

# The Evolving MOOC

**W**hen MOOCs (massive open online courses) emerged to great fanfare in 2011–2012, colleges and universities wrestled with how to best approach this new development in online learning, a development that promised to vastly increase access to education. Some institutions developed their own MOOCs with help from leading MOOC providers, whereas others engaged in sometimes heated discussions with their constituents on whether and how MOOCs might fit with their institutional missions and goals.

According to several recent studies on MOOC efficacy, the model—at least in its traditional form of open lectures and problem sets—is not the panacea that many had hoped it would be for worldwide access to education. The vast amounts of data provided by MOOCs reveal that the courses have extremely low completion rates. A recent study by Harvard and MIT found that 5 percent of the people registered for the first seventeen edX courses in 2012–13 earned a certificate of completion. The researchers also found that only about 3 percent of total participants were from underserved areas. In addition, 66 percent of all participants, and 74 percent of those who earned a certificate of completion, already held a bachelor's degree or higher.<sup>1</sup> Researchers from the University of Pennsylvania Graduate School of Education found that 4 percent of the one million users of Penn's MOOCs completed the courses and that only around one-half of the registered participants listened to a lecture.<sup>2</sup> A second study at Penn found that 83 percent of MOOC participants already had a postsecondary degree.<sup>3</sup> San Jose State University's partnership with the leading MOOC provider Udacity to offer low-cost online courses for college credit produced less than desirable results: students enrolled in the spring pilot online courses had lower pass rates than those in traditional on-campus classes.<sup>4</sup> Although MOOCs have provided a valuable resource to many students, they seem to have fallen short of expected markers of success. As Sebastian Thrun, the founder of Udacity, famously pointed out in November of 2013, when it comes to MOOCs, our dreams and our data don't match.<sup>5</sup>

Despite this discouraging news, MOOC momentum continues to grow. Many institutions are investing time and money in developing MOOCs. Stanford University, having propelled MOOCs into the spotlight, continues to offer new courses and share the exceptional caliber of its institution with the world

through the leading platforms developed by its professors: Coursera, Udacity, and now NovoEd. Udacity has recently focused its attention on providing widely accessible professional development courses for people working with technology, using highly interactive content and instructors who come directly from tech companies. And edX, the nonprofit co-founded by MIT and Harvard, has continued to strive for broad access and availability of its courseware, attracting a large base of institutions to its platform.

Other colleges and universities are developing new types of MOOCs with specific audiences and goals in mind. For example, over the past two years, the leadership at Harvey Mudd College engaged in discussions with the campus community, including the board of trustees, about how the college might incorporate MOOC technology to further its mission and strategic vision. We base any decision that involves investment of

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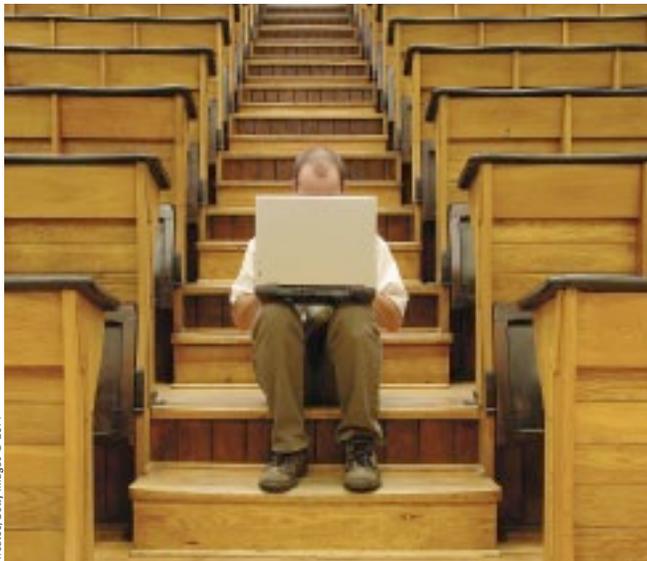
college resources on our strategic vision. We asked ourselves the kinds of questions that other colleges and universities were surely asking: for example, should we create our own MOOCs? As a liberal arts college specializing in engineering, science, and mathematics and committed to innovative teaching, Harvey Mudd could offer outstanding MOOCs in many fields. On the other hand, our faculty and students prize the close one-on-one and small-group learning that is essential to the Harvey Mudd educational experience. Our faculty members already dedicate enormous amounts of time and energy—gladly and

passionately—to hands-on research and experiential learning with our students. How could we, as a small college that must use its resources wisely, best incorporate MOOC opportunities to further our mandate for leadership, innovation, and societal impact, particularly in engineering, science, and mathematics education?

We decided to tackle one of the most pressing issues facing STEM education today: the lack of women and students of color pursuing degrees in computer science and physics. Although these groups have been making steady progress in other STEM fields, their numbers have remained quite low in physics and are low, and dropping further still, in computer science. Research shows that students who are not exposed to computer science and physics in high school rarely go on to pursue these fields in college.<sup>6</sup> Yet many high schools, especially those serving populations underrepresented in STEM,



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are not able to offer computer science or AP physics classes because they lack resources and/or teachers trained in these subject areas.

