



EDUCATING INDIA

The country's vast, education-hungry population could supply the next generation of the world's scientists — but only if it can teach them.

BY ANJALI NAYAR

Subha Chakraborty has hardly left the lab in three months. His master's research in micro-scale systems is running into the early hours almost every morning, and “that is not the right time to go back to your room and sleep”, he says. So he bunks on a makeshift bed under his computer and cooks on a toaster in the corner of the lab's common room.

Chakraborty isn't alone: most of the lab's ten postgraduate students follow a similar schedule. “There's some kind of charm here,” says one of them, Anindya Roy, who has decided to officially surrender his dormitory room.

These students at the banyan-tree-lined campus of the Indian Institute of Technology (IIT) in Kharagpur are among India's luckiest and best: once they have completed their degrees, they will end up working at top universities and private research hubs in India and around the world. But the optimism and drive are ubiquitous. “When you go to the rural parts of the country you meet extraordinarily bright kids who just have to be given the opportunity,” says Chintamani Rao, chief scientific adviser to India's prime minister. There are a lot of them — around 90 million between the college-going ages of 17 and 21, rising to

an estimated 150 million by 2025. And they are hungry, starving even, for an education.

BRAIN DRAIN

But can India feed that hunger? The government has pledged to make it a priority, but faces tremendous obstacles. Most of the elite science and engineering graduates opt for high-paying jobs in industry rather than independent research. Other students far too often end up in high-priced commercial diploma-mills that deliver little real education. Many, many more young Indians don't even get that far: the country's 500 universities and 26,000 colleges have space for only about 12% of its eligible youth. And the population is growing by 1.34% a year, more than twice the rate of growth in China (see ‘A double explosion’).

But if India cannot meet this challenge, it could miss out on becoming one of the world's great innovation hubs, says Rao. “There is a very large population out there that is extremely qualified and they end up in second or third-rate institutions,” agrees Pradeep Khosla, dean of engineering at Carnegie Mellon University in Pittsburgh, Pennsylvania, and a graduate of IIT

Kharagpur. “A lot of talent gets wasted.”

On the surface, India seems to be in the middle of an educational renaissance, thanks largely to its booming economy. After decades of economic stagnation under the socialist policies that followed the country's independence in 1947, Indians enthusiastically embraced a series of business-friendly reforms that began in the early 1990s. The result has been economic growth that currently averages more than 8% a year, with only a slight and temporary slowdown during the global financial crisis that began in 2008. That growth, in turn, has created a flourishing market for qualified graduates in everything from construction to information technology and health care.

“There are a lot of stories of successes — from rags to riches — of Indians who made it just on the basis of good education,” says Pawan Agarwal, author of *Indian Higher Education: Envisioning the Future* (Sage; 2009). “This is creating high aspirations among Indians about higher education.”

Those ambitions, along with the population growth, have fuelled an eight-fold increase in science and engineering enrolment at India's colleges and universities over the past decade, with most of the growth



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occurring in engineering and technology — fields in which jobs are especially plentiful. The low cost of doing business in India and the large crop of English-speaking graduates has made it a global hot spot for investment in research and development (R&D).

“In 2003, 100 foreign companies had established R&D facilities in India,” says Thirumalachari Ramasami, head of the government’s Department of Science and Technology. “By 2009, the number had grown to 750.” Those companies include technology and communications firms such as IBM, General Electric, Cisco, Motorola, Oracle and Hewlett-Packard, all eager to get a foothold in the fast-growing information-technology hub around Bangalore.

Small wonder, then, that the 15 IIT campuses nationwide have roughly 300,000 applicants every year, or that the students who make it in are very, very good: IIT acceptance rates are about 2% (see ‘Only the best’), compared with around 7% at Harvard University in Cambridge, Massachusetts, an emblem of US elitism. “Statistically, out of a billion people there must be a Michael Faraday,” says Rao. “There must be a number of talented people.”

Look closer, however, and it becomes apparent that there are serious cracks in the system. For example, the vast majority of India’s science and technology graduates immediately head for high-paying jobs in industry. Only about 1% of them go on to get PhDs, compared with about 8% in the United States. “Internally the brain drain is quite high,” says Rao. “All the talent goes into sectors that make money but produce very little in terms of creative things for the country.”

What makes this problematic, adds Rao, is that the country’s rising economic tide is largely the result of its myriad outsourcing centres and the computer industry. If India cannot broaden its economy — and make better use of its brightest scientific minds — it will have little chance of solving its

challenges in areas such as poverty, food, energy and water security.

