

India Loves MOOCs

In a country of rigid teaching styles and scarce university slots, students and professors are exploring what online learning can be.

How does a talented Indian teenager like Gaurav Goyal make his mark on the world? Ordinarily, his destiny would have been set on the morning in 2008 when he took his country's toughest college placement exam: the IIT Joint Entrance Exam. More than 300,000 students attempted the test that year; only 8,652 qualified for a spot at one of the ultra-elite Indian Institutes of Technology.

Goyal mustered a score in the top 1 percent, winning entry to IIT Delhi. But he fell just short of the cutoff for the school's most competitive degree program, the one he most wanted to pursue: computer science. Instead, Goyal was told to major in civil engineering. Other students could learn about databases. For him, hydrology awaited.

Determined to change his fate, Goyal, an extrovert with a keen interest in business, found a way to outwit the system. As he recently explained over a dinner of curried cottage-cheese skewers at a fancy lakeside restaurant in Delhi's Hauz Khas district, he wiggled his way into a variety of management courses at IIT Delhi and lined up his first job after graduation at Wipro, one of India's leading information-technology offshoring companies.

Then Goyal set out to sharpen his résumé. In early 2014, he enrolled in three online data-science classes via Coursera, all taught by Johns Hopkins professors. By earning certificates from the courses, demonstrating expertise in areas such as the programming tool R, Goyal impressed Dunnhumby, one of Britain's largest customer-analytics companies. He now works there as a Delhi-based senior analyst, using data to figure out what British shoppers want next.

Throughout India, online education is gaining favor as a career accelerator, particularly in technical fields. Indian enrollments account for about 8 percent of worldwide activity in Coursera and 12 percent in edX, the two leading providers of massive open online courses, or MOOCs. Only the United States' share is clearly higher; China's is roughly comparable. India's own top-tier technical universities have created free videotaped lectures of more than 700 courses, with the goal of putting students at regional colleges in digital contact with the country's most renowned professors.

In the United States and Europe, MOOCs have proved less revolutionary than their champions predicted when they launched on a wide scale in 2012. Rather than displacing traditional undergraduate programs, MOOCs in developed economies seem to find their biggest audience among those eager to learn more about history, psychology, or some other side interest. Those enrollees try lots of classes but often drop out after a few sessions.

It's a different story in India. There, online courses from the U.S. or Europe are finding a big following among college students and recent graduates, says Rick Levin, CEO of Coursera, which is based in Mountain View, California. They are a more serious bunch, hoping that the right technical courses can help them win better jobs. In a boon to Coursera's bottom line, emerging-market learners are also frequently willing to pay \$29 to \$250 for a certificate that attests to their successful performance on a final exam.

"I believe that India ultimately will be a much bigger market for MOOCs than the U.S.," says edX chief executive Anant Agarwal, who also is an MIT professor of electrical engineering and computer science. Indian students crave advanced knowledge that can open doors to a more prosperous life, Agarwal says: "If you've been trampled all your life, now you find you can stand shoulder to shoulder with the best."

Sheer demographics bolster his case: India's population of more than 1.2 billion is nearly four times the U.S. total. India's brightest students enjoy the IIT campuses' cachet as the training ground of tech-sector leaders. A handful of other state-sponsored or private universities achieve top-tier status, too. By and large, though, a degree from most of India's 35,000 colleges simply doesn't register with international employers.

For aspiring Indian engineers and scientists, online credentials offer a way to stand out from the crowd. Coursera's most popular offering in India is an intensely practical University of Maryland course on how to build mobile applications for Android devices. After that come two Python programming classes from the University of Michigan and Rice University. Next is a Stanford class on machine learning. All told, eight of Coursera's top 10 courses in India are highly technical. (Even the two nontechnical classes on Coursera's leaderboard are designed for strivers: Learning How to Learn and Introduction to Public Speaking.)

Coursera executive Kabir Chadha is trying to persuade leading Indian tech employers to embrace his company's completion certificates as an important part of their job-candidate screening. Already, companies including Google, Wipro, Infosys, Infineon, and Microsoft have hired Indian engineers with online-education credentials, though such achievements don't yet factor into recruiting standards in a consistent way, if at all. Thousands of Indian engineers now list schools such as Stanford, MIT, and Carnegie Mellon as part of their educational background on LinkedIn, based solely on completion of online courses offered by professors at those U.S. universities.

