

TECHNICAL AND VOCATIONAL EDUCATION IN INDIA : STATUS AND FUTURE DIRECTIONS

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1.0 SOME FACTS

1.1 SYSTEM OF TECHNICAL EDUCATION

Technical Education including Management Education is one of the most crucial components of Human Resource Development having potential for adding value to products and services, thereby improving the quality of life of the people.

Technical education in India is provided through IITs, IIMs, Regional Engineering Colleges, Engineering and Manpower faculties in Universities, Engineering Colleges and Diploma level institutions. The post-graduate technical education is largely supported, by the Government of India, whereas Degree and Dipolma level technical education is supported in selected cases, by the respective State Governments.

After independence almost upto 1980, expansion of technical institutions was smooth. As a result, the regional requierment of manpower, both at the Degree and Diploma levels was, by and large, met according to the planned need in the country. However, a rapid growth of technical education in some States has caused a regional imbalance in the generation of technical manpower in the country.

The available intake capacities at the degree and diploma level are 1,02,000 and 1,83,000 approximately in the year

1995-96.

1.2 NATIONAL POLICY OF EDUCATION (NPE)

Realizing the potential of this vital sector of education, NPE 1986 and POA 1986, emphasised the need for reorganizing and revamping the technical education system to meet effectively the changes posed by the changing socio economic scenario and to lay down specific guidelines for improving the quality of technical education institutions systems, so that the system is poised to achieve greater effectiveness and better delivery system.

The perspective of development of technical education in the Eighth Plan has identified following thrust area :

- Modernisation and upgradation of infrastructural facilities.
- Quality improvement in technical and management education.
- Responding to new industrial policy- and industry-institution R & D labs interaction.
- Resource mobilisation.
- Institutional thrusts.

1.3 ALL INDIA COUNCIL OR TECHNICAL EDUCATION (AICTE)

The Seventh Schedule of the Constitution places upon the Central Government the responsibility to co-ordinate and determine standards in institutions

for higher education or research and scientific and technical institutions. The most important machinery set-up by the Central Government to provide the leadership is the All India Council for Technical Education, that consists of representatives of the State Governments, Ministries of the Central Government, Industry, Commerce, Labour, Professional and Learned Societies, Concerned Statutory Bodies, Universities, Technical Institutions, Parliament and various other interests concerned with technical education. As a national body, the All India Council advises the Central, the States, University Grants Commission and other authorities on all aspects of improvement and development of technical education. Its functions include inter alia the preparation of plans for the development of technical education to assess the requirements for technical manpower of different types and to suggest measures required to meet them, to suggest improvements in the pattern of technical education from time to time to suit changing conditions, to establish liaison between industry, government departments and other organisations on the one hand and technical institutions on another, to co-ordinate the activities of State Boards of Technical Education, to recommend grants and other forms of assistance that might be given by the Centre to the States, Universities and other organisations in the development of technical education.

1.4 SOME STATISTICS

It would be interesting to know that:

- Technical education supply capacity has increased manifold, yet it works out less than one percent of total student enrollment in higher education system.
- While investment in science and technology over decades has increased from 0.23% of GNP in 1958 to around 1% now, it is still much less than half of what is spent in the developed nations.
- Almost 50% of economic development globally is attributed to the technology development.
- The scientific manpower in India is only about 0.3 per thousand as against almost 4% in the most advanced nations.

2.0 SOME ISSUES

2.1 LACUNAE

Although the system of technical education has grown rapidly in quantity, quality and diversity, there are several lacunae noticed in the present system. Some are listed below :

1. More than 60% of degree level institutions and 70% of diploma level institutions are concentrated in the 3 to 4 states.
2. Most institutions are offering conventional courses which need changes.
3. Majority of the institutions including Institutes of National Importance are facing shortage of faculty.
4. A large number of technical institutions do not have adequate infrastructure of laboratories, library, hostels, computing facilities and campus facilities.
5. Available published resource material in forms of books and journals are very expensive.
6. The manpower out-put in various disciplines has no relationship of manpower demands in various sectors of the economy nationally or regionally leading to acute short

- age in many new and emerging areas.
7. The reach of technical education system is not commensurate with the national goal of equality of opportunity. Also the economically weaker sections and rural population have much less opportunities.
 8. Except for a very few institutions, the linkage between institution and industry is practically absent in technical institutions.
 9. The inter-linkage between programmes at different levels is very weak. Thus, the opportunities to go from certificates level to diploma level and from diploma level to degree level are inadequate.
 10. Research and Development activities which should be integral to education and training are restricted to a few institutions and universities.
 11. A large number of better graduates and post graduates leave the country for higher studies/jobs in advanced countries.

