The Magic Beyond the MOOCs

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Thank you. Thank you, Dan, and welcome to MIT. Since the sequence of presentations has been reversed, I was actually anticipating Anant's presentation. But you all heard about MOOCs, and I'll let Anant speak when he gets here. So I won't talk about edX, I'll talk about something else.

Now, as you know, there's a lot of excitement about MOOCs. Dan talked about it, and we've all talked about it. I'm sure Dick mentioned it. But the question that is often asked is, why is MIT so excited about it? If onlines existed since 1984, and you could argue that correspondence courses were a form of online before we had online. So why are we so excited about it? What I'm going to talk about today is what we consider to be the magic beyond the MOOCs. In other words, what do MOOCs enable that we didn't have that we suddenly have access to today? And that will also give you a sense of why MIT is so excited about this whole endeavor.

So universities have existed for a long time. You know, the Western university traces its roots to 1088 with the University of Bologna. And by the way, this is what lectures look like in 1308. Does that look familiar? I mean, standing here, right? So the reason we're here and the reason edX exists is because surely something's got to change in, let's say, 1,000 years. Right? We've had our disruptive technologies in education. We had the blackboard in 1801. Before that, we had the printing press in 1450. So something's going to change given that we've had two innovations, really, in 1,000 years. And Anant will talk about edX, but I'll talk about all the other stuff.

So let me start by clarifying the difference between MITx and edX. edX is, to us, the platform. It is the theater. And to us, MITx is the content that goes on the platform, that goes on the theater. So in other words, we're like Disney. edX is like the movie theater company, AMC or Lowe's or something like that. So we produce the content. We play it on edX. And it plays as long as we want it to play, then we pull it out. Harvard is Pixar or they're Universal. They produce content. They play it on edX. They withdraw. So this is how we clarify. The ultimate goal for edX is to become the place, the global theater, where courses play and the world population take courses. But that's for the world, and obviously that's an extraordinarily important thing. But what is in it for MIT? So that's what I'm going to talk about for the next few minutes.

So we believe that online education fundamentally enhances the magic of the campus. And we have no illusions about this magic. We believe that lectures are great and lectures are wonderful, but the magic happens in places we tend not to look and in interactions we tend not to note or record. Now, already, organically, this has lead to an organic uptake of edX within our campus. So for example, already we have more than 10 courses using the edX platform, not for global consumption but for internal consumption within MIT. And we voted. In fact, and my own colleagues at MIT are surprised to hear this, but in spring 2013 – and Ike may have mentioned this yesterday – we had more than 10 residential courses using the edX platform and using MITx material on campus. And we had more than 1,200 users, students, using this software on campus as a part of their day-to-day existence, day-to-day studies in courses.

So why are we doing this? The reason is we were curious, at some level, what makes our students and the students at other universities so special? What is it? Why is it that someone becomes a Nobel laureate, someone who becomes a star who starts a company, or the leader of a country? How does this happen? The reason, to put it very simply, is the special thing that happens in interpersonal conversations, mentorship, and interactions. And there are many, many, many examples of this. But one example is our very own Professor David Pritchard who was a professor at MIT and an eminent physicist and also an eminent, in his last 5, 10 years, education researcher. In fact, started a company on education technology.

Now, Dave is extraordinary because he mentored not one, not two, but five Nobel laureates. Five. Right? I'll list them for you. These are all great names: Bill Phillips; Steven Chu, who just retired as Secretary of Energy in the US government; Carl Weiman, the famous physicist who himself has become a great proponent of modern techniques for improving education; Eric Cornell; and Wolfgang Ketterle, who is also a professor here today. By the way, Wolfgang Ketterle, when he received his Nobel Prize he came home, came back to MIT, walked to his neighbor's office, Professor Pritchard, and gave it to him. OK. That is the special magic that happens outside this format of delivering information. And the magic occurs in all the nooks and crannies of MIT. If you walk down the Infinite Corridor, you see students talking to each other, professors talking to each other, people high fiving.

