Revisiting the Kothari Commission (1964–66) Report from the perspective of strengthening our science education and research enterprise

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Last year (2016) was the fiftieth year since the submission of the Report of the Education Commission (1964–66), popularly known as the Kothari Commission Report. This report, in four volumes, was the most comprehensive among other such reports and laid the foundation for the national education pattern. In the sphere of higher education and scientific research, the report strongly urged the necessity of rooting our science on indigenous ethos and priorities, maintaining highest autonomy in academic matters in our institutions of higher education, making our universities the arena of high-quality teaching and research, maintaining high efficiency in the utilization of scarce resources including that of our scientific manpower, selectively encouraging certain centres of excellence so as to bring them at par with international institutions of repute and, above all, nurturing a value system in our scientific temperament, so that we draw nourishment from our rich cultural and spiritual heritage. In this article, we dwell upon these aspects of the report, some of which are rather unconventional. A review like this is still relevant, particularly in the context of making our science, technology and innovation system more productive and socially relevant.

Keywords: Higher education, nation-building, research enterprise, science, technology and innovation enterprise.

INDEPENDENT India reposed her unqualified faith in the cultivation of science in all its forms as the most important capital investment in nation-building, as is evident from science and technology policy statements announced from time to time. Various Education Commissions – University Education Commission (1948–49), Secondary Education Commission (1952–53) and Kothari Commission (1964–66) were set up within the first two decades after independence to chalk out a path of growth for human resource development and capacity building for the new nation. These commissions submitted their valuable recommendations on various aspects of education policy, including spread of science education that would be most appropriate for the young nation. These reports highlighted the nation's priorities, while suggesting the allocation of resources for different tiers and forms of education, and indicated the approach along which growth in the education sector should proceed. At the same time, these reports struck a note of caution on certain pitfalls that were to be avoided.

Among these three reports, the Kothari Commission Report was the most comprehensive, touching all sectors of education, covering varied aspects at all levels like educational reconstruction, teachers' training, enrolment and manpower, equalization of educational opportunities, adult education and removal of illiteracy, rejuvenating higher education and, more specifically, science teaching and research in the universities and finally, educational planning and funding. In the arena of higher education and research in science, it made far-reaching recommendations, some of which were rather unconventional. After 50 years since the submission of the report, it may be worthwhile to re-examine some of its recommendations for the benefit of our science, technology and innovation (STI) enterprise. In this article we examine the Kothari Commission (henceforth called Commission) Report with regard to higher education and research in science.

Challenges faced by the STI system

Independent India has laid a huge infrastructure for capacity-building in various scientific endeavours and can boast of possessing a well-endowed scientific manpower. Successful applications of our knowledge in science and technology to societal problems in the form of Green Revolution and White Revolution strengthened the food security of the nation. Capacity-building developed by us in the areas of atomic energy, space science, communication and missile technology and in the recent past in software, drugs and pharmaceuticals, and materials science has placed India in the forefront among the scientifically

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advanced nations. While in the recent past we have recorded significant improvement in the publication of quality scientific research papers, judged by the improvement in their citation impact, a general perception is that rather than being goaded by 'publish or perish' mentality, our innovation system should be more oriented to respond better to the needs of the producers and to the concerns of society at large. We are yet to address the problems of increasing demands of energy against dwindling reserves of fossil fuels, alarming levels of soil degradation and soil erosion, diminishing groundwater reserves, etc. In the manufacturing sector we are plagued by the low level of sophistication in the production of exports, low productivity and low-skill activities in the informal sector, where about 90% of our workers are employed.

It is in the above context that we may find certain aspects of the Commission relevant for rejuvenating our STI system.

Focusing on certain aspects of the Kothari Commission Report

On setting our priorities right in science education and research

The Commission emphasized that our priorities in science education and research should be geared to the national needs so as to lead to a rise in productivity. The increased productivity was to provide more resources for science and research, and, to quote from the report 'thus will be generated the rising (S–T–P) spiral of science, technology and productivity.' The Commission felt it would be senseless to blindly follow the scientific fashion of other countries; rather it stressed on 'ingenuity' and 'indigenousness' in developing our own scientific culture. To quote from the report on making our science and technology system attuned to our needs, 'The one thing that is supremely necessary in an age of rapid change and radical innovation is that we determine our priorities and programmes in education and research on the basis of hard "indigenous" thinking and needs, and not follow the fashion set by other countries….' Thus, the Commission had the highest conviction about using science education as a tool or an instrument of change for the realization of national aspirations or for meeting national challenges. The Commission expected the universities to lead the economic and cultural development of the area where these are located, through suitable orientation of the courses of study, specifically in science and technology, and by a careful selection of research projects.

Regarding the views of the Commission mentioned in the preceding para, we observe that science is universal in character. Certainly one can practice science addressing the specific needs of the country; but in an educational system its universal character should not be lost sight of. This is particularly relevant in an era when scientific projects are being pursued simultaneously at different centres of the globe with international collaboration. We cannot shut ourselves off from this trend; rather we must acquire competitive edge in some frontier areas selectively.

