massive open online courses (MOOCs), in which enterprising professors teach free courses online at scale, burst on the scene in early 2012 with the emergence of providers such as Coursera, Udacity, and edX. I spoke with Anant Agarwal, the CEO of edX, which was created by MIT and Harvard and hosts university-level courses in numerous disciplines to students around the world. Agarwal taught the first edX course on circuits and electronics from MIT, which drew 155,000 students from 162 countries. You can see the entire interview at www.computer.org/computingconversations.

In its third year, edX has enrolled more than 5 million students from all over the world and offers more than 500 free courses from the world's best universities, colleges, and institutions. The courses cover a wide range of topics, from architecture to social science. Not surprisingly, computer science courses are in high demand:

There are a large number of jobs out there that are unfilled. Many degrees don’t quite match the skill level required for a specific job. We feel that a lot of the computer science courses on edX can help bridge that gap. As an example, we have a course on cloud computing from IEEE and a course on software as a service from [UC] Berkeley.

In addition to classes that provide critical skills to students already engaged in their careers, edX can also improve the pipeline of incoming computer science students. These courses can get students started and be useful throughout their education:

We have a wide range of courses, from introductory courses like Scratch for young people or Introduction to Computer Science all the way to graduate-level courses like Machine Learning from Cal Tech or Big Data from [UC] Berkeley.

With such a broad offering, students can forge a non-traditional path to learning technical skills:

A lot of the students taking our courses are not computer science majors. We got a letter from one student who said she was an English major. She was
never quite sure whether she wanted to go into technology or into the humanities and liberal arts. She ended up [going with] English but late in her college career, she decided to try computer science courses. She took Introduction to Computer Science from Harvard on edX and really liked it. She was considering “topping off” her liberal arts education with some computer science courses to make it easier for her to get a job.

An important part of self-directed study, which is integral to edX courses, is students’ ability to take the time to understand difficult topics on their own schedules:

Pressure and stress is part of the culture at some of the top universities, and many students thrive in that environment. But with that said, we have a large number of self-paced courses where students can dive in and learn at their own pace. If they pass the course and get a verified certificate, they can post it on their LinkedIn profile or elsewhere. When students take these courses in a self-paced manner, they can afford to take more time and explore more than they could in a fixed-regimen course.

Constructing their own curriculum and setting their own pace allows students to follow more creative interests:

There are many design aspects to computer science. If you take a look at the Scratch programming course from Harvey Mudd College, you realize how much fun kids get to have with programming. It’s not just about writing code and looking at ones and zeros. In the Scratch class, kids can do animation and a lot of fun projects involving video and audio, and it’s a fantastic introduction to computer science and programming.

Teaching edX courses also benefits computer science faculty:

Computer science faculty members are really excited about offering online courses. They’re taking the same online courses they create as a free offering on edX and bringing them back to their campuses in a blended model. One example is T.C. Pong, a professor of computer science at the Hong Kong University of Science and Technology. He teaches a great Introduction to Java course on edX and uses the same course in his own campus class.

The experience gained building large-scale open enrollment courses for edX has led to changes in on-campus offerings as well:

MOOCs tend to be relatively short so students can plan their time effectively. So MIT took a four-month Introduction to Computer Science in Python course and broke it up into two parts, each running about six to eight weeks on edX. Campus students noticed this and decided it would be great if they could just take the second part of the course or just the first part. So they split the campus course into two parts. Faculty members have the freedom to experiment online and then apply what works online to campus courses.

Even with the success of edX, there’s much more to do:

We have a very simple vision: we would like to educate a billion people over the next 10 years.

That involves creating lots of great courses and improving engagement and assessment of the courses. [Our developers] are also using the latest in computer science, machine-learning computing, and big data to improve the offerings of the platform as well. I hope that within a few years, we’ll be able to offer spectacular courses in virtually every topic known to mankind.