Our MOOC needed to reach students in these influential high school years. However, the MOOC model in its original form is a poor fit for high school students. Even the most privileged and academically successful high school students rarely complete online courses. So rather than attempting to modify the model to make it more engaging to younger students, we decided to create curricula for teachers to bring to their classrooms using MOOC technology.

We are developing two separate MOOCs: one for teachers of computer science and one for teachers of AP physics. These two MOOCs will provide middle and high school teachers with lectures, hands-on activities, and problem sets. Lesson plans are built into the courseware; the lessons are modular and highly adaptable by the teacher. All content can be learned directly through the online courseware, but learning by students benefits from guidance by a teacher and conversations with peers. The MOOCs draw on the best educational practices and proven strategies for learning these two topics. By creating courses that can function independently of a classroom but that are designed with group activities and discussions, ideally led by an instructor, we aim to bring a valuable curricular resource to more students without removing the important role of face-to-face engagement.

A team of faculty, students, and an alumna of Harvey Mudd is creating the MOOCs and is set to deploy them in the fall of 2014, first in local high schools and then regionally and nationally. We will survey teachers and students at all stages of the course development to assess the effectiveness of our MOOCs. These responses, in combination with data on students' performance, will help strengthen our courseware. Local teachers have been testing the course this semester and are offering

feedback to further shape its development. We will use their feedback and data on student results each semester to further improve the course, sharing ideas for courseware changes with local teachers for input whenever possible. In this way, we will assess changes semester by semester and continue to fine-tune content. By enabling a large number of high school teachers to offer advanced science courses through this different kind of MOOC, Harvey Mudd hopes to reach more young students, including women and other groups underrepresented in science and technology, to both strengthen and diversify the K-12 STEM pipeline.

Harvey Mudd's approach to developing MOOCs is one of many efforts under way at colleges and universities to adapt the MOOC model to fit and further institutional goals. Harvard recently announced that it would offer seven MOOCs exclusively for its alumni, a benefit that will strengthen engagement with the university; several institutions have started offering AP courses for high school students through edX; and instructors are using all or parts of courses for blended learning experiences. The recent discouraging turn in MOOC news is not a signal to abandon ship. It's a sign that we can, and should, innovate even more. At the intersection of technology and education, we would want it no other way. ■

#### Notes

1. Andrew Dean Ho, Justin Reich, Sergiy O. Nesterko, Daniel Thomas Seaton, Tommy Mullaney, Jim Waldo, and Isaac Chuang, "HarvardX and MITx: The First Year of Open Online Courses, Fall 2012–Summer 2013," January 21, 2014, <http://ssrn.com/abstract=2381263>.
2. University of Pennsylvania Graduate School of Education, "Penn GSE Study Shows MOOCs Have Relatively Few Active Users, with Only a Few Persisting to Course End," press release, December 5, 2013, <https://www.gse.upenn.edu/pressroom/press-releases/2013/12/penn-gse-study-shows-moocs-have-relatively-few-active-users-only-few-persist>.
3. Gayle Christensen, Andrew Steinmetz, Brandon Alcorn, Amy Bennett, Deirdre Woods, and Ezekiel J. Emanuel, "The MOOC Phenomenon: Who Takes Massive Open Online Courses and Why?" November 6, 2013, [http://papers.ssrn.com/sol3/papers.cfm?abstract\\_id=2350964](http://papers.ssrn.com/sol3/papers.cfm?abstract_id=2350964).
4. Elaine D. Collins, "SJSU Plus Augmented Online Learning Environment Pilot Project Report," September 2013, [http://www.sjsu.edu/chemistry/People/Faculty/Collins\\_Research\\_Page/AOLE%20Report%20Final%20Version\\_Jan%201\\_2014.pdf](http://www.sjsu.edu/chemistry/People/Faculty/Collins_Research_Page/AOLE%20Report%20Final%20Version_Jan%201_2014.pdf); David F. Carr, "MOOC Math Students Beat On-Campus Pass Rate," *InformationWeek*, August 28, 2013, <http://www.informationweek.com/software/mooc-math-students-beat-on-campus-pass-rate/d/d-id/1111335>.
5. "Udacity's Sebastian Thrun, Godfather of Free Online Education, Changes Course," *Fast Company*, November 14, 2013, <http://www.fastcompany.com/3021473/udacity-sebastian-thrun-uphill-climb>.
6. Martha Cecilia Bottia, Elizabeth Stearns, Roslyn Arlin Mickelson, Stephanie Moller, and Ashley Dawn Parker, "The Relationships among High School STEM Learning Experiences and Students Intent to Declare and Declaration of a STEM Major in College," *Roots of STEM Working Paper No. 101*, [http://clas-pages.uncc.edu/rootsstem/files/2013/11/ROOTS\\_WP\\_101.pdf](http://clas-pages.uncc.edu/rootsstem/files/2013/11/ROOTS_WP_101.pdf).

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