Our science must not bypass India's rich cultural and spiritual heritage

The Commission desired that for science to be a veritable force in nation-building, it must not remain as an alien species; but the spirit of science must be internalized and made an integral part and parcel of our lives. Science must take roots in our rich cultural and spiritual heritage and draw nourishment from it. Thus, the Commission visualized the cultivation of science as a continuing effort of discovery, not different from the arena of self-discovery, in which the seers of this land delved deep into for arriving at a meaning and purpose of our existence through their painstaking efforts. In the process of getting enriched by modern science, our past heritage is not to be by-passed; rather it is to be rediscovered and reinterpreted so that our science does not make us feel rootless akin to having a feeling of alienation. Though apparently this view may appear to be unconventional, strictly speaking, there is no contradiction. The Rishis in the days of yore arrived at certain fundamental truths – 'quintessence of the deepest insight into the happenings of the world' – to quote from the Commission – not on the basis of dogmas, but on the strength of conviction derived from their subjective experience of the highest order. Their method of grasping the Ultimate Reality was based on their direct personal experience, though not on the material plane, through a process of rejection of all those unreal entities; so it was akin to the process a scientist follows for finding the Truth. That is why the scriptures containing these fundamental truths like the *Upanishads*, etc. have inspired so many great thinkers over centuries and continue to do so even today. The Rishis of our motherland preached cultivation of 'Knowledge' with 'wisdom' – 'Jnanam vijnana sahitam…', as the *Bhagavad Gita* says. In our scriptures a 'vijnani' or a scientist has been defined as one who has realized the Truth. In the inimitable words of Sri Ramakrishna, a vijnani has not only seen milk or has heard of milk, but he has tested milk. So, here also the same power of conviction based on a process of rational enquiry and self-realization; although the procedure may be different. What the Commission implied was that the present generation must emulate this spirit of 'rational enquiry' in their venture, so that they have 'faith' in what they have been doing. Faithlessness leads to a lack of self-confidence. We have a more powerful word in our literature – 'Shraddha' – which is faith with a positive connotation.

In the days of yore, our Rishis used to be inspired by this shraddha. Here, the Commission draws our attention to this aspect that we must endeavour to inculcate in our spirit of enquiry with the conviction that there is a truth which is to be uncovered; that there is a mystery which is to be demystified. It is in this spirit of 'shraddha' that the report expresses its conviction in its forwarding letter to the Education Minister, when it says 'There is, of course, one thing about which we feel no doubt or hesitation: education, science-based and in coherence with Indian culture and values, can alone provide the foundation – as also the instrument – for the nation's progress, security and welfare.'

However, it must be pointed out that we must be cautious as to what aspects of our heritage are to be accepted. One must not be blind-folded to accept as sacrosanct whatever is there in our scriptures. The rational aspects of science must not be compromised at any cost. Knowledge is free from all dogmas and superstitious beliefs. Truth is to be deciphered rationally.

Strengthening our university science education and research system

For improving the quality of our science education, the Commission strongly advocated the case for strengthening our university science education and research enterprise. While observing that quite a few exclusive research institutions, divorced from teaching, had already come in existence by that time, the Commission expressed in no uncertain terms that it was not in favour of this trend. The Commission opined that teaching and research were not mutually exclusive; rather one reinforces the other. A scientist in a university combines the role of a teacher and a researcher. As such, the Commission discouraged the trend of setting up of such exclusive research institutions and advocated that for the already existing ones, some sort of a symbiotic relationship should be established between them and the neighbouring universities or teaching institutions. It is heartening to observe that such symbiotic relationship has already been established in most of our research institutions, where these have been playing a dual role of teaching and research, and have established collaborative relationship with neighbouring universities.

The Commission further observed with anguish that the percentage of total university expenditure devoted to research in our country is almost negligible, whereas '... in all educationally advanced countries the expenditure on university research constitutes about half of the total expenditure on higher education. Also about one-half of the time, on an average, of university teachers is devoted to research. It is this balance between teaching and research which lends to the universities their peculiar strength and vitality.' The Commission strongly urged to remedy the existing imbalance between teaching and research in the universities in the interest of 'progress and vitality of science in the country'.

We observe with concern that India's overall R&D expenditure at current prices has been abysmally low, being less than 1% of GDP so far, whereas in scientifically advanced countries like Japan, Germany, South Korea and USA, it has been in the range 2.5%–3.5% of the respective GDPs. It is of imperative necessity that our R&D expenditure is increased to a level of at least 2% of GDP.

