

MIT OpenCourseWare

MIT OpenCourseWare (OCW) is a free and open digital publication of high-quality educational materials organized as courses. Through the Internet, MIT OpenCourseWare has opened MIT's curriculum and the course materials created by MIT faculty to a global audience of teachers and learners. In the United States and around the world educators use these materials for teaching and curriculum development, while students and self-learners draw upon the materials for self-study or supplementary use.

As of June 30, 2010, there were 1,997 courses available on OCW, representing virtually the entire undergraduate and graduate curricula in MIT's five schools and 33 academic units. Since the inception of OCW in 2002, we have also updated hundreds of courses with fresh materials and new pedagogical approaches. OCW publishes about 60 new courses and 110 updates each year.

The overarching goals of OCW are to:

- Publish high-quality, up-to-date MIT course materials
- Increase use of OCW for teaching and learning
- Maximize the benefits of OCW for the MIT community
- Support worldwide Open Educational Resources (OER) and the OCW movement
- Sustain the MIT OCW program

This report is organized according to these overarching goals.

Publishing High-Quality Course Materials

Course Publication

Course publication is at the heart of the OCW mission. During the year ending June 30, 2010, we published 70 new courses, bringing the total published to 1,997, and updated and refreshed 94 previously published courses, bringing the total number of courses updated to 597. In addition, we anticipate that by the end of this summer we will have published another 20 courses attributable to the spring 2010 cycle.

Faculty participation continues to be strong. To date, over 7,000 individuals, including the vast majority of MIT faculty, have voluntarily contributed original materials for publication on OCW.

OCW Scholar Courses

This year, OCW received a grant of \$2 million over three years from the Stanton Foundation to publish materials for 20 foundational courses specifically structured for independent study. The features of these courses, which we have labeled "OCW Scholar" courses, are as follows:

- Focused on foundational subjects in the basic sciences, mathematics, engineering, computer science, business, and economics

- Geared to support independent learning via logically sequenced self-explanatory content, rich media, recitation/problem-solving segments, and self-assessment tools
- Packaged with resources to provide educationally and economically disadvantaged learners additional background to approach certain materials
- Drawn from more than one MIT course in some cases
- Developed by MIT faculty with pedagogical approaches aimed at independent learners

Like other OCW courses, OCW Scholar courses involve no interaction with MIT faculty or students and there is no certification or recognition of work. The courses are offered at no cost, and registration is not required (nor possible). Scholar courses do not replace the existing OCW approach.

The first OCW Scholar courses will be published by December 2010:

- 8.01 Physics I (Classical Mechanics)
- 8.02 Physics II (Electricity and Magnetism)
- 18.01 Calculus I (Single Variable Calculus)
- 18.02 Calculus II (Multivariable Calculus)
- 3.091 Introduction to Solid State Chemistry
- 6.00 Introduction to Computer Science and Programming

Supplemental Resources

In addition to publishing MIT course materials, OCW undertakes many special projects to produce supplemental resources that enrich the educational content of OCW. As of June 30, 2010, there were 28 substantial supplemental resources on OCW.

Supplemental resources are developed through special collaborations. This year's special projects included the following.

- *Kana*: This collection of resources supports learning the Japanese language. One principal component, Hiragana, includes stroke order videos, pronunciation, and vocabulary for each character; reading and listening audio exercises; handouts on how to construct words and sentences; interactive quizzes testing character recognition; and printable worksheets to practice writing characters. The other key component is Katakana, covering pronunciation and vocabulary for each character, reading and listening audio exercises, interactive quizzes testing character and vocabulary recognition, and printable worksheets to practice writing characters.
- *Highlights of Calculus*: This resource comprises a series of short videos that introduce the basic ideas of calculus—how it works and why it is important. The intended audience is high school students, college students, or anyone who

might need help understanding the subject. In addition to the videos, there are summary slides and practice problems complete with an audio narration by professor Gil Strang. This resource is also available on Highlights for High School.

