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5 Ways That edX Could Change Education

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Since MIT and Harvard started edX, their joint experiment with free online courses, the venture has attracted enormous attention for opening the ivory tower to the world.

But in the process, the world will become part of an expensive and ambitious experiment testing some of the most interesting—and difficult—questions in digital education.

Can community-college students benefit from a new form of hybrid learning, based on a mix of local instruction and edX content? Can colleges tap alumni as teaching volunteers? Can labs be reinvented in the style of online video games?

EdX and its collaborators are developing tools and teaching models to answer those questions. And they view the project as a means to study even deeper problems, like understanding how people forget—and creating strategies to prevent it.

"It's a live laboratory for studying how people learn, how the mind works, and how to improve education, both residential and online," says Piotr Mitros, edX's chief scientist.

That laboratory remains a work in progress. When a *Chronicle* reporter visited edX's offices here, in a low-slung brick building on the edge of the Massachusetts Institute of Technology campus, the front entrance lacked even a sign, and staffers had engineered a conference table and bookcase from empty cardboard boxes. But with a $60-million investment announced in May and seven courses going live this fall, things are kicking into high gear. What follows, based on interviews with more than a dozen people affiliated with edX, is a closer look at what that could mean for students, scholars, and other colleges.

Engaging Alumni in New Ways

Robert C. Miller had a problem.

His students were writing so much code that the teaching staff lacked time to read it all and give fast feedback. So Mr. Miller, an MIT associate professor who teaches software engineering and human-computer interaction, decided to try a new tactic: crowdsourcing. His work may help solve a challenge facing massive online courses: how to provide human feedback to thousands of students.

Under Mr. Miller's model, Web-based software called Caesar breaks homework submissions into chunks. A mix of teaching staff, fellow students, and alumni volunteers evaluates the code, which is also automatically tested by a computer. Students then revise and resubmit their work. The human review is essential, Mr. Miller explains, because people can detect things that computers can't, like hidden bugs or poor design.

"The future of online grading is going to be a mix of automated approaches ... and human eyeballs," says Mr. Miller. The class that has deployed Caesar is expected to go on edX as it expands.

His project is one of several that highlight how technology can tap the altruism—and self-interest—of graduates. MIT alumni "are strongly motivated to find great programming talent," Mr. Miller says. By helping to review code, they could both spot that talent and expose students to their companies. Caesar, used on the campus for the past year, has attracted MIT graduates working at companies like Facebook and Google.

Across the Charles River, at Harvard's School of Public Health, E. Francis Cook Jr. and Marcello Pagano are working on a similar idea. The veteran professors will teach a class on epidemiology and biostatistics this fall, one of Harvard's first on edX. Details are still being worked out, but they hope to entice alumni to participate, possibly by moderating online forums or, for those based abroad, leading discussions for local students. Mr. Cook sees those graduates as an "untapped resource."

"We draw people into this program who want to improve the health of the world," he says. "I'm hoping we'll get a huge buy-in from our alums."

Reinventing Hybrid Teaching

In March, Tony Hyun Kim moved to the Mongolian capital of Ulan Bator, where he spent three months teaching high-school students a spinoff of the first edX course. The adventure made the young MIT graduate one of the first to blend edX's content with face-to-face teaching. His hybrid model is one that many American students may experience as edX presses one of its toughest goals: to reimagine campus learning.

On his own initiative, Mr. Kim brought over lab gear and mentored about 20 teenagers through the circuits-and-electronics class, which is based on a course normally taken by MIT sophomores. The edX version features video snippets and interactive exercises, and Mr. Kim used the free online content to teach in a style known as the "flipped classroom." Students watched edX content at home. At school, Mr. Kim spent hours each day reviewing material and apprenticing them through labs and problems.

The results were remarkable. Roughly 12 students earned certificates of completion. One 15-year-old, Battushig, aced the course, one of 320 students worldwide to do so. EdX ended up hiring Mr. Kim, who hopes to start a related project at the university level in Mongolia.