2.2 OTHER ISSUES

The issues also to be kept in mind are :

1. With emphasis on globalisation and liberalisation of the Indian economy opening out to the world market, the quality of human resource will be a key factor in the success story.
2. Excellence alone in higher technical education is not a sufficient condition for the development of quality of human resource. It is the focus on relevance that is equally necessary to deal with our emergent as well as the long term needs.
3. The expenditure being exorbitantly high on Higher Technical and Management Education in India, it is absolutely essential that the educational institutions use resources optimally.
4. Technology Development, Technology Transfer, Increased Outlay on R &D and support for translating the research knowhow into prototype development need to be encouraged in Technical Institutions.
5. Industry and Institution interaction is presently insignificant. Effective linkage are vital for emerging national environment.
6. Resource sharing between the institutions and also between the institution and the R & D organisations is necessary for mutual betterment and optimal use of financial investments for modernisation of laboratories and library resource centres
7. Vital sectors like Energy Conservation, Power Generation, Water Resources, Transportation and Communication must receive special emphasis in technical institutions.

3.0 VOCATIONAL EDUCATION

Primarily to eliminate over crowding in higher level institutions, and also to imbibe vocational bias in general for appreciation of emerging trends of technological developments and inspiring confidence for self employment, the Government of India launched the Scheme of vocational education in its early five year development plans in consultation with Ministers of Education (MHRD) and Labour.

The scheme of vocationalisation of courses aims at developing knowledge, skills and attitude for gainful employment with major emphasis on self-employment. Vocational Education is essential for providing manpower for economic growth and provides link between production, employment and

educational process. **The linkage of vocational programmes with Technical Education shall ensure the development of highly skilled professional competence and would thus produce the right type of manpower required for the vocational streams.** The NPE (86-92) states that "the introduction of systematic, well planned and rigorously implemented programmes of vocational education is crucial in the proposed educational reorganisation. These elements are meant to develop a healthy attitude amongst students towards work and life, to enhance individual employability, to reduce the mis-match between the demand and supply of skilled manpower, and to provide an alternative for those intending to pursue higher education without particular interest of purpose." The policy also states that "it is proposed that vocational courses cover 10 percent of higher secondary students by 1995 and 25 percent by 2000.

Vocationalisation of education has been identified as a priority area in the Eighth Five Year Plan.

The Education Commission, 1966, recommended vocationalisation of secondary stage-both lower and higher to cover at least 50 percent of the enrollment at that stage. The courses were expected to be largely terminal in character, providing knowledge and skills to students for entry into middle level jobs. The National Council for Educational Research and Training (NCERT) provide technical support.

The programme has met with mixed success. Programme of Action for Implementation of National Policy on Education 1986 attributed its slow progress to factors such as absence of a well co-ordinated management system, unemploy-

ability of vocational pass outs, mis-match between demand and supply, reluctance in accepting the concept by the society, absence of proper provisions for professional growth and career advancement for the vocational pass outs etc.

The Programme of Action 1992 framed by the Ministry of Human Resource Development, Government of India, envisages to expose the students at the first degree level to the world of work by including application oriented courses in the curriculum and providing opportunities for project and field work.

The courses in 35 vocational subjects alongwith required infrastructure and implementation strategy have been prepared by the expert groups.

The programme launched by the MHRD through UGC for providing vocational bias in the first degree of the liberal arts, physical sciences etc. is a step in right direction. For implementation of the programme, these programmes need formal tie-up with the technical institutions and the industry in the regions without which the programmes will be confined to "class room" setup and defeat the purpose. Since the technical institutions are linked with the industry and are under the purview of the AICTE, it would be fruitful if the UGC-AICTE co-ordinating mechanisms is established.

4.0 AGENDA FOR ACTION

In order to ensure proper maintenance of norms and standards, accreditation, funding of priority areas, monitoring and evaluation and a co-ordinated and integrated development of technical education as envisaged in the Act, the Council (AICTE) decided to take inter-alia the following steps :