- *Angles*: *Angles* is an annual online magazine of exemplary writing by students in four foundational writing courses at MIT: 21W.730 Writing on Contemporary Issues, 21W.731 Writing and Experience, 21W.732 Science Writing and New Media, and 21W.734J Writing About Literature. In these classes, students learn to read more critically, to address specific audiences for particular purposes, to construct effective arguments and narratives, and to use and cite source material properly. Students in these courses write a great deal; they pre-write, write, revise, and edit their work for content, clarity, tone, and grammar and receive detailed feedback from instructors and classmates. Assigned readings are related to the thematic focus of each course and are used as demonstrations of writing techniques. The pieces in *Angles* can be used as teaching tools and practical examples for other students and self-learners to emulate.

Highlights for High School

In addition to the regular course publication, OCW also offers Highlights for High School (HFHS), which was launched in 2007. This program takes advantage of our trove of exceptional teaching resources to better serve high school constituencies. Since its inception, the HFHS portal (<http://ocw.mit.edu/OcwWeb/hs/home/home/index.htm>) has received 1.4 million visits, and it is now receiving 55,000 to 60,000 visits per month during the school year, an increase of about 64% over last year.

While we continue to maintain the HFHS section of OCW, this year we suspended development of new materials until further sources of funding can be identified. We did, however, incorporate the new Highlights of Calculus supplemental resource into HFHS.

Publishing Operations

There were two notable achievements this year. First, in collaboration with MIT Information Services and Technology and the MIT Libraries, we completed a landmark project to replace the OCW content management and publishing infrastructure. In the short term, this will allow us to improve usability and many features of the website. Longer term, this new infrastructure will help us improve integration with Stellar. The new content management system is based on the open-source Plone software.

Second, in winter 2010 we began incorporating fair use content into several courses. This is a follow-on to last year's multi-university collaboration to develop a "Code of Best Practices in Fair Use for OpenCourseWare." A key element of the publication process is intellectual property clearance. This applies when course materials contain third-party objects such as drawings, charts, and photos. In certain circumstances described in the code, use of copyrighted objects under the fair use doctrine of US copyright law is compatible with established practice. Fair use can contribute to a richer, more complete educational resource for users. Currently, there are more than 200 objects in OCW (out of thousands of third-party objects).

Increasing Use of OCW for Teaching and Learning

Users

OCW serves a global audience under a Creative Commons Attribution/Noncommercial/Share-Alike license (for information about Creative Commons, visit <http://www.creativecommons.org>). Users include:

- Educators, who may adopt or adapt the materials for their own teaching purposes
- Students enrolled in educational programs, who may use the materials for reference, practice exercises, or mapping out their programs of study
- Independent learners, who may find the materials helpful for enhancing their personal knowledge either from the materials themselves or from the many references, readings, and other resources

About 95% of all users indicate that they are partially or fully successful in achieving their purposes in using OCW.

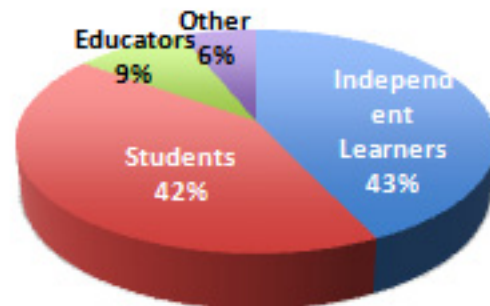


Figure 1. OCW users

OCW Distribution Channels and Traffic

The primary source for OCW materials is the MIT OCW website. Users visit the OCW website about 1.5 million times per month. To date, approximately 65 million individuals from every corner of the globe have accessed MIT OCW content, and traffic continues to grow every year.