The Commission did not find much substance on the debate of prioritizing basic research vis-à-vis applied research in our universities, as it observed that such type of distinct categorization was already getting blurred. Rather, the Commission urged that science education at all levels should be strongly reinforced through the study of applications to local environment and industry; it further advocated vigorous and continuing effort to forge strong links between science, technology and production and academic mobility between universities as well as between universities and national laboratories and other research institutions in the country, including those set up by the industrial sector. Regarding this debate we may recall what Menon[1] had observed several decades ago, 'It is interesting that all of these problems that Pasteur encountered were in his immediate vicinity and interest in them evolved from his own basic research in which he displayed great experimental ingenuity. His approach was fundamental and resulted in the formulation of new biological principles. We have only to look at the range of problems that we encounter in our environment … to realize that there are challenges to excite the keenest minds.'

While making a strong case for strengthening our university science education and research enterprise, the Commission, in no uncertain terms, stressed the importance of securing the highest autonomy of our universities in academic matters and thus ensuring a 'climate conducive to research'. To quote from the report on this point, 'The universities have a major responsibility towards the promotion and development of an intellectual climate in the country, which is conducive to the pursuit of scholarship and excellence, and which encourages criticism, ruthless and unsparing but informal and constructive…. It is important to recognise that the case for autonomy of universities rests on the fundamental consideration that, without it, universities cannot discharge effectively their principal functions of teaching, research and service to the community….' While deliberating on this point, the Commission urged the importance of preserving the autonomy, both within the university and in its interaction with the outside world, so as to maintain a proper academic climate in which the scientists were not distracted by petty worries and their morale was kept high. Unfortunately, as we observe with growing concern these days, the autonomy of higher educational institutions in our country is being eroded more and more. This is particularly so for the state universities.

The Commission accorded a high priority for the development of education and research in agriculture and allied activities. It desired a reasonable proportion of our talent to opt for advanced study and research in agricultural sciences. The Commission envisaged the increasing importance of a specialized study of mathematics for a developing country like India in the coming days of automation. It suggested concrete steps like establishing a few advanced centres of study in mathematics in some selected universities, so as to place India 'on the world map of mathematics within the next two decades or so'. We observe with pride that in the field of agricultural science and in mathematics, indeed India has excelled.

Among a few other things relating to the university science education, the Commission stressed the importance of acquiring the ability to fabricate research equipments and instruments as well as development of laboratory workshops and facilities for servicing, repair and fabrication of scientific apparatus. Unfortunately, this culture is on the decline to the great detriment of our innovative spirit.

Selectively encouraging centres of excellence

The Commission, in no uncertain terms, advocated developing and nurturing very selectively certain centres of excellence or a cluster of such centres, so as to bring them at par with international standards. According to the Commission, such selective approach was absolutely necessary, where resources were scarce and the country was not in a position to squander away the scarce resources in unproductive ways. In fact, the Commission was of the view that our use of resources was to be even more efficient than that by developed countries. For our best we must aim to provide the best according to international standards was what the Commission insisted. To quote from the report, 'But India cannot forever remain at the receiving end of the pipeline. She must make her own contribution as an intellectual and cultural equal to the eternal human endeavour to extend the frontiers of knowledge. This demands a large-scale programme for the discovery and development of talent and the creation of Centres of Excellence in higher education which can compare favourably with the best of their kind in the world.' Thus the Commission recommended a 'rigorously selective approach' for these centres of excellence in matters of selection of subjects for advanced study and research, selection of the most able students for such courses and assigning to each of these selected centres 'resources exceeding a certain critical size'. This approach presupposed that the selection of such centres would be made on the basis of our national needs and on a careful monitoring of their output on a continuing basis, so that the stagnant centres were weeded out and newer ones were included. Here again, we notice with concern that this principle of resource allocation on objective assessment of performance is getting disturbed by certain recent developments like the concept of Academic CSIR.

Conclusion

A persistent theme of the Kothari Commission Report that one cannot miss, is how to use science education as a tool in meeting the challenges facing the nation. The report has laid great stress on the social purpose of education in general and science education in particular. An education in science, according to the Commission, is not merely to be treated as an opportunity to boost one's career prospects; but it should instil a sense of fulfilment that one would be better equipped to serve the nation. It is this emphasis on societal relevance of science education and research that has been the abiding theme of this report. In doing so it has laid a great deal of emphasis on rooting science in our cultural and spiritual ethos so that enrichment through education remains a continuous process and there is no feeling of alienation from our rich cultural heritage. Further, science was to be fashioned according to our needs and priorities, judiciously using our scarce resources in the most efficient manner. There may not be much doubt that our research initiatives need be more focused like what Vikram Sarabhai did while drawing up the country's space programme. He had seen an opportunity in space science and technology to leapfrog from backwardness and poverty and suggested that sound economic evaluation of the required sources was necessary before embarking on the programme. Like our Nano Mission and a few others, we may consider to take up time-bound mission approach in more select areas. The report thus has an abiding message for us, which we cannot ignore.

1. Menon, M. G. K., Basic research as an integral component of a self-reliant base of science and technology. In Address of the General President at the Annual Session of the Indian Science Congress held at Mysore, 1982.
2. Report of the Kothari Commission (1964–66) in four volumes available at www.teindia.nic.in

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