

Chapter – 3

PRESENT STATUS OF POLYTECHNIC EDUCATION IN INDIA

As India moves progressively towards becoming a 'Knowledge economy', it becomes increasingly important that the Five Year Eleventh Plan, (2007-2012) has focused on advancements of skills and these skills have to be relevant to the emerging economic environment. In old economy, skill development largely meant development of shop floor or manual skills. Even in this area, there are major deficiencies in our work force which need to be rectified. In new or knowledge economy, the skill sets can range from professional, conceptual, managerial, operational behavioural to interpersonal skills and inter-domain skills. In the 21st century, as science progresses towards globalization, knowledge domains and skill domains also multiply and become more and more complex. To cope with this level of complexity, the Eleventh Five Year Plan has given a very high priority to technical and polytechnic education¹.

The Technical Education in India expanded multifold substantial growth from pre-independence period to post-independence period. Number of engineering colleges rose from mere 38 in 1947 with an annual intake of about 2940 students and the output of graduates being 1270 students. Number of technical institutes at the first degree level was 49 in 1950-51 and on March 2004 is 1300+ churning out 3,60,000² and 1522 in 2005 and 1617 in 2008. Number of Polytechnics (Diploma Level Engineering Institutes) was 53 in 1947 with total admission capacity of 3670 (less than 4000 per year) students and the output of graduates being 1440 students. In 1997, there were 416 institutes for diploma level (UG) education in engineering with an annual intake of 1,30,946 students. This indicates the large expansion in technical education. In 2005-06, number of Polytechnics existed 1244 with an intake of 1,88,300 students in India. Post graduate and doctoral programmes in engineering are

1 *Eleventh FYP 2007-2012, Inclusive Growth (2008)*. Vol.1. Planning Commission, Govt. of India. New Delhi, Oxford University Press.p.87.

2 Mannivanan, D.G.(2005) Engineering education : The Indian perspective for global leadership. *University News*. 43(39) Sep. 26 – Oct 2.pp.120-122.

also now available in more than 150 institutions all over the country with a greater number of colleges in the South and Southwest regions, compared with the other regions¹. In 2007-08, Polytechnics at regional level is 202 with an annual intake of 33,180 students².

There are more than 30 university centres including Indian Institutes of Management (IIMs) offering courses at PG level in Business Administration with annual intake of about 1,000 students. The above figures exclude many private institutes offering similar type of education³.

The increase of engineering colleges had been much more than polytechnics under the period of review. The period under review had witnessed an extensive growth of technical institutes with the active participation of private sector. The U.R. Rao Committee which has reviewed the performance of technical education draws attention to the unsustainable expansion of technical education and makes far reaching recommendations to achieve excellence in this sector. In his report he has observed “a serious situation has arisen in recent years because of the mushrooming of a large number of private technical institutions and Polytechnics⁴.”

The technical education falls under the Ministry of Human Resource Development (MHRD) as the nodal authority that covers courses and programmes in Engineering, Technology, Management, Architecture, Town Planning, Pharmacy and Applied Arts and Crafts.

The MHRD caters to the programmes at diploma, undergraduate, post graduate and research levels.

According to the statistics (2004) from AICTE, there were 1346 engineering colleges in the government and private sector with the annual intake of 4,39,689.⁵ As compared to 562 degree level institutes in 1997-98, the total number of approved engineering colleges in 2005 was 1522. The intake capacity increased from 1,34,298 in 1997-98 to 5,08,595 in 2005-06 and increased from 2007-09 is 6,11,475⁶. As per the statistics available from AICTE, the intake of students for undergraduate

1 John, F.S. and Jeba, J.K. (2008). Globalization of technical education: An Indian perspective. In *Recent trends in technical education*. R. Hariharan. Ed. Delhi, MacMillan publishers.p.253.

