

Indian education: challenges

India is going through significant transformations – aspirational, economic, social and technological. Indian youth, whose number has in fact created a window of opportunity for the country, are the prime movers of these transformations. The level of success we achieve, going forward, is thus directly dependent on our ability to enable each one of our youth to realize his/her full potential. Our key education challenge is thus to create an ecosystem that enables precisely this.

We now live in a highly competitive environment that is interconnected, globalized and knowledge-driven. Our human development programme, while it must preserve and nurture our civilizational roots, must transform our youth to be capable of forging ahead in the present-day competitive environment, particularly in the context of meeting our domestic needs, which perhaps would constitute the largest market globally. Every child must be able to comprehend his/her surroundings, related challenges as well as opportunities and acquire the ability to address them. The Technology Vision 2035 has visualized quality education, livelihood and creative opportunities as one of the key prerogatives of all Indians. Education technology roadmap (TV 2035, technology roadmap – Education, TIFAC) for that vision envisages 100% literacy, including operating knowledge of devices/instruments/machines, individualized curriculum, ubiquitous content access, language-neutral education accessible to all, emphasis on skill acquisition through vocationalization of mainstream education, and new forms of assessment and certification for a wide range of talents and skills as some of the ingredients of the ecosystem that should be evolved for the purpose.

Presently, there are around 15 lakh schools, 38,000 colleges and 760 universities catering to around 26 crore students (~85 lakh teachers) in our school system and around 3.4 crore students (~14 lakh teachers) in the higher education system. While the gross enrolment ratio (GER) is near 100% up to class 8, it starts declining at higher levels (secondary 78%, senior secondary 54% and higher education 24%). There is also an issue of high average annual dropout rate at the secondary level, which is around 18%. Nearly 90% of students in higher education go to private institutions. Tremendous shortage of higher education institutions is leading to heavy competition for getting admission. As a result, we have a thriving coaching class industry worth ~Rs 4.2 lakh crores, which is roughly equivalent to total public expenditure on education that stands at around 4.1% of

GDP. There is thus potential to reshape the higher education framework to realize better outcomes. Presently, however, there are serious quality issues barring a few institutions. Only 40% of the students passing out of the Indian higher education system are deemed employable according to the India Skills Report 2017. There is also an issue of availability of jobs for nearly 25 crore students presently in the education system. The situation is likely to aggravate as one seeks to enhance GER in the higher education system. There is thus a huge gap between the contemporary education scene and desirable goals that we must realize. Clearly the gap cannot be bridged in the business-as-usual mode. Luckily for us technology can offer solutions to address the twin challenge of access as well as quality. Schools, colleges and universities as currently constituted will soon be redundant. They are anyway unable to deliver on the expectations. Instead, what we need are institutions of learning that are virtual/meta/open in character and can better prepare our youth to contribute effectively in the new-age society.

The role of teachers would remain singularly important even in the new technology-enabled environment. Teachers would need to reinvent themselves as facilitators and mentors in the new learner-centric education environment. As a matter of fact, the technology support could considerably strengthen constructivist practices as well as personalized treatment in the delivery of education. Respect for teachers and affection between teacher and student, which appears to be on the decline, can be rebuilt in the process. A well-structured teacher education and training framework relevant to new-age education would, however, be necessary and should be launched on a massive scale as early as possible. Post Graduate Diploma in eEducation in Digital Society offered by Yashwantrao Chavan Maharashtra Open University and Maharashtra Knowledge Corporation Ltd, is one such effort in this direction.

Our universities, by and large, seem to be more preoccupied with the conduct of examinations than being the centres for advanced learning and knowledge-based facilitation of society at large. Wherever large numbers are involved, the role of examining body can be entrusted to an independent technologically capable agency, freeing the university to focus more on its core functions. Such a modality can in principle also enable a common examination framework between universities and lead to broader choices to students to construct their own learning portfolio from across universities/colleges.