“The first MOOCs were replicas of the traditional, full-semester experience. Now ... people are experimenting with a lot of formats that break with tradition.”

Few people have wrestled more extensively with the challenge of teaching electrical engineering to undergraduates than Anant Agarwal. A product of IIT Madras and Stanford, he has been teaching at MIT since 1988, perfecting an upbeat, high-energy classroom style that has earned him two teaching awards. With his booming voice, untucked flannel shirts, and sweeping hand gestures, Agarwal projects a geeky charisma. One of his 2007 lectures has attracted some 550,000 page views on YouTube.

Given the opportunity four years ago to create a globally appealing online course on circuits, Agarwal could have kept the star role for himself. Instead, he reworked camera angles so that he became an unseen background voice—while circuit diagrams and problems enjoyed full prominence. Online students needed to put each lecture’s concepts to work, right away, by designing their own circuits and analyzing the ways that amplifiers, inductors, and other devices would operate. Built-in software allowed students’ work on a digital sketch pad to be automatically graded within seconds.

It was a most un-Indian approach, sidestepping the long lectures, rote learning, and heavy emphasis on foundational principles that typify many Indian college courses. Indian campuses and tech companies began buzzing about this rare chance to experience hands-on teaching. Circuits 6.002x, as his MOOC was called, attracted 155,000 people worldwide in its 2012 debut—nearly 50,000 from India.

“I got super-excited at the prospect of being a virtual MIT student,” Shreyas Jayaprakash recently recalled. He was finishing up his undergraduate studies at a regional college in Bengaluru at the time, worried that he couldn’t compete successfully against other 6.002x students from around the world. But Jayaprakash raced to complete the course quizzes within hours after they were posted. He ended up with a 99 percent score on the final exam. Today he is a design engineer for the Bengaluru office of Avago Technologies, where he inspects chips that ultimately become part of Dell, Cisco, or Facebook servers.

Taking 6.002x “improved my problem solving,” says Ashwith Rego, who is pursuing a master’s degree in electrical engineering from IIT Bombay. One quiz gave Rego a better understanding of oscilloscopes. Another had him analyze car suspension systems. On the hardest problems, he tapped into online discussion forums, populated by students from as far away as Argentina and Ukraine.

What Agarwal started, dozens of other U.S. professors have now exported to India, too. Jim Fowler, an assistant professor of mathematics at Ohio State, teaches Coursera’s most popular online calculus class. Instead of lecturing nonstop at a whiteboard, he pauses periodically to blow up a balloon or cast shadows with a stick-figure puppet—helping learners visualize the integrals and derivatives they are being asked to calculate.

Such showmanship delighted Surya Prakash in 2013, when the West Bengal student took Fowler’s calculus MOOC. Prakash had finished high school and was trying to score well enough on the Joint Entrance Exam to win admission to an elite engineering college. Earlier attempts to master calculus had gone badly, but Prakash seized on Fowler’s examples and drew on them to achieve a strong test score—and a ticket to a first-tier college in Jaipur.

Mixing facts and fun in a MOOC “helps you remember things better when it comes time to take the exam,” says Mahesh Kumar Hiremath, a computer science major in his senior year at BMS College of Engineering in Bengaluru, who has taken at least eight MOOCs, often to get a second perspective on his actual courses in topics such as algorithms or Java. The extra effort has paid off; Hiremath has earned As in most of his classes and is joining SAP after graduation.

BMS’s snug urban campus is a sanctuary from the noisy motorbike traffic of modern-day Bengaluru, and a contrast to the opulent 16th-century temple to the Hindi demigod Nanda that sits just across the main access road. The school attracts people with a single-minded focus on academics, many the children of middle-class accountants, engineers, and biologists.

“There are a *lot* of computer science engineers in my family,” Chaitra Chandrasekhar, who’s majoring in medical electronics and biomedical engineering at BMS, wryly observed, during a roundtable chat over tea and biscuits at the school. Like many of her peers, she has used online classes as a safe, easy way of expanding her horizons, even if some explorations (such as a short-lived attempt to learn German) went nowhere. Medha S. Bharadwaj, a medical electronics major, took a Python programming class to help her on the job market and a Western music class for fun.