2 Opt Cited. Sharma, R. p.23.

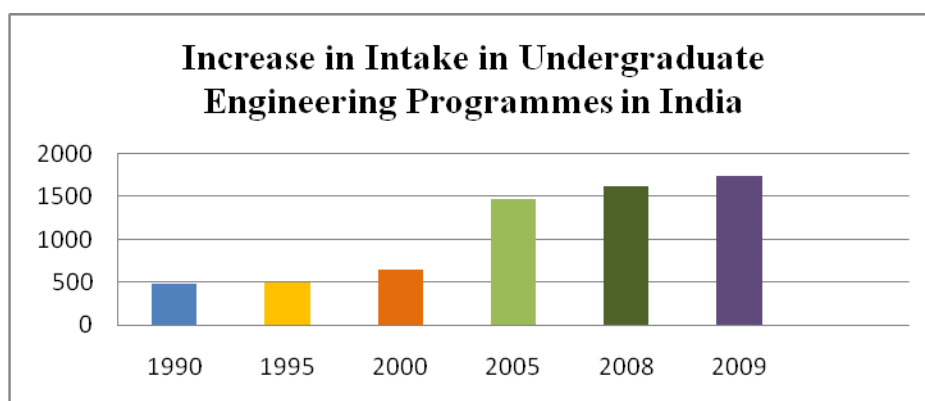
3 Joshi, Govind (2008). Digital library, institutional repository and ETDS in research libraries in India. Current status. In *Recent trends in technical education*. R. Hariharan. Ed. Delhi, MacMillan publishers. p.263

4 Aggarwal,M.(2008). *Education in the third world and India : A development perspective*. New Delhi, Kanishka.p.321

5 www.aicte.ernet.in (Accessed on 12.08.2010)

6 *India : A Reference Annual* (2009). 53rded., New Delhi, Publications Division, Ministry of Information and Broadcasting, Govt. of India.p.223.

programmes in 2005-2006 was 4,52,000, in 2007 was 5,50,000 and in 2008-09 is 8,75,000¹. The growth of annual intake of students is illustrated in following figure.

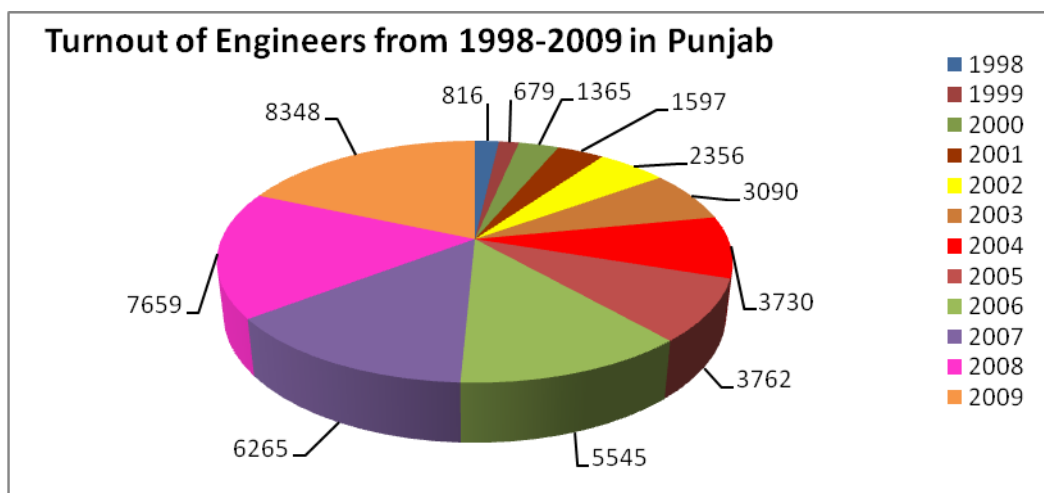


Graph - 3

This intake of students resulted in a turnover of engineering graduates more than what the job market can absorb in the year 2009. The intake capacity is still low when compared to size and India's population².

The turnout of engineering graduates from the technical institutions is steadily increasing.