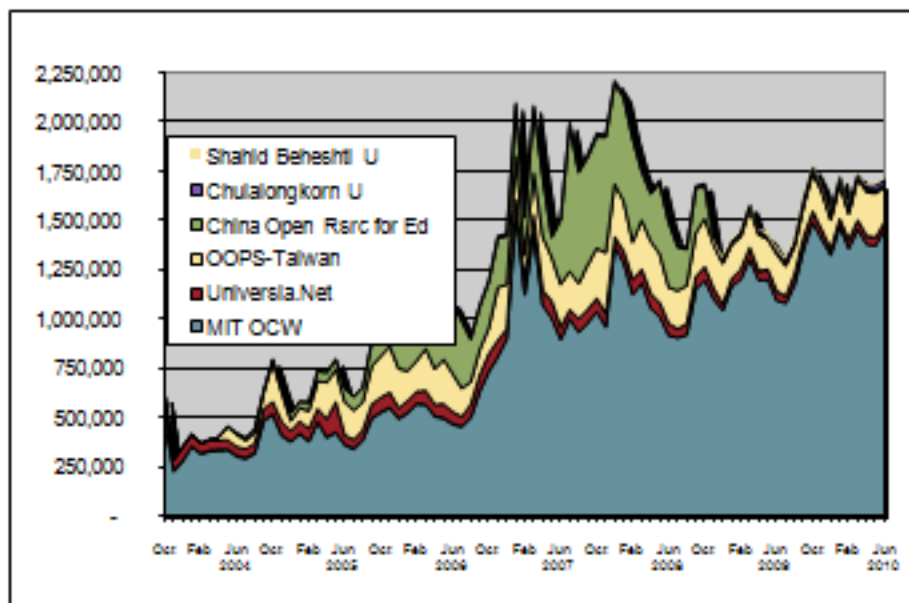


Figure 2. Web traffic to OCW and OCW translations through June 30, 2010

In addition to the OCW website, MIT provides content through the mirror site program, zip downloads, video distribution websites, and translation affiliate websites.

Mirror Site Program

For users in certain developing regions of the world, Internet access is cost prohibitive, unreliable, or nonexistent. OCW helps bridge the “digital divide” through its mirror site program. Since 2006, the program has provided OCW content on external hard drives, with updates via low-bandwidth-compatible rsync service, to educational institutions in areas with limited Internet access. As of June 30, 2010, OCW supported 244 mirror sites, primarily in African and South Asian countries such as Ethiopia, Ghana, Kenya, Namibia, Nigeria, Pakistan, the Philippines, Rwanda, Tanzania, and Zimbabwe.

Under the program, local educational institutions become OCW mirror site affiliates and agree to host OCW materials openly and freely under the OCW Creative Commons license. Affiliates also agree to promote OCW use among their constituents and provide a local contact for content updates and monthly usage data. The majority of OCW mirror site affiliates are colleges or universities that have good local area networks but may have access only to costly or weak Internet infrastructures. Nonprofit organizations, ministries of education, and Internet service providers are also OCW affiliates. This program is made possible by a generous donation of external hard drives from Seagate Inc. All technical and coordination efforts are provided on a volunteer basis.

The program is greatly facilitated by MIT students choosing to serve their home or host countries and help make OCW available locally. Many students on MIT Public Service Center fellowships or internships through the MIT International Science and Technology Initiatives (MISTI) personally install OCW on local campuses and also use the resource to teach courses and topics in mathematics and science at local venues.

Zip Downloads

Users can download individual courses in zip files for offline use. As of June 30, 2010, OCW has delivered over 11.7 million zip files of full course content.

Video Distribution Websites

Initially as a convenience for users, and more recently as a deliberate cost-cutting strategy, OCW has made its video and audio materials available through YouTube, iTunes U, VideoLectures.net, and Internet Archive. OCW video materials comprise well over 1,000 hours of content, including full-course video lectures for some of the most popular courses as well as video clips and demonstrations for many more courses. To date, iTunes U and YouTube together have supplied about 23 million video downloads. These free services replace bandwidth that OCW would otherwise have to buy from its worldwide network distribution service provider.