Indian technical colleges seldom offer the wide-ranging electives that can be found on U.S. campuses. So BMS students such as Sharath Chandra tend to chuckle when they admit to signing up for online oddities such as a sports management MOOC taught by the University of Pennsylvania. It’s irrelevant to his computer science studies, Chandra conceded. Even so, he added, “it was fascinating to find out how Real Madrid can sign a player for \$80 million, and make back \$40 million of that with extra T-shirt sales.”

India’s vast size and rapid development mean there is always a shortage of professors. With a record 3.2 million students currently enrolled in university-level engineering programs, there aren’t enough experts to teach everyone in person. Essential courses can’t be offered at all in some rural colleges; elsewhere, people with just a bachelor’s degree are pressed into duty as instructors for first-year courses. The best hope of fixing this predicament, says pioneering Indian computer science professor Deepak Phatak, is a much bolder role for online education.

Phatak is India’s most persistent champion of tech-based ways to stretch the classroom. In 2002, he and a colleague arranged for his IIT Bombay class in information science to be live-streamed, via video, to other Indian colleges. He is an active supporter of a national program that has made stored videos of elite institutions’ course lectures available free of charge to anyone who wants to watch. Recently, Phatak and three other IIT Bombay instructors teamed up with edX to offer their own online introductory course on computer programming.

Making the technology hum is the easy part, Phatak says. It’s harder to rearrange university priorities so that India’s best instructors can be granted enough discretionary time to build first-rate MOOCs from scratch. Another barrier, Phatak says, is schools’ reluctance to provide academic credit for online learning. He has been working with the All India Council for Technical Education to establish new guidelines that would allow students to earn 15 percent of their credits online. One proposal would let outlying colleges use a blended model, in which online instruction supplements class lectures and discussions. That approach will be put into action in the 2015–16 academic years, with about 50 of India’s autonomous institutes working with IIT Bombay to offer blended MOOCs in three subjects.

Eager to establish that India can create its own advanced online classes rather than importing content from the United States, the Ministry of Human Resources Development last year sketched out plans for its own MOOC platform, known as Swayam. As of this June, however, only three Swayam courses had been announced. Coursera and edX each offer more than 500 online classes.

While Indian students are embracing the visual thrills and incessant mini-quizzes of U.S.-style MOOCs, their professors aren't as delighted. In 2012, Gautam Shroff, an adjunct professor at IIT Delhi, decided to create a Coursera MOOC on Web intelligence and big data. He came away with mixed impressions. Reaching a big audience was enticing, he observed, but "the average learner was nowhere near as well prepared as a typical IIT undergraduate." That forced him to teach at a more rudimentary level than he might have wanted, even though a few students were so savvy that they almost didn't need the course at all.

Shroff also found that in his field, it was hard to test the depth of students' understanding. The MOOC format required him to come up with assignments and exams that could be machine-graded, which tilted everything toward more superficial questions than might be posed in a traditional, hand-graded classroom exam.

Overall, he concluded, MOOC students are more likely to end up with an "awareness" of a field, rather than deep knowledge. That's not all bad, he observed. It just means that, at least for him, teaching a MOOC is "more like writing a short book than teaching a course."

R. K. Shevgaonkar, former director of IIT Delhi, has been testing various online education methods for at least a decade. He is confident that digital learning in some form is "a good solution" for India as it seeks to spread technical knowledge fast enough to satisfy the demands of a big, rapidly growing nation. He is eager to see India become an exporter of online academic instruction rather than a net importer from the United States.

Shevgaonkar himself has posted on YouTube a massive, 60-lecture series about transmission lines and electromagnetic waves. This 2007 presentation lacks interactive quizzes or video-editing fanfare, but Shevgaonkar makes no apologies for the spartan delivery. His opening lecture has attracted a very robust 285,000 views, and a respectable 8,800 students made it to the final (60th) lecture.

"Every course can't be in the [U.S.-style] interactive format," Shevgaonkar argues. "Some have to be very serious lectures."