

Director of Digital Learning

Education Innovation at MIT

MIT has a long history of improving education to make it more accessible and engaging. The founding philosophy of the Institute in 1861 was “learning by doing,” a break from the pedagogical orthodoxy of the time. The last 50 years have seen a number of significant advances towards making education more engaging and participatory.

The establishment of MIT’s Experimental Study Group, a learning community that stresses engaged learning using discussion-based classes for freshmen, was a recognition of the importance of active learning as early as 1969. The creation of the Undergraduate Research Opportunities Program that same year was another historic step in the direction of experiential learning. Building further on innovations at MIT and at other universities, faculty from the Department of Physics introduced the Technology-Enhanced Active Learning (TEAL) classrooms in the late 1990s and early 2000s. TEAL classrooms offered a studio-like atmosphere in which students conducted hands-on experiments and learned physics through active engagement rather than lectures. In the period since, professors in the Department of Electrical Engineering and Computer Science have experimented with a series of techniques to engage students: studio-like classrooms in which lectures were supplanted by exercises, video lectures, and automatic tutors that assessed student work online and provided rapid feedback.

In 2002, MIT launched OpenCourseWare (OCW), a groundbreaking effort to share its curriculum with the world for free. Today, OCW offers over 2,000 courses and receives over two million unique visitors every year. In 2008, OCW and partners at other universities launched the OpenCourseWare Consortium to develop a worldwide open education resources (OER) movement through a community of more than 250 universities. Collectively, OCW Consortium members have published materials from more than 13,000 courses in 20 languages.

In December 2011, MIT launched a historic online learning initiative called *MITx*. The first class delivered on *MITx*, 6.002x Circuits and Systems, and was developed by a team led by professor Anant Agarwal of the Department of Electrical Engineering and Computer Science on a new platform for delivering online education to campus and to anyone on the Internet. Other key faculty and staff involved in 6.002x were professor Gerry Sussman, Dr. Chris Terman, and Dr. Piotr Mitros. 6.002x attracted over 150,000 enrollees from around the world and was MIT’s first so-called massive open online course (MOOC). The online class was simultaneously taught online to about 20 students on campus.

The launch of *MITx* was in many ways the result of decades of effort to make learning at MIT more engaged, active, and participatory and, at the same time, accessible to the world. MOOCs, which bring many (but not all) of these ideas together, began to gather momentum in 2007. The proliferation of for-profit companies offering MOOCs in 2011 spurred MIT into action towards the end of that year. The creation of edX, based on the

principles of open access to the world, a not-for-profit business model, and an open-source software platform to counterbalance commercial efforts, was a natural step in keeping with MIT's long-standing traditions.

In June 2012, MIT joined with Harvard University to launch edX, a not-for-profit organization with three major goals:

- Expand access to higher education for everyone
- Enhance teaching and learning on campus
- Advance teaching and learning through research

edX offers three services:

- Developing a platform for online education
- Hosting courses offered by partner universities
- Helping produce some online courses (for partner universities that need assistance)

Accordingly, on June 1, 2013, edX made its code base open source. Today, edX has registered over 1.2 million enrollees and has 28 partner universities, including the University of California, Berkeley; ETH Zurich; Tsinghua University in China; and the Indian Institute of Technology in Mumbai.

Office of Digital Learning

In November 2012, President Rafael Reif announced the creation of the Office of Digital Learning (ODL) at MIT. Professor Sanjay Sarma was installed as MIT's first director of digital learning and professor Isaac Chuang as associate director.

The mission of ODL is to help the MIT community transform teaching and learning at MIT—and around the world—through the use of innovative digital technologies. A goal in the formation of ODL was to create a coherent and mutually supportive central organization comprising previously separate MIT groups engaged in activities directly related to digital learning. In addition, to fill the vacuum created by the spin-off of edX, ODL was also charged with formalizing a new internal unit, called *MITx*, to create courseware for edX and to encourage the use of digital learning on campus. (Please note, the term *MITx* here refers both to the MIT initiative to create free online courses for a worldwide audience and to the MIT organizational unit that works with faculty to produce these courses.) MIT's flagship online learning enterprise, OpenCourseWare, headed by Cecilia d'Oliveira, was announced as the first unit to become a part of the ODL. Dr. Daniel Carchidi was soon recruited to lead *MITx*. In April 2013, the Office of Educational Innovation and Technology (OEIT), headed by Dr. Vijay Kumar, joined ODL. Finally, in August 2013, Academic Media Production Services, headed by Larry Gallagher, joined the Office of Digital Learning.

Today, ODL provides a variety of services to MIT and to learners and institutions around the world, such as developing *MITx* courseware for edX, offering open education resources to over two million visitors per month through OCW, and helping students in Haiti and Pakistan with digital tools developed by the OEIT, and producing videos of major MIT events.

MITx

One of the first steps ODL took was to separate two functions previously conflated into the edX organization: platform development and course production. Placing these functions in the newly formed external organization created a number of complications ranging from questions of ownership of intellectual property to the coordination of course production between faculty and edX staff. Instead, we decided early on that *MITx* would take charge of course production and edX would focus—at least as far as MIT was concerned—on platform production. edX now encourages this model of its other university partners as well. In addition to course production, *MITx* also undertook the task of encouraging experimentation with and deployment of online tools on campus.

The setup of *MITx* would not have been possible without the support provided by OCW, which proved a key resource for the fledgling ODL. The roles of massive open online courses and open education resources are subtly different. MOOCs are “open” not necessarily in the sense of open educational resources, but in the sense of open enrollment. Any student in the world can enroll in a MOOC, but the student may not be able to download the course material. At the same time, OCW provides open educational resources, but does not conduct a live course with a cadence, deadlines, and fresh assessment materials. By definition, a MOOC may not involve OERs and OERs need not be offered as MOOCs. For all these reasons, OCW was not deeply involved in the creation of edX. However the production processes are similar enough that ODL was able to leverage synergies. Many of the early *MITx* staff, including Dr. Carchidi, were either OCW alumni or did “double duty” for OCW and *MITx*.