Translation Affiliate Websites

OCW has formal arrangements with other organizations and institutions to provide translations of MIT content. So far, languages include Spanish, Portuguese, Chinese (simple and classical), Thai, and Farsi. Our newest translation affiliate is the Turkish

Academy of Sciences, which plans to translate 70 courses over the next two years. Data from translation affiliates indicate that, in total, about 300,000 visitors per month access MIT content through their websites. Among these affiliates, there are about 800 translations of MIT OCW courses. There are also translations in other languages, including Japanese and French, developed by institutions on their own, without formal ties to OCW.

OCW in the News

We aggressively pursue media opportunities as a means of increasing OCW's visibility and impact, and as a result OCW is frequently cited in the media.

Although no official announcement will be made until July 2010, the American Association for the Advancement of Science notified OCW in spring 2010 that it would be the recipient of the Science Prize for Online Resources in Education (SPORE) and would be honored in the forthcoming July 30 issue of *Science* magazine. The SPORE awards were established to encourage innovation and excellence in education, as well as to encourage the use of high-quality online resources by students, teachers, and the public.

In addition, OCW appeared in the press more than two dozen times during the past year. Links to articles about OCW are available via the OCW website at <http://web.mit.edu/ocwcom/MITOCW/Media/>, offering access to articles such as the following:

- [“How to Learn Something for Nothing,”](#) *New York Times*, April 8, 2010
- [“An Open Mind,”](#) *New York Times*, April 8, 2010
- [“OpenCourseWare Brings Both New Benefits and Questions to Universities,”](#) *Daily Cardinal*, January 19, 2010
- [“Number of Free, Noncredit Courses on Web Increasing,”](#) *Philadelphia Inquirer*, January 12, 2010
- [“How to Learn Just About Anything Online...for Free,”](#) *AARP Bulletin*, January 1, 2010
- [“Website Launched to Boost Education,”](#) *Arab News*, December 29, 2009
- [“Opinion: OpenCourseWare and the Future of Education,”](#) *The Tech*, December 8, 2009
- [“Education’s Subtle Transformation,”](#) *Daily Free Press*, November 5, 2009
- [“Students Find Free Online Lectures Better Than What They’re Paying For,”](#) *Chronicle of Higher Education*, October 11, 2009
- [“Around the World, Varied Approaches to Open Online Learning,”](#) *Chronicle of Higher Education*, October 11, 2009
- [“Free Education from Massachusetts Institute of Technology,”](#) *Liberian Daily Observer*, August 26, 2009

Maximizing the Benefits of OCW

OCW contributes to the MIT community by:

- Creating lifelong connections between MIT and our students and alumni
- Catalyzing improvements in teaching and learning at the Institute
- Showcasing the MIT curriculum and the MIT faculty in ways that strengthen the Institute's reputation and promote international engagement

Beyond its service to a worldwide audience, OCW has a significant impact at MIT, where both faculty and students embrace it. OCW staff work extensively with faculty to develop or refine course materials for publication, and faculty frequently use these updated materials in their classroom teaching on campus. Some statistics are as follows:

- 84% of MIT faculty use OCW in their teaching, advising, or research
- 32% of faculty say that publishing on OCW improves their teaching materials
- 91% of MIT graduate and undergraduate students use OCW in one or more ways: as a part of their assigned coursework, as a supplemental resource for study, or as a tool for planning curricular programs and choosing courses
- 96% of these students say OCW has a positive impact on the MIT student experience

During AY2010, in addition to the inherent benefit of OCW for the MIT community, we also:

- Rolled out community messaging on the OCW website with announcements supporting MIT programs such as Sloan Executive Education, the System Design and Management Program, summer term, the MIT Center for Transportation and Logistics, the Admissions Office, the Alumni Office, and others.
- Collaborated on the new Singapore University. Last year, OCW participated in the development of MIT's proposal to the Singapore Department of Education to build a new science and technology university in Singapore. A contract was awarded in spring 2010, and we anticipate that in AY2011 OCW will be supporting the faculty teams that develop the new curriculum by identifying and repurposing OCW course materials.
- Collaborated with the MIT Energy Initiative (MITEI) Education Office. OCW participated in a proposal to the Bechtel Foundation to publish interdisciplinary courses in the new MIT energy minor area of study. In AY2011, OCW will work with the MITEI Education Office to begin publishing new energy courses and to create a new energy education portal.