“Everyone’s just making computers faster, and our computers are pretty fast already,” agrees Manu Prakash, who graduated from the IIT in Kanpur — and who, like many Indians with academic ambitions, elected to pursue his education elsewhere. He earned his PhD from the Massachusetts Institute of Technology in Cambridge, and now runs his own biophysics lab at Stanford University in California.

Prakash says that although the IIT system does attract superb students, it is institutionally broken because it doesn’t value creativity. “You have a brilliant mathematician coming into an engineering course and then taking a nine-to-five job with a company,” he says. “There is something wrong there.”

QUANTITY VERSUS QUALITY

Whatever its flaws, the IITs remain out of reach for millions of eager, ambitious Indian students. The higher-education system is expanding pell-mell to accommodate them — with the burgeoning private sector filling around 90% of the demand. “We will need another 800–900 universities and 40,000–45,000 colleges within the next 10 years,” says Kapil Sibal, India’s minister of human resources and development. “And that’s not something the government can do on its own.”

For-profit colleges and universities are popping up around the country by the day — nearly 4,000 of them in 2010 alone. The road leading out of Chennai in southern India, like many around the country, is crammed with hundreds of private engineering colleges. The government has struggled to maintain any kind of standard. “The big challenge is that when you move to grant more access [to

education], that the access must come with quality,” says Sibal.

Many private institutions have only a few hundred students each and offer little in the way of laboratory or practical training, because labs are expensive. Curricula are outdated and there are crippling shortages of teaching staff, thanks to the allure of higher-paying industry jobs. “The younger generation is completely disillusioned with pursuing higher education with the intention of going into teaching,” says Agarwal. Sibal estimates that at least 25% of academic posts are vacant and more than half of professors lack a postgraduate education.

Rahul, who prefers that his real name not be used, studies information technology at a private college an hour outside Delhi. “We are spoon-fed,” he says. “The teachers dictate and the students literally write down what they say.”

Rahul’s parents paid hundreds of thousands of rupees up front to get him into the institute after he scored poorly on entrance exams. He says that about 30% of his peers entered in the same way, and at other colleges the informal ‘management quota’ can be as high as 40–50%.

This year, tuition at the institute cost 85,000 rupees (US\$1,900): more than three times that charged by the IIT system. And the payments at many private colleges don’t stop there, says Rahul. “A few days before [exams] you can pay 1,000 rupees for a copy of the paper, and you can pay another couple of thousand rupees if you didn’t get the right marks,” he says. “Then, if you don’t attend classes or labs, you can pay 5,000 rupees to fulfil your attendance quota. Education here is based entirely on money. And to think, my institute is one of the best in the area.”

There are more than 600 colleges affiliated with one university in his province alone, and every college has 5–6 branches, with 60–120 students each. “That’s lakhs [hundreds of thousands] of students passing out of these colleges per year,” says Rahul.

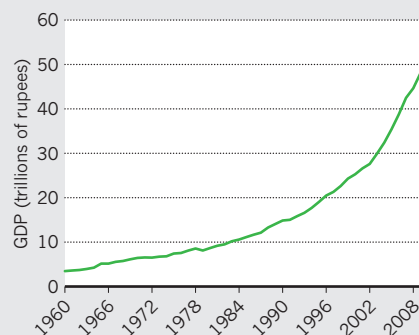
Moreover, many of the students are graduating with abysmal literacy and numeracy skills.

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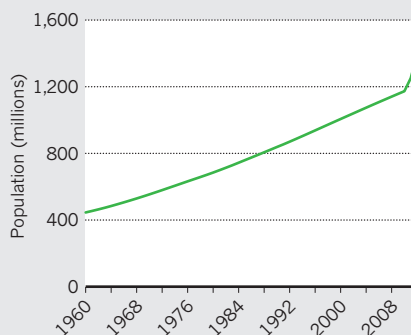
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How technology is helping India’s children to learn:
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A DOUBLE EXPLOSION *India is struggling to meet rising aspirations for education.*

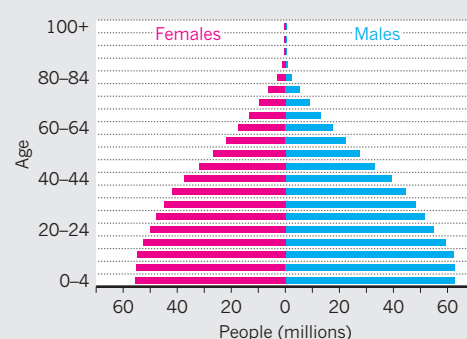
India's booming economy is spawning millions of new jobs — especially for college-educated scientists.