If you walk into a lab, as you all, as educators, know, it happens in these sidebar conversations. We have the expression, the water cooler conversations, the back of the envelope, the back of the napkin conversations. It could be, for example, in a discussion. This is the Electric Vehicle Club at MIT. I just took pictures from MIT, but it happens around the world. That is the Infinite Corridor, [INAUDIBLE] labs. That is a robot lab. That's not a student, by the way, that's a robot. Our students do tend to look like that, but that's only before exams.

But this is something that we never record. This is something informal. We take it for granted, right? What we take formally is this stuff. And so over the last 20, 30 years, we

recognized this needs to be taken seriously. And there are more examples. This is a teaching lab. And so over the years, MIT slowly morphed, and other schools have morphed. Eric Mazur at Harvard's been talking about it for more than a decade about getting students more engaged in learning, getting them to build things, do projects. So when we came to this realization, it wasn't instant. It's, as I said, a progression. We realized that what we also need to do is figure out how to distill and deliver this magic. Because we, against our better instincts as scientists, we only like what we can measure. But this is immeasurable and unmeasurable. But we, against our better instincts, have accepted it. And we've decided that we are going to do it and do it right.

So some historical things. So in 1969, MIT created a new entity called the Experimental Studies Group. And ESG consists of small interactive classes, problem-solving sessions, discussion-oriented seminars. There's a hammock in the ESG space. Students live together. It's almost like a Montessori school. So we did this in 1969. In 1970, we launched yet another extraordinary innovation, which is Concourse. This was founded, amongst others, by Professor Larry Bucciarelli. And this was an effort to bring engineering education and liberal arts education closer together, and it focuses on science and the humanities. It consists of lunches, seminars, very different. And they have their own tutors, their own lecturers, and a very different education experience. And we have many instructors here who are involved both in ESG and in Concourse.

And then in the late '90s, we launched yet another grand foray, a fairly famous one into engaged learning, and that is TEAL. That is the Technology Enhanced Learning Environment, and it's based on interactive learning. In fact, I think you were in the TEAL classroom, those of you who were with Ike yesterday, on Sunday, you were in the TEAL classroom. And Ike would have shown you this picture. That's how the TEAL classroom looks. It doesn't look like this. That's the point. Right? It's much more engaged and interactive.

Over the last five to 10 years, the word "flipping" the classroom has become, I think, a very nice way to explain what we're trying to do, which is get away from one-on-one lectures and go to interactive lectures. That term, I believe, was invented by Sal Khan, who was a commencement speaker here a couple years ago and, of course, MIT alum. So at MIT, going back to the late 1990s, we've been using automatic tutors to enhance the in-class experience. And I want to clarify the difference, and Anant can talk more about it, between automatic tutors and online. Online is still human intensive. What happens with an automatic tutor is you get automatic grading. And as Anant will explain, in edX you have automatic grading. You have fora. You have all sorts of other – of course, short videos. I'll talk about them a little bit more.

But what automatic tutoring did was it was the first step in being able to flip the classroom pretty significantly. Because now you could get students to watch videos and narrative PowerPoints, and then see if they understood the material, not only for yourself as a professor, but for the students' own good, before they entered the classroom. So now,

in the classroom, with the confidence that the students had actually understood stuff, you could lift the level of the conversation. So I just want to clarify. There's a difference between online education and what is happening today, which is automatic grading, which is a pretty fundamental breakthrough. All right.

So again, in the last 10 years, we've started flipping more and more classrooms. Many of them were done before edX, but now, as I showed you, more and more professors are organically using edX because of this desire, this tide, to do more and more in the classroom and to relegate some of the most routine stuff online. And so there's a whole bunch of classes. And this fall, fall of 2013, Professor Michael Cima is going to be doing a very interesting class where we will be using the edX platform to flip 3.091, which is a chemistry class, and it's a very elaborate experiment. By the way, this spring, 14.73 and 14.73x, we did another experiment, where not only did we teach the worldwide class – this was a class with Professor Esther Duflo – we simultaneously taught the class at MIT so that our students could interact with the worldwide blog. The focus of the class was on global poverty, and to have this very rich discussion occur on the blogs was a very interesting experience.