Faculty members continue to incorporate OCW into research proposals as a useful vehicle for disseminating findings. Two examples of this in AY2010 were:

- *Howard Hughes Medical Institute grant to strengthen undergraduate and precollege science education.* Professor Graham Walker and his colleagues are developing new ways to teach and inspire students about science and research under this new \$1.8 million, four-year grant. They will use part of this grant to share their

online science educational tools with a larger worldwide audience through OpenCourseWare.

- *National Science Foundation grant on emergent behaviors of integrated cellular systems.* Professor Roger Kamm and researchers at the University of Illinois at Urbana-Champaign and the Georgia Institute of Technology are establishing a center to develop the science and technology to engineer clusters of living cells or “biological machines” that have desired functionalities and can perform prescribed tasks. This research will help to establish the nascent field of engineering biological systems. The center will develop programs aimed at attracting students to STEM (science, technology, engineering, mathematics) fields and, particularly, to the growing area of bioengineering. An integrated inter-institutional graduate program will be developed and courses will be made accessible via OpenCourseWare.

Supporting Worldwide Open Educational Resources and the OCW Movement

OCW’s principal focus in the area of worldwide OER is its support of the OpenCourseWare Consortium (OCWC). OCWC (<http://www.ocwconsortium.org>) is a collaboration among more than 200 domestic and international institutions that have banded together to advance education and empower people worldwide through OpenCourseWare. The goals of the consortium are to:

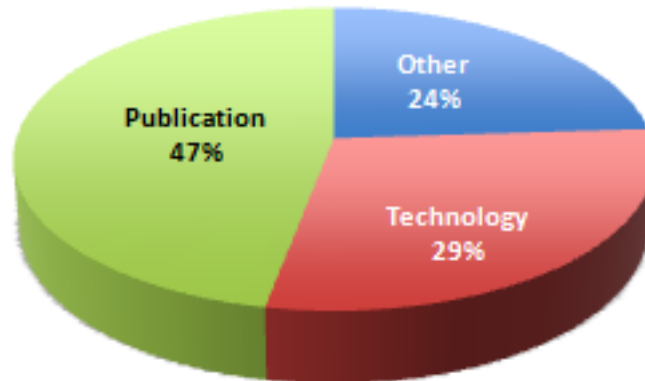
- Extend the reach and impact of OCW by encouraging the adoption and adaptation of open educational materials around the world
- Foster the development of additional OCW projects
- Ensure the long-term sustainability of OCW projects by identifying ways to improve effectiveness and reduce costs

Originally a development effort led by MIT OCW, the consortium became an independent 501(c)3 organization in FY2009. This year, OCWC completed the transition by hiring a new executive director to manage operations, converting to a membership dues model and raising \$70,000 through this process, and transferring financial management away from MIT to an independent organization.

The consortium’s annual meeting, OCWC Global 2010, was held in Hanoi in May. The theme of this year’s meeting was “Educational Policy and OpenCourseWare.” Despite economic conditions, this meeting was the largest international OCW meeting to date. Cecilia d’Oliveira, Steve Carson, professor Shigeru Miyagawa, and Brandon Muramatsu represented MIT. Steve Carson was elected to another term as president of the consortium. The next OCWC Global meeting will be held on the MIT campus in spring 2011, and the theme will be based on the 10th anniversary of the MIT OpenCourseWare announcement.

Sustaining the MIT OCW Program

OCW expenses for FY2010 totaled \$3.3 million, about 10% below our budget of \$3.7 million. We achieved this through a continuing program of aggressive cost management. OCW cost allocation is shown in Figure 3.