Turnout of Engineers in Punjab from 1998-2009



Courtesy: AICTE, INDIA

Graph - 4

The trend that started in “Seventh Five Year Plan” continued in Eighth Five Year Plan onwards as the technical institutes increased in the self financing colleges

- 1 Radhakrishnan,P.(2006). Education for wealth creation: A new orientation to technical education. *University News*. 44(48) Nov. 27-Dec. 03. pp.51-55.
- 2 Anand Krishnan, M. (2004). Undergraduate engineering education. *New directions for excellence*. Report submitted to AICTE, 2004.

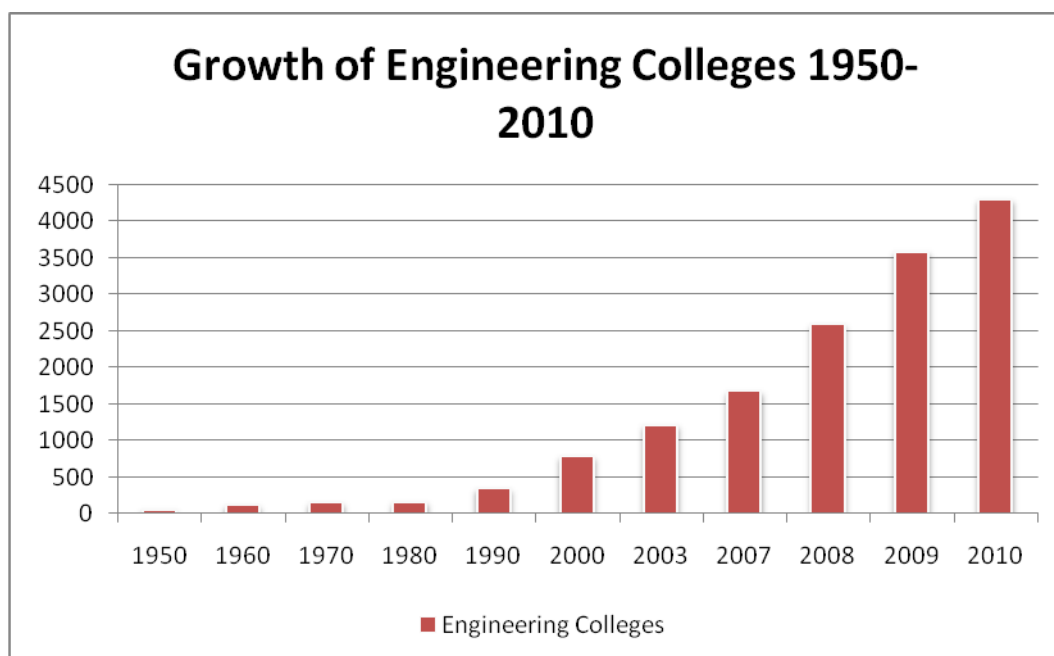
that outnumbered public institutes several times over. At present in India, there are 15 IITs, 20 NITs, 1 IISc and more than 4000 degree engineering colleges. Out of these 20-25% is government engineering colleges and rest of the colleges are managed by private sector. At the initial stage up to 1970, the number of engineering students was near about eighteen thousand and now it has reached up to near about 9 nine lacs. The growth of engineering colleges in India is shown in table - 9

Table - 9 : Growth of Engineering Colleges in India

Year	Engineering Colleges
1950	50
1960	110
1970	145
1980	158
1990	337
2000	778
2003	1208
2007	1668
2008	2582
2009	3575
2010	4285