1. Regulate **admission** to all programmes of studies in technical institutions with reference to manpower requirements and take steps for ensuring that admissions are made as per the approved guidelines.
2. Regulate effectively the establishment of new technical education institutions and starting of new programmes of studies with reference to the overall needs of the economy.
3. Establish Board of Research & Development with participation of R & D organisations, technical departments of the Government of India particularly the Department of Science and Technology to participate and in funding of R & D activities of the Technical Institutions.
4. Establish Board of Industry- Institute interaction to develop programmes and to forge permanent links for mutual benefits.
5. Activate the accreditation process through the National Accreditation Board (NAB).
6. Ensure greater involvement of the States in the monitoring and regulation and co-ordinated development of technical education.
7. Take steps for encouraging and promoting private initiative, support and participation in technical education system.
8. All India Boards of Studies will be dynamic vehicles to carry on changes in curricula and give thrust to the technical education system to attain level of excellence.
9. Our engineers and managers should be comparable with the best in the world and the technical institutions produce graduates which are internationally comparable.
10. Engineering Education requires teachers of a high calibre and dedication. All teachers be given an opportunity to participate in properly designed refresher programmes. Quality of Teachers is to be ensured.
11. University Industry linkages are of great importance in Technical Education. Industrial backup of Teachers in Engineering and Technological Institutions is to be encouraged. Every teacher should have organic links with industry. Tax exemption benefits should strengthen University-Industry Inter-action.
12. Prominent Indian industries including public undertaking should each adopt educational institutions as their own R&D houses and by doing so, the research pursuits of the educational system would become rewarding. In return, the industry should bear some portion of revenue expenditure of the educational institutions particularly, the research cost. Arrangements could be worked out by making necessary amendments in the Acts and Statutes of the institutions to facilitate this.
13. Excellence in science and technology is an important component to be cared by the educational institutions. A significant fraction of the support for science and technology must go to the educational institutions.
14. We have science and technology manpower in the country which is unutilised and continue to invest large public funds to continue to produce them. We cannot afford to cause such wasteful expenditure with no return. Investment should seek

- optimal return for reinvestment.
15. Introduce a scheme for giving autonomy to selected technical institutions coupled with the concept of accountability.
 16. To minimize the wastage, we should be clear about the future type and level of manpower needed to contribute to the various national development sectors.
 17. To ensure cost effectiveness with avoidance of duplicate investment in technical education institutions, located nearby.
 18. To encourage multiple use of infrastructural facilities through part time courses, continuing education programmes, consultancy and testing services.

All India Council for Technical Education has taken or initiated actions on most of the issues.

5.0 SOME AREAS OF CONCERN AND FUTURE DIRECTIONS

5.1 REGIONAL IMBALANCE

During the period from 1900 to 1995, the number of Degree level Engineering Colleges in the country rose from 5 with an intake of 1000 to 393 with an intake of 1,01,678. Of these, just the four States of Andhra Pradesh, Karnataka, Maharashtra and Tamilnadu had 60% of all the colleges 243 and provided facilities for almost 70% of the total intake in the country. It is noteworthy that of the 243 colleges, 187 are private colleges. And the Northern and Eastern Regions being more densely populated, the average population per intake in these Regions/States is from 6 to 10 times more compared to that in the Western and Southern regions. Statistics also show that intake in Civil, Mechanical and Electrical En-

gineering as well as total intake is almost equal in Northern and Eastern States. In the Western Region, due to large number of non-Government colleges in Maharashtra, branchwise intake is relatively high and the total intake is almost five times more that of the Northern and Eastern regions. The intake in Southern Region is the highest in all branches compared to other regions, the contribution from Karnataka being the maximum. In 1991, the above mentioned four States have generated graduates equal in number of the country's out-turn in 1983 and 72% of the country's projected out-turn will be from these four States.

There exists a very high degree of regional imbalance in the out put of the engineering graduates which leads to disproportionate out put of the technical manpower not matching with the requirements of the regions.

5.2 INDUSTRY-INSTITUTE LINKAGES

India is basically an agriculture based nation. The growth rate in Indian agriculture has risen from pre-independence 1% to over 2.4% in the post independence period with the population touching 900 million mark. Our growth rate should be about 3.5%. During the span of over four and a half decades of post independence, our industry has worked with imported technology. At the same time, our universities/R&D organisations have not kept pace with the development of global technology. They could not inspire mutual confidence and could not build leadership. This phenomenon has been very unfortunate. Although, Industrial development in India has progressed rapidly with enormous diversification, but it does not give guarantee to its continuous status because of lack of its in-house R&D. The

industrial sectors have done nothing absolutely to encourage the development of an emerging technology in R&D sector. This has been further aggravated through frequent changes of industrial policy, lack of quality consciousness, followed by opaque attitude of the government.

It is necessary to develop mutual intellectual mobility (human resource). There is also a need to develop mutual participation in academic curriculum, consultancy, entrepreneurship development and extension services.

5.3 RESOURCE CRUNCH

In the technical education system, the Central sector annual investments are over Rs. 400 crores, besides many-fold investments by the state sector and the private sector. These inputs are increasing very fast. Thus quite a large chunk of funds is provided by the government for technical education but there is always a demand for more and more grants. **We need to make our system self-reliant, and we need to adopt strategies that can assist to reduce financial dependence.** The National Institutes of importance including IIT and IIMs are seriously considering alternative models to be self-reliant with one time central assistance to build their corpus funds, followed by generating income through their activities of teaching, research and industry consultancy. These innovative models of changes can also be successfully applied to the State-supported and private sector institutions, of any size and level alike. We could probably minimize expenditure by our norms and optimize the student enrollment and drop redundant programmes and divert the savings of new marketable, need-based activities. Austerity measures could also add to our coffers.