Publication: Faculty liaisons, IP clearance, publication planning, data entry, video metadata, QA, editorial

Technology: CMS infrastructure, content distribution, analytics, web development, systems support

Other: Outreach, evaluation, fundraising, planning, management, finance & admin

Figure 3. OCW expense breakdown

Even in these exceedingly tight financial times, MIT has found a way to contribute \$1.5 million from general Institute funds annually to support OCW. But this still leaves a gap of some \$2.2 million in funding. To date, this gap has been covered primarily by reserves of capital left over from the initial OCW development funded by the Hewlett and Mellon foundations and a generous corporate gift from Ab Initio. Assuming the current OCW financial profile, these reserves will run out in FY2013. In addition to these reserves, OCW has modest income from online donations, endowments, and other sources. Together, these sources represent about \$300,000 to \$400,000 in annual support.

The bottom line is that OCW will eventually be faced with an annual funding gap of roughly \$2 million. In anticipation of this, MIT undertook an extensive study in 2009 with the help of a special faculty committee convened for this purpose. In FY2010, we conducted a thorough market research and analysis effort with consultants Bain & Company (pro bono). The Bain study provided many helpful insights into the potential of possible future revenue opportunities. Figure 4 summarizes the study recommendations, showing principal features and estimates of the revenue potential of each option. The option labeled “Brand-compatible ads” is what we are now calling Corporate Underwriting (along the lines of the NPR model) and currently piloting. The “OCW Certificates” option is an idea currently under study by OCW staff and a working group of OCW External Advisory Board members. Phase 3 options are Institute-level considerations that will be explored in a larger context in the coming academic year.