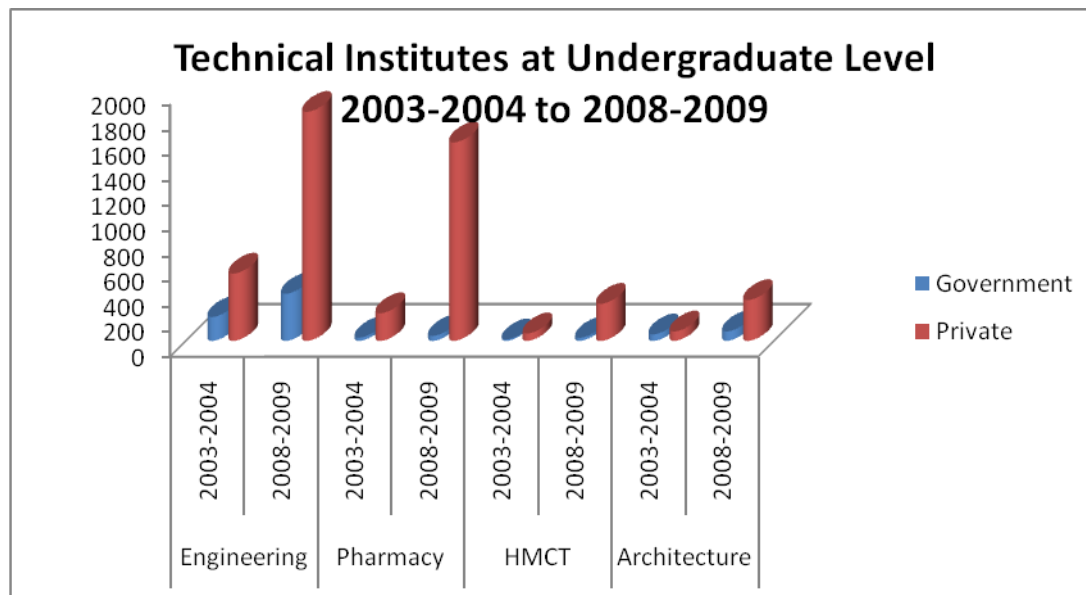
Sources : AICTE, National Knowledge Commission

Graph illustrates this increase in the engineering colleges from 1950 to 2010.



Graph - 5

The growth of technical institutes at the under graduate level is shown in the graph for the period 2003 to 2009 at the government and private level¹. Private agencies have been playing a significant role in improving the technical education in India, like the trend in eighties.



Graph - 6

There are seven technical institutions offering courses in Engineering, Pharmacy, Hotel Management and Catering Technology (HMCT), Management Studies (MBA/PGDBM), Computer Application (MCA) and Applied Arts and Crafts.

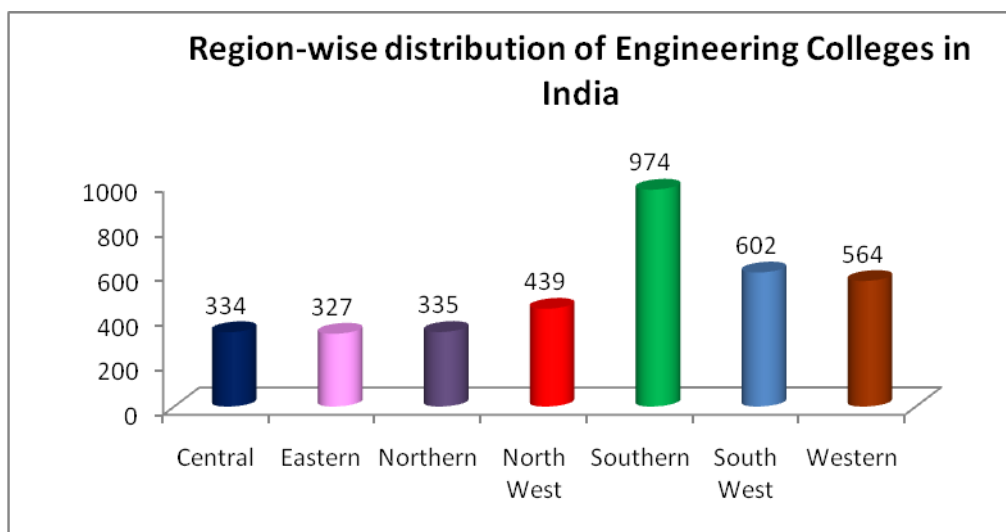
The regional imbalance in our country is a major issue of concern in technical education. There has been a substantial growth of technical education during the post independence period in India. The number of technical institutions at the first degree level was 49 in 1950-51.

The table -10 depletes region wise growth of engineering institutions. The AICTE has distributed all engineering institutions in seven regions of India.