So you can see that our urge to improve what happens on campus has driven a lot of what we're doing here. And this is a message that – I've shown you MIT examples – but this is a message that is resonating worldwide. As I said, Eric Mazur of Harvard gets a lot of credit for it. There are folks at Stanford, Berkeley, great schools around the world who are thinking about this more and more. I was recently talking to Professor Nam Suh, who retired as the president of KAIST, and they've done the same thing at KAIST. Extraordinary movement in education. I'm sure you're familiar with it, but I just wanted to peg it and say that's the reason we really got into this.

Now, there are deep pedagogical reasons for taking this approach. I want to spend a few minutes talking about it. You could say that we're doing it because it's convenient, but it isn't. So let's explore that a little bit. And there's a wonderful paper by three authors from Australia. It's a review paper – Glance, Forsey, and Riley. And I found it about a month ago, and I recommend it. It's called "The Pedagogical Foundations of MOOCs." What it does is it takes what MOOCs do, Massive Open Online Courses, and it takes every element of MOOCs and looks at the education research that supports it. And again, a great paper.

So the first is online delivery. Now, there is a lot of literature that shows that online delivery is effective delivery. There are downsides to it, which I can explain in a second. The downside is the affect. The upside is the cognition. In other words, students learn better online, but they don't feel as good about it. Interesting. What it means is that the community experience is needed to give them the stamina to keep doing it, to keep taking the next class, to stay in the class, and so on. But in fact, the learning outcomes are quite good online. In fact, you could argue, if you look at a range of studies, generally better than in class. And there are many reasons for it. You can scroll back. You can watch the

video again, et cetera, et cetera. And then in the edX world and the MOOC world, the peer community helps a lot.

The second is short videos. And again, there's a lot of literature, going back to Richard Mayer, et cetera, et cetera, that says that enhanced attention and focus that comes from these TED style short videos, it's nothing to shake a finger at. The impact is great. Again, students get a bite-size amount of material, and then they can go back, scroll back, and when they get it, they can move on.

The third is online quizzes. And what online quizzes do is give instant feedback. In my class that I taught last semester, feedback would arrive three weeks after the material. Because if I taught a class, the assignment would go out at the end of the week, be returned a week later, and that's when the students received feedback on their doubts, or we found their doubts. But it turns out that if you do it immediately – force students to go back and retrieve information from their short-term memory, it's called retrieval learning – it enhances learning outcomes. So there is, again, a lot of literature on it. Online quizzes is retrieval learning.

And then short videos and quizzes – so if you take a short video and then have a quiz, what it forces students to do is master the material before they move to the next chunk of material, and that has wonderful outcomes. It's more work on mastery learning. Bloom and others have written about it.

And then, finally, online forums, and this is something that Anant can talk more about. It has been a revelation to us. That's David Pritchard, by the way, whom I just spoke about. Hi, David. You were up there a moment ago. Online forums, which enable peer assistance and out-of-band learning. And again, a lot of literature about how peer-to-peer learning – because peers are somewhat more sympathetic, and they understand where the student is coming from – works really well.

So there's a lot of literature for this. So again, I want to say to you that we didn't do this because it's a fad. Well, OK, we did it a little bit because it was a fad. But this was a long time coming. We've been working on this for more than two decades, and this is the final and the natural endpoint of a deep urge within MIT.

