeping up on developments in their professional field. Sixty-six percent of visitors indicate they are mostly or completely successful at meeting their educational goals for visiting the site.

One example of OCW use is that of Professor Triatno Yudo Harjoko, Head of the Architecture Department at the University of Indonesia. Together with his colleagues, Harjoko is redesigning their teaching model. Harjoko describes the main goal in this transition as “encouraging students to learn by themselves, and to be both critical and creative.” In the redesign process, OCW, to which Harjoko was introduced by a colleague several years ago, has served as an immense comparative database. Rather than directly transposing OCW syllabi to University of Indonesia courses, Harjoko and his colleagues have been scrutinizing MIT's courses to better understand how they were designed and



Highlights of Calculus. A series of videos, showing ways in which calculus is important in our lives, are ideal for high school students, college students, and anyone interested in learning the basics of calculus. View the videos at <http://ocw.mit.edu/high-school/calculus/>.

developed. "We try to understand how the courses are formulated," Harjoko explains, "and what the expected outcomes are. This gives us an important perspective on the learning process."

The impact of OCW also reaches far beyond formal classrooms. Haitian natives Jean-Ronel Noel and Alex Georges provide an example of the many unanticipated ways OCW is generating benefit. Noel and Georges planned to create solar panels to power lighting to serve the needs of their country, but in their research and development process, they required guidance in electrical engineering. Noel found the needed help through OCW. "I was able to use OCW to learn the principles of integrated circuits. It was much better than any other information I found on the Internet." Today their company, Enersa, has made a difference in their community by training and employing 18 people of Cité Soleil and has made a positive impact on the environment by making solar-powered LED lighting available in almost 60 Haitian towns and remote villages (see the first figure).

Perhaps more significant than the direct impact of the site is the global OCW movement MIT helped launch. More than 200 universities worldwide have joined MIT in sharing their own educational materials openly, creating a global body of knowledge that spans many cultures and academic levels. More than 13,000 courses from these schools are available through the OpenCourseWare Consortium portal (<http://ocwconsortium.org>) (4).

MIT has been very successful at attracting a large global audience that uses the OCW materials in a wide

variety of ways. The site is a repository of educational resources, a reference for scientific and technical information, an educational planning tool, an informal learning space, and a source of entertainment and inspiration to millions of people. The site has also generated significant benefit for the existing MIT community with more than 90% of students, 84% of faculty, and 50% of alumni accessing the site for a range of academic purposes. In addition, more than a third of incoming freshman who knew of the site before choosing their school say OCW positively influenced their decision to attend MIT.

This variety of uses, however, presents the greatest challenges in developing a vision for the next phase of OCW's development. Although MIT will continue to publish materials from new courses and to update materials from previously published courses, the OCW team is actively seeking new ways to expand the project's global ben-

efit. In 2007, OCW introduced a companion site, Highlights for High School (<http://ocw.mit.edu/highschool>), which catalogs more than 2600 resources embedded in the main OCW site that correspond to U.S. Advanced Placement curricula for physics, calculus, and biology (see the second figure). The Highlights site has received more than 1 million visits since launch, and 70% of visitors report being mostly or completely successful at meeting their educational goals in accessing the site.

This fall, OCW will begin to introduce course materials designed specifically for use by independent learners, which will include complete sets of content, increased focus on problem-solving, and additional self-assessment opportunities. Through these and other pilot programs, the OCW team hopes to develop a better understanding of how to increase the benefits for this varied global audience.

OCW must also develop a sustainable funding model. MIT currently covers about half the cost of OCW publication, and grant reserves support the rest of the \$3.7 million annual budget. As the grant reserves are depleted, OCW expects to transition to a model similar to that used by U.S. National Public Radio, drawing support to complement MIT's direct contributions from a combination of corporate gifts and underwriting, visitor donations, major gifts, and additional grants. In the past year, OCW has received more than \$220,000 in small donations from thousands of users around the world, indicating that this model has the potential to generate substantial support.

Despite the global use of OCW materials and the widespread adoption of the OCW model at universities worldwide, we are still in the early stages of understanding the many ways these materials are being used to improve formal and informal learning, and we believe many opportunities lie ahead for increasing the impact of OCW materials from MIT and the many other schools that have chosen to share their educational resources.

About the Authors



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References and Notes

1. OCW content is published under a Creative Commons V3.0 license, www.creativecommons.org.
2. OCW monthly traffic data, <http://ocw.mit.edu/about/site-statistics/monthly-reports/>.
3. For visitor role and use data, please see: <http://ocw.mit.edu/about/site-statistics/>.
4. MIT was instrumental in establishing the OCW Consortium and guiding its early collaboration efforts as an informal alliance. In 2009, the Consortium became an independent 501(c)(3) organization with its own board, officers, and budget. For more information, see <http://ocwconsortium.org>.

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