Region	No. Of Colleges
Central	334
Eastern	327
Northern	335
North West	439
Southern	974
South West	602
Western	564

¹ Natarajan, R.(2009). *Private initiatives in higher education : Roles of privatization in professional education*. New Delhi, Sneh Parkashan. P.132

The Southern Region has maximum engineering colleges with a number of 974 colleges, followed by South West with 602 colleges as shown in Graph-7.



Sources : AICTE, National Knowledge Commission

Graph - 7

Further, the growth in Central, Eastern and Northern regions are approximately equal to Southern Region as reflected in Graph-7.

Technical Education: Present Status

The technical education system in the country can be broadly classified into three categories: Central Government funded institutions, State Government funded institutions and Self Financed institutions. For example in India, centrally funded institution of technical and science education are mentioned in Table – 7 (Chapter-2).

From the year 2006-07 onwards, the technical education consists of 1617 engineering colleges, 1292 Polytechnics with corresponding rise in intake of 2.36 Lakh to 2.65 Lakh students, 7 IITs and 06 IIMs which are Institutions of national importance. One new IIMs namely the Rajiv Gandhi Indian Institute of Management (RGIIM) at Shillong in Meghalaya has started functioning from the academic session 2008-09¹. 20 National Institutes of Technology (NITs) and more than 3500 are engineering colleges, 415 institutions for diploma in pharmacy, 63 schools for Hotel Management and 4 Institutions for Architecture in 2006, Statutory Body and AICTE. ALL these institutions are engaged in proper planning and coordinated development

1 *Economic Survey (2008-09). Govt. of India, Ministry of finance. New Delhi, Deptt. of Economic Affairs Economic Division.p.272.*

of Technical Education System (TES) in the country. For Postgraduate courses, there are 1147 educational institutions for Master of Business Administration (MBA), Post Graduate Diploma in Management (PGDM) and 953 for Master of Computer Applications (MCA).

Seven (7) Deemed-to-be-Universities, namely, Indian Institute of Science(IISc), Bangalore, Indian School of Mines, Dhanbad, School of Planning and Architecture, New Delhi, Indian Institute of Information Technology and Management, Gwalior and Indian Institute of Information Technology(IIIT), Allahabad, Indian Institute of Information Technology, Design and Manufacturing, Jabalpur and Kanchipuram.

Four (4) Boards of Apprenticeship Training, National Institute of Foundry and Forge Technology, Ranchi, National Institute of Industrial Engineering and Technology, Sant Longowal Institute of Engineering & Technology, (SLIET), Longowal. North Eastern Regional Institute of Science and Technology (NERIST), Itanagar, 4 National Institutes of Technical Teachers Training and Research (NITTTRs).

All these institutes and boards are making significant contribution in their specialized fields for the growth of technical educational sector¹.

Many central programmes/schemes contribute significantly to technical education. These include :

- Programme for Apprenticeship Training (Scholarship and Stipends),
- Community Polytechnics (CP),
- Technician Education Project-III assisted by the World Bank for Improvement of Polytechnic Education.
- Technical Education Quality Improvement Programme (TEQIP),
- Polytechnics for Disabled Persons,
- National Programme on Technology Enhanced Learning (NPTEL).
- National Programme for Earthquake Engineering Education,
- INDEST, MALIBNET
- Consortium and Technology Development Missions.

The dispersal of degree level technical institutions in the country is however highly skewed to a side. Andhra Pradesh, Tamil Nadu, Karnataka and Maharashtra account for nearly 55% of enrollments in the country.

¹ *Annual Report (2006-07). Department of Education.* New Delhi. Ministry of Human Resource Development. P.140.

The Dawn of IITs

From the year 2008-09, our country is going to increase 2000 more seats for admissions in IITs. The reason may be due to the eight (08) new IITs, increase in OBC Quota/Reservation or the overloading of seats in older institutions (IITs) per year. In 2008, the admissions in the IITs were given only for 5521 seats but in 2009, the number of seats was increased to 7480. Seven of IITs were already running at Mumbai, Delhi, Kanpur, Guwahati, Kharagpur, Madras, and Roorkee.