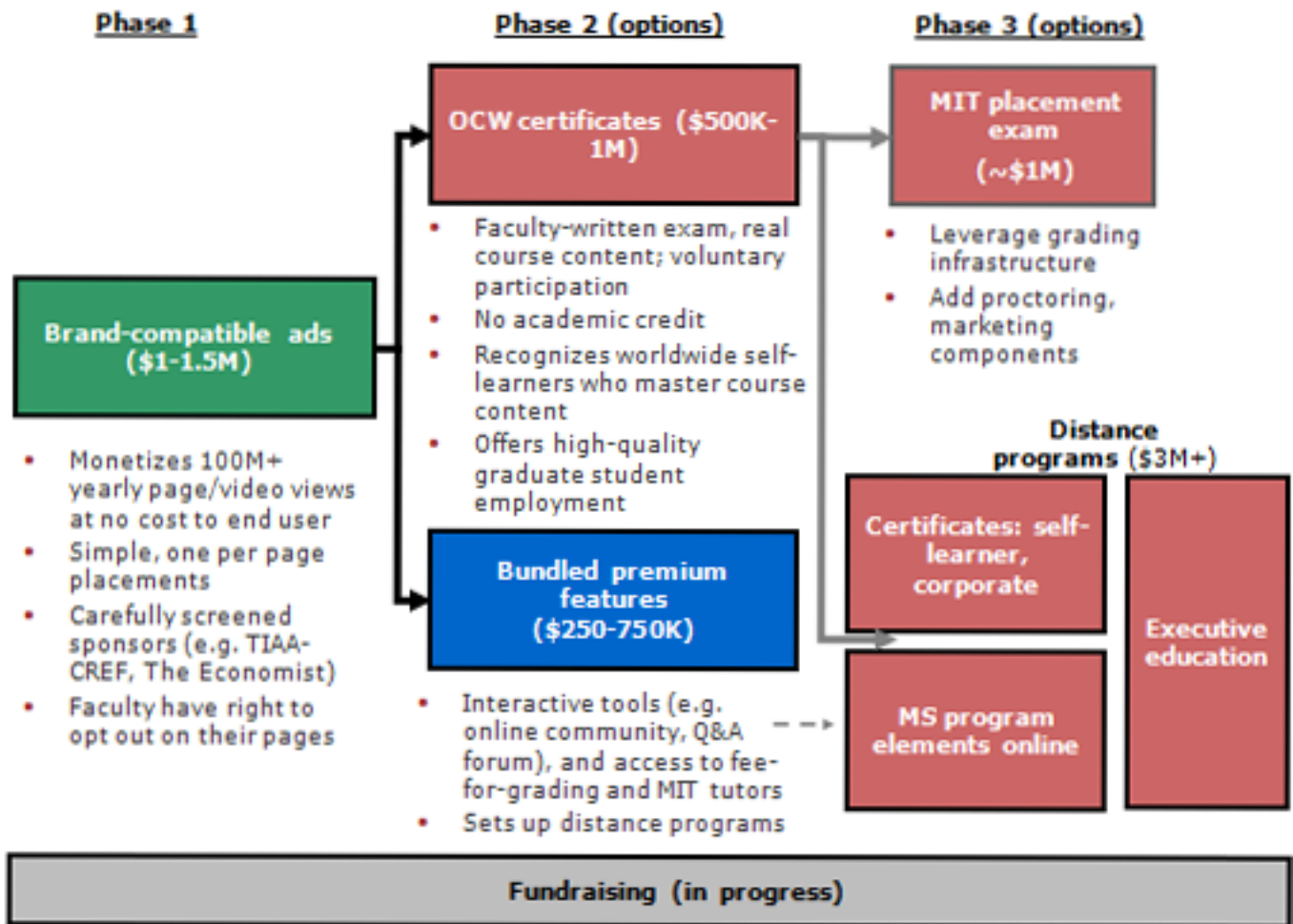


Figure 4. Summary of Bain recommendations

After the conclusion of this study, we reached out to MIT faculty and senior administrators on more than two dozen occasions to describe the OCW sustainability challenge and to gain consensus on moving forward with phase 1. As part of this outreach, we attended faculty meetings, departmental lunches, school council meetings, Academic Council meetings, and several individual meetings with faculty members and department heads.

In light of this work, during FY2010 OCW settled on an eight-part sustainability program. Components of this program, which are in various stages of implementation, are summarized in the following table.

Components of OpenCourseWare's Eight-Part Sustainability Program

Component	Description/Value Proposition	Historical Benefit	Future Potential	Current Status
Cost management	Efficiencies and contract negotiations	30% budget reduction	Incremental	Ongoing
MIT budget support	Value of OCW to MIT	\$9.75 million	\$1.5 million per year	Ongoing
Grants	Ramp up/innovation	\$26 million ramp up/\$2.6 million innovation	Unknown	Opportunistic
Major gifts	≥\$100,000	\$1.2 million (in endowment)	Unknown	Implementing
Online donations/small gifts	Newsletter campaigns/Course Champions	\$550,000 donations/\$30,000 Course Champions	\$200,000 per year	Ongoing
Corporate gifts	Corporate philanthropy	\$6 million from Ab Initio in 2006	Unknown	Opportunistic
Corporate underwriting	Controlled advertising	None yet; pilot started	Bain: \$1–\$1.5 million; <i>Technology Review</i> : \$300,000–\$500,000	Pilot
Affiliate marketing	Referrals (Amazon)	\$76,000	\$40,000 per year	Ongoing

Individual Donations

We finished FY2010 with a total of \$225,000 in individual donations, an increase of nearly 50% over last year. These donations included small online gifts, corporate matching gifts, part of last year's Senior Gift, and several \$5,000 gifts to our new Course Champion program.

Major Gift Fundraising

We are working on a plan for major gift fundraising that includes clear work flows, plans for increasing OCW's profile among Resource Development staff, and fundraising goals for 2011.

Corporate Underwriting

We have been working with *Technology Review* and the MIT Enterprise Forum since February to launch an OCW corporate underwriting pilot using an approach similar to that used by National Public Radio (NPR). Our goal was to have initial sponsors in place by the end of June, but this has not happened. Our part-time sales manager has initiated contact with approximately 20 companies to date, and although there are several good

prospects in the queue, none have yet signed on. We have begun a search for a full-time corporate sales manager on a term basis to head the underwriting sales effort, and we are also exploring the possibility of joining NPR's existing nonprofit sales network.

