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School's Out, Forever

A new online education program from Harvard and MIT is poised to transform what it means to go to college.

By Chris Vogel | [Boston Magazine](#), [September 2012](#)



Illustration by Justin Metz

Brian Ho sits at a desk in his home in suburban Honolulu, staring at a computer screen. He's already worked a full day at his software development company, but instead of taking this June evening to relax, the self-taught computer programmer is trying to “put together” a circuit on his screen. The 51-year-old attaches wires to batteries, diodes, and capacitors in a virtual laboratory that appears on his monitor. It's not easy—but then again, the Massachusetts Institute of Technology never has been.

This past March, Ho signed up for MIT's first online course taught by a real professor, with actual grades. For Ho, who'd barely scraped his way through high school before earning an electrical engineering degree from the University of Hawaii in 1992, this was a chance to take a course at the school he once dreamed of attending. For MIT, it was a test run of a new educational venture it had dubbed MITx. The idea behind MITx is to offer a full class on the Internet, taught by a tenured professor, complete with video lectures, tutorials, and graded assignments. Anyone can sign up, for free. At a time when tuition and fees at private universities are averaging more than \$28,000, that price has attracted a lot of interest.

And the MIT project is actually part of a movement. In the past year a new wave of education startups have been pushing the radical notion that knowledge is important, but a diploma isn't. Whether it's computer programming or corporate communications, goes the thinking, an expert understanding of the subject is far more important to an employer than a college transcript. And this isn't just some hazy theoretical musing. Investors are making big bets on it. This past spring, for example, two competency-focused startups offering free online classes—Coursera and Udacity—spun out of Stanford University. Each of them has received millions in venture funding despite lacking a public business model to make money.

MIT was hoping to enroll a mere 2,000 students for its first class on circuits—it was, after all, a course in electrical engineering. Anant Agarwal, the professor, took his on-campus course designed for math and science whizzes and adapted it into an online format. The response was staggering: More than 150,000 students of all ages and education levels, from Massachusetts to Argentina to Pakistan, signed up. Harvard was so impressed that in May, it joined forces with MIT. The two schools pooled \$60 million in resources and renamed the venture edX. The stated mission was to educate a billion people around the world.

Many of the students in that first course were like Ho: years out of college and looking to improve their knowledge—or just wanting to be able to say that they were “taking a course at MIT.” The potential of edX, though, goes far beyond teaching older students. It could become an entirely new model not just for undergraduate education, but for education, period. Faculty and supporters argue that it has the potential to transform how students learn. It might also make an expensive four-year degree a luxury in the modern workforce rather than a necessity. By educating the world free of charge, edX could make MIT and Harvard obsolete.

But just how revolutionary is all of this? Is putting a bunch of lectures and playing with circuits online really the same as a well-rounded classical education? And how can classes on the Internet possibly replicate the on-campus experience?

That's not the point, say supporters. They're not looking to replicate college, they're looking to disrupt it. "If people have been skeptical about online learning or its place in the future, edX throws that theory to waste," says Michael Horn, an executive director of the Innosight Institute, a Silicon Valley-based think tank focused on education and healthcare innovation. "To see Goliaths like Harvard and MIT enter the arena sends a powerful signal. It is very exciting and is going to transform education in pretty profound ways."

In his Hawaii home, Ho types in an answer and within seconds a bright green check mark pops up on his screen. He got the question right. "It's instant gratification, like playing a video game," he says. "Everyone who takes the class online says they're addicted to the green check mark. We joke that this isn't just an engineering course, it's also a psychology thesis."



EdX president Anant Agarwal hopes the higher-ed program will one day reach a billion students. (Photo by Scott M. Lacey)

When I visit the edX headquarters in June, I find a bland, brick office building across from the MIT campus. The modest office suite feels appropriate for a startup: fresh white paint, a tiny kitchenette stuffed with boxes, and a conference room with wall-to-wall built-in bookshelves, all of them empty. The glass walls of the 15 interior offices are covered with equations and ideas written in felt-tipped pen, serving as whiteboards until the real things arrive. Oddly, there are hardly any computers in sight.

In a bare corner office sits Agarwal, who was named president of edX in May. He grew up in India and attended the Indian Institute of Technology Madras, where he earned his bachelor's degree. He went on to receive a Ph.D. in electrical engineering from Stanford, has taught electrical engineering and computer science at MIT since 1988, and has cofounded five startups in the computer design industry. Agarwal tells me that he's passionate about edX's mission of educating the world because he understands how precious access to advanced learning can be. Higher education remains limited in India, he explains, and he was fortunate to be able to go to college himself. Online learning, he says, has already opened up opportunities for people living in poor communities with limited access to universities. "Suddenly with edX," he says, "you can improve that 10-fold."