New IITs have been approved by the Govt. of India in 2008. The Govt. has approved the setting up of eight (08) new IITs in Rajasthan, Ropar(Punjab), Hyderabad(A.P.), Bhubaneshwar (Orissa), Gandhinagar (Gujrat), Bihta (Bihar), Indore and Mandi(Himachal) will raise the number to be 15 (fifteen). Two (2) new IITs- Indore and Mandi (Himachal) will take admissions for 120-120 seats. The largest number of seats were with IIT- Kharagpur having about 1084 seats. Total costs of Rs. 6080 crores @ Rs. 760 crores per IIT. A brief summary of IIT establishment and their mentor body is showing in table – 10.

Table - 10

Sr. No.	Name of IIT	Establishment Year	Mentor Body
1.	IIT Kharagpur	1950, as IIT 1951	IIT Kharagpur
2.	IIT Bombay	1958	IIT Bombay
3.	IIT Madras	1959	IIT Madras
4.	IIT Kanpur	1959	IIT Kanpur
5.	IIT Delhi	1961: As IIT 1963	IIT Delhi
6.	IIT Guwahati	1994	IIT Guwahati
7.	IIT Roorkee	1847: as IIT 2001	IIT Roorkee
8.	IIT Rajasthan	2008	IIT Kanpur
9.	IIT Gandhinagar	2008	IIT Bombay
10.	IIT Punjab (Ropar)	2008	IIT Delhi
11.	IIT Hyderabad	2008	IIT Madras
12.	IIT Patna	2008	IIT Guwahati
13.	IIT Bhubaneshwar	2008	IIT Kharagpur
14.	IIT Indore	2009	IIT Bombay
15.	IIT Mandi	2009	IIT Roorkee

Source : <http://iit.org/> (Accessed on 28.12.2009)
http://en.wikipedia.org/wiki/Indian_Institutes_of_Technology
(Accessed on 29.12.2009)

Reservation in these IITs :

7 Old IITs (OBC Quota) = 18%

6 New IITs (OBC Quota) = 27%

(SC Quota) = 15%

(ST Quota) = 7.5%

(Physically Handicapped) = 3%

Due to 9% reservation of OBC seats every year from 2007 in IITs, there will be about 550 seats increase in the category this year. According to 11th Five year Plan (2007-2012), these institutions (IITs) will give admissions to about 20,000 students¹.

Apart for reservation, there is also relaxation in the minimum qualifying marks for admission for SC/ST students. Seats are also reserved in hostels. However, in institution percentage varies as per the State Government policies². Human Resource Development Minister Kapil Sibal who chaired the meeting of Board of Directors of IITs, said that the current cut off of 60% in class 10+2 is very low for the IIT selection. It should be 80% to 85% percent³.

Action Plan For ITIs

- Complete Upgradation of 500 ITIs by investing Rs. 2.0-3.5 crore in each into institutions of excellence.
- Upgrade remaining 1396 ITIs in Public Private Partnership (PPP) mode by providing interest free loan up to Rs. 2.5 crore each.
- Facilitate 1000 new ITIs in underserved regions- to be setup in PPP mode so that largely unskilled work force of these backward areas could acquire skills and mainstream with workforce in progressive regions.
- Set up 500 new ITIs – in Industrial Clusters/ SEZs on a demand-led basis – also in PPP mode.
- Quadruple ITI capacity by encouraging them to run two shifts or more. Introduce short term modules in 2nd shift.
- Intensive Faculty Training Programme.

1 Chand,S.(2009). Good news for students preparing for IIT's. *Publishers Monthly*. 52(4).p.14. www.schandgroup.com (Accessed on 9.2.2009)

2 *India : A Reference Annual (2009) 53rd ed.* New Delhi, Publications Division, Ministry of Information and Broadcasting, Govt. of India.p.229.

3 *The Tribune*. Oct. 20, 2009 p.1. www.tribuneindia.com (Accessed on 10.04.2010)

- MoUs with States and ITIs defining outcomes and reforms and imposing obligation to transfer autonomy to the PPP¹.