EdX is now preparing a bigger experiment that is expected to test the flipped-classroom model at a community college, combining MOOC content with campus instruction. Two-year colleges have struggled with insufficient funds and large demand; they also have "trouble attracting top talent and teachers," says Anant Agarwal, who taught the circuits class and is president of edX. The question is how MOOC's might help community colleges, and how the courses would have to change to work for their students.

"MOOC's have yet to prove their value from an educational perspective," says Josh Jarrett, of the Bill & Melinda Gates Foundation, which backs the community-college project. "We currently know very little about how much learning is happening within MOOC's, particularly for novice learners."

Gamifying Labs

As edX tries fresh teaching models, it's also engaging the math muscle of MIT to push the boundaries of simulations.

When MIT students take the circuits class, they sit at a lab workbench and build with tools. Lab equipment can cost a fortune: An oscilloscope may run $20,000.

Offering a comparable experience online is an engineering challenge. It must be fast, sufficiently open-ended, and simple enough to use without consulting "telephone-book-size manuals," as Mr. Agarwal puts it. Mr. Agarwal, a former director of MIT's Computer Science and Artificial Intelligence Laboratory, has worked on this problem for years. "To me, the big hurdle to online learning was, How do we mimic the lab experience?"

EdX's first crack at answering that question can be heard in the violins that filled Mr. Agarwal's office one recent morning. The music came from his computer, where he input it through a circuit. It's one part of a simulated lab environment that lets students rotate components and build circuits as if they were "assembling virtual Legos on a desktop," Mr. Agarwal says.

More Legos are coming. Eventually, edX students won't just build circuits. They'll assemble computers, cellphones, and perhaps even bridges, all from digital parts. EdX points to video games as one model for its lab design.

"You see a lot of immersive experiences in the online gaming world, where people really get caught up in the mission," says Christopher J. Terman, a senior lecturer who helped build edX's lab and who is known as the "education czar" of MIT's department of computer science and electrical engineering. He adds, "When you think about what an immersive engineering experience is, we've really just scratched that surface."

Studying the Human Mind

Over time, enrollment in edX is expected to climb into the millions. That has major implications for research—an area that Mr. Mitros, the chief scientist, has been discussing with faculty members.

"Basically, everything that a student does is logged and can be mined by researchers," Mr. Mitros says. And the platform is rigged so researchers can show content to one group of students and not to another, and then test the results.

So who might study edX? Anthropologists interested in online social interactions, for one. And psychometricians who work on test problems.

But to Mr. Mitros, most exciting is the chance for once-impossible cognitive-science research. If you're like many people, you've forgotten much of your formal education. But studies show that if you repeat things—you take a freshman physics class, say, but continue to use those concepts throughout college—you retain them. Researchers might show refreshers to students at different points in time after a course has been completed, Mr. Mitros says, tracking what they recall.

"You can build a mathematical model of how memory works, based on data from a large number of students," he says. The results of such research could be applied directly to improving education.

Changing MIT

One question is how edX might improve elite universities, which are late to the e-learning game. In the spring, MIT tested the edX circuits class with about 20 on-campus students. It was a hit: A majority said they would take another Web class.

Bethany LaPenta, a junior majoring in electrical engineering and computer science, enjoyed earning credit while studying on her own schedule. She found Web tests less stressful than in-class ones, and took the midterm in her dorm room. Another benefit: Students could rewind or fast-forward their professor. Data showed MIT students tended to watch the videos at 1.5 speed, which makes voices sound almost like chipmunks but delivers information more rapidly. "I do want MIT to offer more online education," Ms. LaPenta says.

To Mr. Agarwal, many aspects of e-learning are better than campus lectures, where attendance often plummets by semester's end. Future MIT students will experience a blended education, he says, with videos and auto-graded exercises online, and in-person time spent on labs and research and group problem solving. His prediction: "Ten years from now most of our classes will be using blended learning."