But India's population is expanding even faster, topping 1.2 billion last month.



The result is a country full of young people, many more than India's educational system can accommodate.



Employers' surveys suggest that up to 75% are unemployable.

"You can pay to get in, you can pay to get good marks and you can pay for your attendance, but you can't pay to get into a good company," says Rahul. "There are people at my college who don't even know how to say 'how are you?' in English" — the working language of most companies.

Rahul's experience is not unusual. Geeta Kingdon, who studies education, economics and international development at the University of London's Institute of Education, points to allegations of widespread corruption in how Indian institutes and universities are accredited. "Even those who have got the relevant accreditation only got it because they paid the relevant bribe," she says. Many don't bother. A government crackdown on unaccredited institutions in 2010 left more than 40 universities and thousands of colleges in court.

Corruption has even reached the august halls of IIT Kharagpur. Last October, a handful of the institute's top engineering professors were accused of running a fake college

called the Institution of Electrical Engineers (India) from the campus. The scheme allegedly involved the use of forged documents bearing the IIT logo to lure in students, who were charged 27,000 rupees for admission, roughly what the IITs charge per year. The IIT Kharagpur has launched an inquiry into the incident. "But there will always be another scandal down the road," says Srinivasan Ramanujam, a mechanical engineer at the institute. "Students are desperate to get into a college and people exploit this mentality."

With all these desperate but half-baked graduates, India's hopes of becoming a global centre of innovation are being compromised. Too often, the corporate R&D model sweeping through India treats science graduates more as grunt workers than true innovators, says Ramasami. "Just availability of scientifically talented people does not provide scientific breakthroughs. For the discovery process you need ambience and creative people."

India's government is working hard to change the trend. In January 2010, for example, it pledged to ramp its investment in R&D up from the current 1% of the gross domestic product to 2%, but this will happen very slowly, says Rao. The government's budget for 2011–12 included a one-third increase in its annual higher-education investment, to a total of 130 billion rupees. And it has approved a new funding agency, the National Science and Engineering Research Board, which is expected to become operational this year, and will have an initial budget of around US\$120 million, says Rao.

By 2014, says Ramasami, the hope is that such measures will raise the number of science and technology PhDs awarded each year from the current 8,900 — less than one-third that of the United States or China — to at least 10,000. By the end of the decade, he says, the target is 20,000 PhDs a year.

OVERSEAS INPUT

The government is also counting on an injection of money and expertise from foreign academic institutions. With enrolment rates waning abroad, many universities are looking to India

as a new academic market — including US institutions such as the University of California, Berkeley, and Carnegie Mellon University.

US President Barack Obama's trip to India last November highlighted the growing interest: included in his delegation were three presidents of US universities and senior representatives of several more. During the trip, Obama and Indian Prime Minister Manmohan Singh announced that they would hold a US–India summit on higher education this year to help encourage collaborations.

So far, Indian law has restricted foreign universities to forming partnerships with Indian institutions, says Sibal. But a Foreign Educational Institutions Bill being considered in India's parliament would allow them to build full-blown campuses of their own. Sibal takes it as a sign of what India could become. "Top-quality institutions of the United States and around the world are actually knocking at our door," he says. "The India of tomorrow will be an India that provides solutions not just for itself, but also for the rest of the world."

But that is only if India's rising youthful generation can break out of its current job-based mentality — not easy in a developing country.

One evening late last year, Shirsesh Bhaduri, a fourth-year biotechnology student at IIT Kharagpur, visited Tikka — a makeshift café in the shade of a banyan tree, where students and faculty members catch up over cups of 3-rupee tea and samosas. But just over the campus's whitewashed walls is the reality of West Bengal state and most of India: unruly fields, shanty villages, water buffalo and jungle.

"In other countries, people may choose their career according to their interests," says Bhaduri, who has just been to an interview with London-based bank Barclays. "But here the industries that pay the maximum attract the maximum applications. Most people do a master's in business administration after the IIT — and that is the aim of most people out here. Everything is money-oriented." ■

Anjali Nayar is a freelance writer based in Nairobi.

ONLY THE BEST

Even with ten new campuses established since 2000 (green), the Indian Institute of Technology system accepts only around 2% of the 300,000 who apply.