Industry being the major beneficiary of higher technical education, should by itself, be willing to partly bear the high cost of raising and training technical manpower. This is for its own benefit. If the industry does not voluntarily come forward to share this responsibility, the technical institutions could not be blamed if they resort to some hard selling. There are numerous ways in which industry could participate. It could contribute to corpus funds, institute chairs in emerging areas, provide loans, scholarships and awards to students, and sponsor short or long term industrial projects.

It would be a gesture savoury on the part of the faculty to do consultancy projects, generate funds through sponsored programmes and participate in continuing education programmes. Although indirect, it is a substantial help. The alumni, in India and abroad, could financially buttress their almamaters by whatever regular, small or large, contribution they could make towards the betterment of the institutions to which they themselves once belonged. A permanent, warm, mutually responsive relationship between the institution and the alumni, would certainly prompt them to look after the interests of the next generation of students of their family. Tangible gains would accrue from industrialist alumni and by their efforts to induce the managements to participate in this noble deed.

From a mere 0.23% of GNP in 1958-59, the government investment in S&T went upto 1.13% in 1987-88, but subsequently declined to 0.9%. As against this, USA spends 2.7% GNP, Japan 2.8% and France 2.4%. Our investment is substantially low.

Provisions be made in the Acts and

Statutes of the Central and State Sector Institutions for expanding their jurisdictions for establishing technical institutions in the neighbouring countries and in turn obtain financial resources.

In the process of increasing efficiency and productivity in a situation of resource limitations, sharing and optimizing the use of available resources assumes greater importance. It applies to all sectors and there should be greater co-operation and interaction. **Interaction and interdependence are well recognised concepts in the present day world. This assumes particular significance in the roles of Universities, technical institutions, industries and R&D organisations.**

The situation prevailing in the country also calls for the following operational strategies :

- (i) To constitute an Higher Educational Development Bank for providing soft loans etc.,
- (ii) To rationalise fee structure on the All India basis, and
- (iii) To introduce student loan schemes.

5.4 HUMAN RESOURCE

Technically educated and trained human resource is the most crucial constituent for the economic and industrial development of any nation. This has led to mounting demands on the need of such technical education as would produce diversified human resource capable of acquiring, utilising, adapting and improving technologies,, ensuring low-cost but high-quality productivity. These skills can be attained only through higher levels of technical education. Competent human resource is vital for successful implementation of economic restructuring programmes leading to sustainable development.

Retraining the manpower to meet

the situations arising out of innovations is also the responsibility of our institutions of higher learning.

5.5 GLOBALISATION

The technological globalism which we are subjected to today, exposes us to global competition. In many emerging areas, the source of competitiveness in a global economy is technological competence. The services and traditional industries are dependent on new technology. This means that the engineers have to be continuously trained in new technologies which are likely to emerge as we are seeing. **So, unlike conventional education, technology and engineering education has to be futuristic. Engineering education to be useful has to impart skills of tomorrow and not that of yesterday.**

5.6 QUALITY OF TEACHERS

New scheme have been started to benefit teachers working in the technical education system. These include Travel Grant, Financial Assistance for organising Seminar/Symposium/Conference/Workshop, Emeritus Fellowship, Carrer Award for Young Teachers, Besides above, the Council invited proposals for funding the deserving institutions under the schemes of modernisation and Removal of Obsolescence (MODROBS) Research & Development Programme (R&DP) Thrust Area Programmes in Technical Education (TAPTEC),

A National Board of Accreditation (NBA) has been constituted as independent body within AICTE under clause 10(u) of AICTE Act, 1987. Accreditation is a process of quality assurance. Over 250 institutions have already shown their interest for their participation in this activity. These are some steps taken by

the AICTE towards improvement of quality of Teachers and Institutions.

6.0 CONCLUSIONS

We are steadily shifting to a fast track of economic and industrial development, which, inevitably leads to mounting demands on technical education. Adaptation of ever new technologies constitutes a key strategy in the emerging global as well as national competitive environment. This calls for a highly diversified human resource capable of acquiring, utilising, adapting and improving technologies that ensure low-cost but high quality productivity. These would require generic skills normally attained through higher lev-

els of technical education. Technically competent human resource, therefore, becomes absolutely vital to the conception and successful implementation of economic restructuring. At the same time, it ensure sustainable economic development. The onus of making available this resource lies clearly, on our system of technical education.

Our goal is to develop a sound system of technical education where excellence, relevance and participation are prime and that the system is dedicated to match our aims of globalisation and growth of national economy and is free from exploitation.

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