Organization and Governance

The OCW organization reports to associate provost Philip Khoury. OCW's 22-member staff is organized into teams handling course publication (three teams), production and technical support, outreach and external relations, finance, planning, and administration. Cecilia d'Oliveira is executive director of OCW.

OCW Faculty Advisory Committee

The Faculty Advisory Committee is an internal oversight group that advises on OCW policy, sustainability, and relations with the MIT faculty and with academic departments. Committee members in AY2010 included:

Hal Abelson, Electrical Engineering and Computer Science
 Alex H. Chan (graduate student), Science, Technology, and Society
 Eric Klopfer, Urban Studies and Planning
 Vijay Kumar, Office of the Dean for Undergraduate Education
 Stuart Madnick, Sloan School of Management
 Haynes Miller, Mathematics
 Shigeru Miyagawa (chair), Foreign Languages and Literatures
 Hazel Sive, School of Science
 Ann Wolpert, MIT Libraries
 Dick Yue, School of Engineering

With the departure of professor Steve Lerman from the Institute, professor Shigeru Miyagawa will chair the Faculty Advisory Committee beginning in AY2011.

External Advisory Board

The OCW External Advisory Board advises MIT's president and provost on key questions concerning future directions and the sustainability of OCW. The board keeps current on OCW activities via communications from the president. It meets annually on campus, with additional telephone and electronic interaction during the year. This year's meeting was held on April 30, 2010.

Members of the Advisory Board as of the end of AY2010 were:

Ewa Abraham, whose interest is early childhood education
 Bruce Alberts, professor, Department of Biochemistry and Biophysics, University of California, San Francisco; cochair, InterAcademy Council; editor-in-chief, *Science* magazine; and former president, National Academy of Sciences

Norman R. Augustine, retired chairman and CEO, Lockheed Martin Corporation

Tim Berners-Lee, professor, School of Engineering, MIT, and founder, World Wide Web Foundation

John Seely Brown, former chief scientist, Xerox, and chief innovation officer, 12 Entrepreneurship

Cathy Casserly, senior partner, Carnegie Foundation for the Advancement of Teaching

Rajat Gupta, senior partner, McKinsey & Company

Sheryl Handler, CEO, Ab Initio, and MIT alumna

Susan Hockfield, MIT president

Kim Jones, chair of the board and executive director, Curriki Global Learning Network

William Kaiser, partner, Greylock Partners, and MIT alumnus

Philip Khoury, associate provost and Ford International professor of history, MIT

Frannie Léautier, executive secretary, The African Capacity Building Foundation, and MIT alumna

Jennifer Bruml Lemelson, board of directors, Lemelson Foundation

Steven Lerman, vice chancellor and dean for graduate education, MIT; chair of the OCW Faculty Advisory Committee; and MIT alumnus

Abhay Parekh, adjunct professor, Electrical Engineering and Computer Science, University of California, Berkeley, and MIT alumnus

Sam Pitroda, chairman, India Knowledge Commission, and chairman and CEO, World-Tel Limited

J. William Poduska, founder of Prime Computer, Apollo Computer, and Stellar Computer and MIT alumnus

L. Rafael Reif, MIT provost

Peter Smith, senior vice president of academic strategies and development, Kaplan Higher Education, and former assistant director general for education, UNESCO

Matthew J. Szulik, former chairman, Red Hat

Maria Thomas, former CEO, Etsy

Charles M. Vest, president, National Academy of Engineering, and MIT president emeritus

Professor Shigeru Miyagawa, in his new role as chair of the OCW Faculty Advisory Committee, is replacing professor Steven Lerman on the External Advisory Board.

Cecilia d'Oliveira
Executive Director

More information about OpenCourseWare is available at <http://ocw.mit.edu/>.