Online classes are hardly new, of course. The University of Phoenix has been offering Web-based bachelor's and post-grad programs since 1989. The for-profit company is based on the interesting proposition that you don't need to sit through lectures in a building draped with ivy, because everything you need to know can be taught over the Internet. In 2010, more than 600,000 students took classes through the school.

MIT began contemplating a massive online class in 2007. Then-provost L. Rafael Reif, who was named the Institute's president in May, saw that students were using the Internet in nearly every part of life, yet classroom learning remained relatively untouched by the Web. So he set up several committees dedicated to thinking about how online technology should remake the way students learn, and how that technology could be shared with the world. Professors played with different techniques for four years, and in 2011 Reif finally unveiled MITx to faculty, alumni, students, and trustees. Agarwal quickly volunteered to put his full circuits course online.

In the old days—like, a year or two ago—online learning consisted of students sitting in front of computers watching hour-long videos of professors droning on from behind a lectern. If you were lucky, somebody might post a PowerPoint presentation. That model is dead.

At edX, lectures are chopped up into short, digestible snippets, which run anywhere from three to 15 minutes. Typically, there are two lectures a week, with each lecture containing anywhere from five to 20 video snippets. Onscreen, you never see the professor. Instead, words or formulas appear on a blackboard as the professor's voice guides you through the lesson with a transcription of the lecture also running on the screen. Quizzes, homework assignments, and labs—which use a “virtual sandbox” that lets students build electrical circuits as realistically as if their hands were touching actual copper wires—are interspersed throughout the course.

If you get an answer wrong or don't understand something, you can rewind the lesson (they're “on demand”) and watch it again. Students must complete the work on deadline, and since everything is auto-graded, feedback is instantaneous. Typical classes run for six to 12 weeks, and though advanced students can skip only so far ahead for now, that may change in the future. Unlike previous online models, edX connects pupils and professors through discussion forums and chat rooms, enabling students to “socialize” and help one another learn. At the end of the course, if you're successful and pass the final exam, the university gives you a certificate. You're considered competent in that subject matter. Currently, the certificate is free, but edX could charge for it in the future.

David Ku, who was a senior at MIT last semester, needed to take the circuits class to graduate with a degree in electrical engineering and computer science. He decided to try the online version. Ku says the virtual edX labs “were the most powerful component” of the experience. “You put together wires and tubes online, measure voltages and currents exactly like I would've in class.” He also appreciated having instant access to his grades, rather than waiting a week for a teaching assistant to mark up and return his homework. With online learning, he says, he could move at his own speed. It was a new way of taking classes and learning, and he says he loved it.



Harvard president Drew Gilpin Faust, former MIT president Susan Hockfield, and edX president Anant Agarwal at the May announcement of the new online higher education program. (Photo by Bill Greene/Boston Globe via Getty Images)

Not everyone, however, is happy with the idea of shifting from in-person classes focused on a four-year degree to online tutorials focused on a specific competency. Sylvia Martinez of Generation YES, a nonprofit focused on educational technology, worries that many students, particularly at-risk students, require a more hands-on approach to learning than online lectures provide. She's also concerned that many people mistake delivering content online with teaching. "People," she says, "learn through experience, through research and the kinds of experiments they conduct on the MIT campus. You wouldn't want to go to a doctor who just watched a bunch of videos about open-heart surgery—at least I certainly wouldn't."

Another issue is motivation. Martinez and other critics believe that many students need the requirement of showing up for class or the weight of paying a significant amount of money to compel them to do the work. So far, their fears appear justified—online course completion rates have been low. When Coursera, one of the initiatives that came out of

Stanford, offered a machine learning class last fall, 104,000 people signed up, but only 13,000, or 12.5 percent, received a certificate of completion. MIT fared even worse. Of the 154,763 students who took the Institute's electrical circuits course, only 4.6 percent earned a certificate. The rest either dropped out or didn't pass. (Another way to interpret these numbers is that more than 7,000 people *did* complete and pass the course—50 percent more than MIT's entire undergraduate enrollment.)

There's also a problem with subject matter: EdX's auto-graders, which are necessary to handle the large volume of students, are currently unable to deal with anything other than objectively right or wrong answers. This works fine for math and science classes, but is problematic when it comes to the humanities. Henry Leitner, an associate dean at Harvard's Division of Continuing Education, concedes that the technology is not yet good enough to grade essays, but says, "There are a lot of brainstorming sessions taking place right now on how best to do it."