OpenCourseWare

The original mission of OCW remains a very important social contract for ODL, and will remain a priority going forward. The creation of the Office of Digital Learning creates new opportunities to leverage both OCW and *MITx* content for each other’s benefit. Furthermore, *MITx* is already producing a rich library of material that is naturally modular, creating new opportunities for OCW. OCW has been an important force in engagement with the world—be it through the OCW website, through the OCW Consortium, or through its engagement with the US State Department. This function too resonates with an important objective of ODL—international engagement.

See the separate OpenCourseWare report for details of OCW’s achievements during the academic year.

Office of Educational Innovation and Technology

The Office of Educational Innovation and Technology works with faculty, staff, and students to enable and promote the development and dissemination of innovative uses of technology in teaching and learning. This is achieved by scouting new technologies that may assist education, liaising with departments and brainstorming with faculty to develop and meet emerging needs and experiment with new approaches, integrating technology with curricula, developing and implementing new software modules, and transitioning delivery systems to long-term core service providers. Recently, OEIT has taken on a central role in a number of international engagement projects in locations such as Haiti and Pakistan.

These missions remain an important and continuing priority of ODL. They are also synergistic with the work of *MITx* and OCW. Several software simulation and visualization modules developed by OEIT are now being modified to work with the edX platform.

Early Milestones

The launch of the *MITx* unit was the Office of Digital Learning's most important milestone for 2012–2013. Dan Carchidi was recruited as program manager, along with eight other team members. Eight *MITx* courses have already been taught on edX, and six more have been developed for the calendar year. The courses for fall 2013 will be developed in large part by the MIT team.

MITx classes for MIT

On campus, more than 1,200 students and 10 different classes have already used the residential *MITx* system, a locally hosted instance of the edX platform. The local hosting was enabled by the efforts of Professor Chuang and OCW production manager Peter Pinch. Classes employing this system ranged from 5.11x Principles of Chemical Science to 18.05 Introduction to Probability and Statistics and 6.s064 Introduction to Machine Learning, as well as 8.011 Physics I: Classical Mechanics. Usage of residential *MITx* ranged from providing students with pre-lecture questions to exam preparation videos and auto-graded assessments, as well as to complete interactive online project problems involving auto-graded Python code.

Software Development and edX Coordination

Professor Sarma serves on the board of edX and the High Level Policy Subcommittee, Professor Chuang on the Technical Advisory Committee, and Dr. Carchidi on the Instructional Design/Pedagogy Subcommittee. We have also developed several software modules that have served the needs of MIT faculty using *MITx* for on-campus courses. Professor Chuang, a key contributor to the original edX code base, developed many of the new software modules and features, and is working with a very small group of students and staff to further develop our internal capabilities; his contributions are in addition to those developed by edX. Finally, many modules developed by OEIT, such as the STAR software suite, are also being adapted to edX.

MITx Fellows

MITx has established a community of over 20 MITx Fellows. These are students and postdocs who work with departments to develop classes and establish a community of use for ODL and MITx.

Community Engagement

ODL organized an open house and two special-interest group (SIG) meetings for the MIT community and MITx users, respectively. These events were well attended. For example, the SIGx meeting in May 2013 had more than 100 attendees, including MIT and external faculty, lecturers, postdocs, students, and ODL staff. ODL has also hosted several internal events for the office and its constituent entities.

Task Forces

ODL launched eight task forces to help MITx work out strategies for different aspects of our work: videos, games, assessments, hands-on experiences, basic research, graduate studies, modularity, and learning spaces. Each group was headed by a faculty member and consisted of faculty, students, and staff. The task forces reported out the same day as the SIGx meeting and the recommendations were recorded and are being adopted by MITx.

In addition, Professor Sarma, Professor Chuang, and Dr. Kumar participate on the Institute-wide Task Force on the Future of MIT Education commissioned by President Reif in April 2013. Professor Sarma co-chairs the task force with Israel Ruiz, executive vice president and treasurer of MIT.

National and International Outreach

Outreach is a key component of the ODL mission. Since its inception, ODL has taken three steps in this direction. The first was ChicagoX, in which ODL offered an introductory computer-programming course, A Taste of Python Programming, targeted at students in Chicago as part of that city's 2013 Summer of Learning initiative. The six-week course provided a basic introduction to programming skills. The course was notable in the role that OCW staff, specifically Cecilia d'Oliveira, played in coordinating it as a special project.

Second, ODL has begun to engage MIT's international programs, particularly the MIT International Science and Technology Initiatives (MISTI). This summer MISTI students in various countries are organizing meet-ups to engage with past, current, and future MITx students.

Third, MITx offered its first course directed at teachers, rather than students, this summer. This Mechanics ReView course, 8.MReV, was taught by professor David E. Pritchard and his colleagues in the Department of Physics, and yields Continuing Education Units (CEU) credits to participating teachers.

Office of Digital Learning Internal Coordination

Already the units of ODL have started coordinating to serve a unified mission. To further streamline activities and processes, the office has launched a strategic planning process. The outcome of this process will be shared strategic priorities, a shared mission, and a work plan that has the buy-in of all the members of the organization.

Conclusion

The Office of Digital Learning is now eight months old. While many challenges lie ahead, the office has made significant strides. The ongoing strategic planning process will help shape the office for the years ahead by suggesting a cohesive approach that makes the office maximally effective in meeting the needs of the MIT community while also serving our objectives of increasing access to higher education for a worldwide audience.

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