Nearly two-thirds of India still resides in rural areas. Presently, there are large disparities between urban and rural areas that need to be urgently bridged, even as we prepare ourselves to become globally competitive. The emerging knowledge era offers unique opportunities in this regard. Knowledge technologies by and large promote democratization and decentralization. Economic activities in rural areas thus no longer need be restricted to agriculture and allied activities. With additional opportunities in industry and services sectors, the rural domain should in principle offer greater opportunities compared to urban areas, provided we are able to do requisite capacity and capability building of rural youth. This calls for a radically different approach to education. The core idea should be to nurture an ecosystem in rural areas, which links livelihood with technology, technology with research and outreach, and both these with school education. Such an ecosystem, *Cillage* as we call it, really becomes a bridge between the modern knowledge resources that exist in *Cities* and their assimilation and applications in *villages*. While this would facilitate livelihood enhancement in the neighbourhood, one could also positively impact school education in the region through ICT-enabled education delivery and management using well-designed digital content in vernacular. Education can get further enriched through engagement in socially useful productive work in several new livelihood activities that are also taking place alongside. An experiment to test this concept has been implemented with positive results near Pandharpur in Maharashtra (Kakodkar, A., Ronge, B., Patankar, A., Mule, S. and Pawar, P., *Curr. Sci.*, 2017, **112**(4), 750–758). In this context, we also need to recognize that such an ecosystem while nurturing innovation to address local needs also ensures that technologies retain their competitive edge through continuous rejuvenation.

Conceptually similar ecosystems should exist in all knowledge institutions. While students should be able to learn all the way up to frontiers of contemporary knowledge and push those frontiers forward through research, society must benefit through new knowledge and its potential applications. This would also require translational research as well as training in entrepreneurship and an ecosystem for students to get first hand experience in such domains. Recent emphasis on engagement with industry and villages in higher technical institutions is a welcome sign in this regard.

In this context, it is worth recognizing that while the Indian R&D spending is larger than in countries like Israel, Canada, Sweden, UK, Switzerland, Finland, etc. and our per scientist (full time equivalent) spending is comparable to the best in the world, our industry investment in R&D is still very low and we have ground to cover to become commercially competitive with our technologies in the marketplace compared to the countries mentioned above (refer data in Battelle R&D magazine). Also worth recognizing is the fact that Indians are the largest group among the immigrant founders of billion dollar start-up companies in USA (Anderson, S., NFAP Policy Brief, National Foundation for American Policy, March 2016). Most of these people would have had their initial education in India. The above two evi-

dences amply underscore the need to evolve a conducive innovation ecosystem in our country. It is also worth mentioning here that the value system for performance appraisal of researchers should judiciously combine the impact of research on the peer community as well as on the target beneficiaries of that research. A symbiotic existence of fundamental and applied research together benefits both.

One of the industry segments that contributes maximum to employment and exports is micro, small and medium enterprises. Most of their technological needs, which remain unaddressed for want of deployable resources, can be met by undergraduate engineering students who any way have at least a semester marked for project work in their curriculum. An internship scheme that enables students to identify actual industry problems and resolve some of them chosen on a competitive basis, would bring relevant benefits to students, their institution and the industry. Growth of synergy between them in the process would be an added advantage. TIFAC and Rajiv Gandhi Science and Technology Commission (RGSTC) in Maharashtra have both implemented pilot schemes in this regard with encouraging results. These need to be main-streamed.

Any education programme or for that matter any creative activity, to flourish and excel, must be autonomous and guided/governed by the peer community. While there has to be a mechanism to recognize stakeholder expectations, translation of these expectations should be solely in the hands of experts in the area, who also should form the barrier to micromanagement by any group other than the established peer group. Such an autonomy should be comprehensive. The regulatory system should be objectives-oriented with incentives and penalties that are performance-based. Emphasis should be on an overall ecosystem with broader definitions of infrastructure and resource requirements as well as protection of public interest.

Knowledge, society and economy are the three broad domains that impact every individual. These domains must be thoroughly entangled with each other for a healthy society. Knowledge for too long has been the preserve of a few whose engagement with economy was weak and remained more at the preaching or administration level with respect to society. In the new knowledge economy era, all this is changing rapidly. Deeper engagement of knowledge with economy as well as society is fast creating an ambience of entrepreneurship that creates value. This is a qualitative change from the earlier era dominated by trade and transactional mindset. One could therefore expect significant positive change in the context of ethics and morals in the society with knowledge playing an increasing role in economy and society. Quality education consistent with the aspirations of Indian youth and deeper commitment to our time-tested civilizational values is of course a prerequisite.

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