Meanwhile, if we're educating the world, there's a concern that we're exporting one of the most valuable American assets—our excellent higher education system—and doing so for free. Beyond whatever competitive disadvantages that may put us at, there's also the potential that developing nations, trying to educate millions of people, will choose not to build costly new brick-and-mortar institutions, potentially undercutting the growth of academic cultures there. Instead, these countries might steer students to the Internet, where they can get a fine education for practically nothing.

And what of all the professors? In June, the education publication *Inside Higher Ed* and the Babson Survey Research Group released a study showing that 58 percent of faculty members described themselves as more fearful than excited about the future of online education. If one professor can go from reaching 150 students to 150,000, that has the potential to put a lot of educators out of work. And two-thirds of the faculty members surveyed viewed learning outcomes from an online class as generally inferior to those from a face-to-face course. Then again, 80 percent of budget-conscious academic technology administrators said they were more excited than fearful about the new form of learning.

Perhaps most important, the edX experience is remarkably different from the experience of going to college on campus. Agarwal and edX students concede that you lose out on one-on-one time with professors, apprenticeships, mentoring, and research opportunities, not to mention the fun and growth that accompany campus living. Generation YES's Martinez says

she has no doubt that online learning will produce “some favorable outcomes. But will it be the norm? I don’t think so.”

The question on everyone’s mind is whether edX will kill off the traditional university.

The answer: maybe.

MIT and Harvard, naturally, believe edX will be used to supplement, not replace, the traditional college education. The schools, by the way, were joined by the University of California-Berkeley in July, and they continue to look for additional partners.

Agarwal is hopeful that edX can “lift all boats.” Community colleges, for instance, could adopt the curriculum and “flip” the classroom, meaning students would learn the edX materials online and spend class time doing homework and asking questions. This way, he says, teachers could spend their valuable time working directly with students instead of teaching boilerplate materials to everyone at the same time. This idea is gaining momentum. In June, the Bill & Melinda Gates Foundation, seeking to develop the “flipped classroom” model, gave edX a \$1 million grant to partner with an institution that educates low-income students.

Agarwal also wants to team up with state governments. He’d like to give welfare recipients additional benefits for taking free edX classes. In exchange, they would learn skills that could help them enter the workforce.

For now, no one sees colleges disappearing, since many students will continue to value the on-campus experience. That means the top 200 or so schools should be fine. Beyond those institutions, though, asking people to spend \$120,000 on a degree could become difficult. “I think if you move into the middle tier, those schools are in deep threat,” says Horn of the Innosight Institute. “I don’t think the economics will make sense for many people when the knowledge they need to get a job is available for free online.”

EdX may also be an excellent tool for midcareer students using the online classes to build their credentials for a promotion, or for people just seeking to sate their intellectual curiosity. “I personally don’t think that universities should pretend the virtual class is going to be the same as the physical experience,” says Sal Khan, a former MIT and Harvard student who founded Khan Academy, which offers short online tutorials on everything from

physics to art history. “I think the virtual can be better in some dimensions and the physical one will be far better in others.”

This shift to self-paced learning in the online environment seems likely to transform the entire way universities think about learning. “Honestly, the way higher ed is shaped right now makes no sense,” Horn says. “Why we move someone along when they haven’t mastered the previous concept and think they’ll be successful in the next one is crazy. It shouldn’t be about the grade, but whether you learn it.” Agarwal concurs, and hopes edX will play a role in democratizing education and altering the entire notion of traditional degrees. “I think we can question whether degrees are antediluvian,” he says. “Online learning has flexibility. Why not master courses in energy, writing, communications, and engineering and get a credential?”

In July, edX announced it would begin offering seven online courses—including introduction to computer science, artificial intelligence, and circuits and electronics—from MIT, Harvard, and Berkeley.

The idea of competency is already sparking interest from forward-thinking employers. This past May, technology entrepreneur and Dallas Mavericks owner Mark Cuban wrote on his blog: “As an employer I want the best prepared and qualified employees. I could care less if the source of their education was accredited by a bunch of old men and women who think they know what is best for the world. I want people who can do the job. I want the best and brightest. Not a piece of paper.”

Khan agrees. He says his company is always looking for innovative thinkers, whether or not they have a college diploma. “Four-year degrees already have less value to employers,” he says. “They don’t differentiate you or signal a whole lot. A physical university experience is invaluable for making friends, but I think it’s a luxury. Backpacking through Europe is also a mind-expanding experience, but you don’t need to do it to get a job.”

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