Now, there will be a lot of challenges ahead. We have no doubts about that. So for example, there's a lot of fear about MOOCs. Will they cost faculty jobs? And technology moves at the pace of technology. We cannot be King Canute and try and stop a tidal wave with our hands. If edX didn't exist, this would still happen. What edX does is it brings – and I want to say this – unlike other companies which have shareholders, we are trying to bring stakeholders to the table. You, we, we all are stakeholders, right? We can collectively define where things can go with this. In other situations, you have shareholders, and that, to me, is a little bit worrisome.

So one of the reasons edX is not-for-profit is because let's at least figure out where we want to go collectively, and that's why we're so happy to host this conference at MIT. And I'm going to thank Dick Larson for his extraordinary leadership in creating this wonderful community. But I don't think it's going to cost us jobs. I believe that it will more likely change our jobs because it will change the way we interact with students. If a professor is used to coming in and ranting for 90 minutes, as I do, then maybe I need to change the way I interact with students. Maybe I need to learn a new technique.

It's no coincidence to me that the word "lecture" is a little bit – and my daughter said it to me the other day – she said, “Dad, don't lecture me.” Well, it's a little negative, right? Anyway. A lot of words in academia have become negative. If an argument becomes useless, we say it's academic. So we’ve got to reclaim some moral authority here. But having said that, the press on online is pretty extraordinary. This is an article that was written by Kevin Carey for the New America Foundation. He took a class that was taught by a very famous professor, Eric Lander at MIT. Eric Lander is also on President Obama's Council of Advisors on Science and Technology, a very famous guy. He had led the sequencing of the genome and so on.

And I just want to highlight one thing Kevin says. He says, "Live and taped lectures really aren't the same. Live lectures are definitely worse." And by the way, he did his homework. He took the whole class, and he attended the live lectures. OK. So it's a love/hate relationship. He loves Eric's online lectures, but he says the live lectures aren't as good. And he says the burden is on us to figure out what we're going to do with this technology. Again, we are stakeholders. So my suggestion is let's think of this as a challenge for the greater good. And I feel that professors will rise to the challenge. This is what we at MIT at the Office of Digital Learning, Ike and a lot of our colleagues who are here. I see Steve Carson here. This is what we're working towards, is let us see if we can enable professors to grasp this challenge rather than see this as a threat.

And then the hard reality, especially in the United States, is that the price of education, the cost of education, is skyrocketing. The blue line, just to cut to the chase, is income, inflation adjusted. The red lines are all cost of education. So that's another elephant in the room. And, in fact, to those who say that MOOCs will hurt residential education, let me say that MOOCs will actually save residential education by improving, changing fundamentally, the return on investment from residential education.

So the new challenge for all of us, I believe, we all believe here at MIT, is how do we distill and enrich such a wonderful institution, Western education, share education worldwide? It's not really Western education, because if you look at the old universities of Asia, of North Africa, and so on, this is a tradition we have taken that has developed over 3,000 to 4,000 years, and we need to figure out what makes it so special.

And there are a lot of questions. We're somewhat glib in saying we're going to flip the classroom. But what does that mean precisely? What are you actually going to do in the

classroom? Are you going to do problem solving? Are you going to do more tutoring as Oxford and Cambridge have done for more than 100 years? Is it going to be problem-based teaching? Do you give the problem at the beginning of the class and solve it? Or do you give the problem at the beginning of the class and have students struggle with it and then give them the solution? We don't have the answers to this.

Daniel Schwartz at Stanford has a wonderful paper that says you better give them the problem, but not the solution at the beginning of the class, letting students struggle and then give them the solution. So we'll have to learn all this stuff in this new world, the magic beyond the MOOCs. Do we do hands-on learning? Do you do field learning? There's all these questions that we'll have to answer in the years ahead.

Final comment is any new technology comes with challenges. And this is what Socrates had to say about a new technology called writing. Right? He said this new technology of writing is going to change pedagogy and learning because students will use writing not to understand, but merely to mimic what someone else thought. Right? That's the essence of his statement. And by the way, the irony of this is we know this because it got written down. So I'll stop there. Well, thank you very much, and it's a great pleasure to be here.