Science in everyday life and lessons

If India is to fulfil its promise of becoming a thriving nation soon, it must improve the quality of its science education, writes **Bikash Sinha**

India is expected to emerge as an economically prosperous country with the majority of our citizens in the age group below 40 by 2020. We dream of an inclusive society where the bulk of the population would have access to education and healthcare and a prosperous life with hope and confidence. It is crucial to comprehend that science and technology are at the heart of that possibility. Thus it is important that India becomes a knowledge power house, a globally important centre for technological innovation and scientific creativity.

To achieve even partially the goals we have set for ourselves, we need vast resources of manpower trained in science and technology.

The present situation in the country, however, is not altogether encouraging. We still do not have educational institutions that are in the top 50 or even 100 in the world. Our universities have deteriorated and in a state of perpetual decay owing to years of neglect and political interference. Even our best institutions are not up to the mark any more; there is a serious leadership crisis. We do not find sufficient numbers of young leaders in science.

At the same time, there is increasing competition from other countries, especially our Asian neighbours. Some of them, such as South Korea and China, have made enormous investments in science in the last few years, not only in terms of funding but also in creating a large manpower base. The main concern for us should be not merely to improve the quantity of our scientific contribution, but, more important, to improve the quality of science significantly. Let us not forget that India contributes only around 3 per cent to world science and around 1 per cent or so to the top 1 per cent of scientific research. In the next 10 to 15 years, we should try to reach a level where at least 10 per cent of the top 1 per cent of scientific research comes from India.

We must ensure that we have a large number of schools and colleges of *high quality* and that our universities become storehouses of high quality knowledge and are able to generate future leaders in science. These young leaders should lead our programmes, not government bureaucrats entangling us with rules and regulations. The national mission should have deep passion and conviction, strong enough to overcome bureaucratic pressure for tediousness and 'more of the same' which have precedence. Teachers and teaching should become a national mission for the next decade. Our leading institutions should take active part in improving the quality of schools and colleges. It is imperative that we rescue our schools from the prevailing appalling conditions that are well below the standards expected.

Over the years there has been a deplorable diffusion of our manpower from the mainstream of science and technology to management and information technology. The motivations for such a trend are all too obvious.

Forty years ago, the top dogs went for physics, especially theoretical physics, but the same brilliant lot now go for engineering and eventually management. Science consequently suffered. It is not difficult to understand the present scenario.

The government, especially the prime minister, Manmohan Singh, has quietly initiated a large number of pioneering reforms in the science and technology sector. Suddenly, to be a teacher in a college or even in a school is not a bad thing; slowly, such jobs have become attractive once more, the salary now is good; students, especially in Bengal, keep one youthful in mind with ample scope for original research even in colleges, as was the case a long time ago.

Meanwhile, the ministry of human resources and development, with the prime minister's direct initiative, has expanded rather rapidly the number of centres of higher education, science and technology in particular.

National Institute of Technology, Patna

The number of Indian institutes of technology has increased from the original five to 15 now. The total number of the national institutes of technology has gone up to 30. Every state now has an NIT. The Indian institutes of science education and research, originally conceived and recommended by the science advisory council to the prime minister, are now five in number, scattered across the country. The IISERs have no baggage of history; they are born of a completely new concept, and designed for science education in a definitive atmosphere of research.

Each of these institutions, in principle, has its own character and goals. We see that IITs over the years have shifted their base more towards technology and its entrepreneurial activities. The bulk of our best and the brightest has gone away to the United States of America and established themselves; some of them at top positions in business enterprise, high-powered positions in the administration and prestigious positions in the faculty of Ivy League institutions. The IIT students are very successful. How much India has gained, we have to see; the only point that can be made is that for many reasons India has not benefited enough from these highly talented people. With time, India has faded from the psychological topology of US-based non-resident Indians.

Frankly, the time has come to revisit the IITs and seek out their role in contemporary India. How, for example, are IIT leaders going to tackle the vast landscape of young, educated middle-class population of future India? I define middle class as those whose daily per capita spending is between $10 and $100. Indeed, the time has come to examine critically the role of those who graduate from the IITs — are they only meant for export? What about importing them back, at least partially, somewhat like China is doing with much vigour? I am afraid the inertia in India is huge. Implementing substantial changes demands a degree of determined effort especially designed for this. The only positive thing is that this unprecedented change in the sector of science and technology and, indeed, higher education in such a short time gives us some confidence and hope.

The NITs on the other hand, originally evolved from regional engineering colleges to national institutes of technology. Being involved with one of them closely, I see the old baggage of the REC is still lurking in the corners, and provincialism is eating away the spirit of a national institute. The NITs are yet to establish their special brand and get away from the inevitable stigma that the NIT is for those who couldn't quite make the grades for the IITs. The IITs, similarly, should not be patronizing. The terrible symptoms of IITs patronizing the NITs are already showing.

Establishing NITs in each state evidently implies that some effort must be made for the improvement of local technology, and also for the development of special entrepreneurial skill relevant to the region. One of the main tasks is to take on engineering with a modern outlook, involving many disciplines effortlessly. The NITs have a great future and potential. We have to nurture these institutions with much care and sensitivity.

From my personal experience (the Calcutta IISER) the IISERs have all the ingredients both of high-quality education and excellent research. A huge number of our institutions are strong either in education or in research at any given time, leaving the entire effort half-baked. Research cannot flourish without education and education cannot excel without the spirit of research. I sincerely hope more IISERs come up in India.

The IISERs have the intrinsic potential of producing great leaders in science, a beautifully balanced individual trained both in education and research. Products of the IISERs clearly can bridge the void between research and education.

We are now in a very exciting time for science — we have to go all out to take our message down to the school and college levels. The rusty and out-of-date conception about science must go. Tomorrow's India needs scientists in all spheres of human activity. Our children must realize that science is not just for scientists. Starting from a cell phone to the tremendous demand for energy, the startling dangers of dramatic climate change (all too obvious today) and indeed a whole host of yet unexplored areas of human experience need science at the best of times and in the worst of times.

A vigorous campaign for outreach must be initiated with the motivation to discuss, "What is science and its relevance in India?" This very important exercise is yet to take off. Science education remains an unexplored territory and this pedagogy must start at the school level in a massive way almost immediately. It is not just up to the government — it is the educated, science-oriented people of society who must initiate this. It is my firm belief that over dependence on the government only calls for interference, leading to a lack of originality and a suppression of creativity.

Tomorrow's young India cannot survive only on marketing: tomorrow's India has to be the centre for all markets in the world.

We must all join the battle and go for a decisive win.

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