Polytechnic: Present Status

Polytechnics in the country offer three year generalized diploma courses in conventional subjects such as civil, electrical and mechanical engineering. The courses are now diversified to include electronics, computer science, medical lab technology, hospital engineering, etc.. Women's Polytechnics offer courses in garment technology, beauty culture, textile design, library science, etc.

There are 1292 polytechnics under the aegis of the Ministry of Human Resource Development with a capacity of over 2.95 lakh offering three-year diploma courses in various branches of engineering with an entry qualification of 10th pass. Besides, there are 415 institutions for diploma in pharmacy, 63 for hotel management, and 25 for architecture.

The number of polytechnics has increased slowly from 1203 in 2001-02 to 1266 in 2005-06 with corresponding rise in intake from 2.36 lakh to 2.65 lakh. The proportion of polytechnics is high in the southern states (46%). Further, the proportion of public sector institutions at degree level in the country is very low around 20% and on the other hand around 80% of diploma level institutions are in public sector. 125 districts do not have even a single polytechnic.

Even the existing polytechnics seem to struggle for survival. Over the years, the diploma courses have lost the skill components and are perceived as diluted version of degree education. The Eleventh Plan will have to address several issues including static curricula, poor industry interface, lack of flexibility to respond to needs, obsolescence of equipment, lack of trainers, and inadequate funding.

Community Polytechnics (CP) are wings of the existing polytechnics intended to provide a platform for transfer of appropriate technologies to rural masses and to provide technical support and services to the local community. At present, there are 669 CPs in the country. During the Tenth Plan period, about 13 lakh persons had been trained in various job-oriented non-formal skills/trades.

¹ Bhatt, Sunil (2010). Growth and development of engineering education: An overview of Indian scenario. *University News*. Vol.48(10).pp.12-21

There are about 5114 Industrial Training Institutes (ITIs) imparting training in 57 engineering and 50 non-engineering trades. Of these, 1896 are State Government-run ITIs while 3218 are private. The total seating capacity in these ITIs is 7.42 lacs (4 lacs seats in government ITIs, and the remaining 3.42 lacs in private ITIs). These courses are open to those who have passed either class 8th to 10th depending on the trade and are of 1 or 2 years duration, which varies from course to course. In addition to ITIs, there are six Advanced Training Institutes (ATI) run by Central Government which provide training for instructors in ATIs for electronics and process instrumentation, offering long and short courses for training of skilled personnel at technician level in the fields of industrial, medical and consumer electronics and process instrumentation.

In order to provide sufficient autonomy in academics administration, finance, management, improved physical infrastructure (building, equipments) etc., the government launched a scheme for upgradation of 100 ITIs into Centres of Excellence, with effect from the year 2004-2005. Now, in 2009, the GOI has approved 160 crore rupees for the upgradation of 100 Industrial Training Institutes¹

The Apprentices Act, 1961, as amended from time to time, regulates the training of apprentices. The Act serves a dual purpose- First, it regulates the programme of training apprentices in industry so as to conform to the prescribed syllabi, period of training, etc. prescribed by the Central Apprenticeship Council and second, to utilize fully the facilities available in industry for workers. As on 2008-09, over 20800 public/private sector establishments were covered under the Act and number of seats allocated were 2.30 lacs, out of which about 1.72 lacs seats were utilized².

A “Submission on Polytechnics” has been launched, where it is proposed to (i) Assist the establishment of 1,000 new polytechnics by the State Governments throughout the Country (ii) provide assistance for construction of women’s hostels in 500 existing polytechnics to augment the facilities, (iii) provide assistance for construction of women’s hostels in 500 polytechnics and (iv) Start a renewed community Polytechnic scheme in 1,000 polytechnics in order to promote community

1 Jagbani, 2nd October 2009, p.1. www.jagbani.com (Accessed on 10.04.2010)

2 11th FYP 2007-2012, Vol.1: Inclusive Growth (2008). *Planning Commission, Govt. of India*. New Delhi, Oxford University Press. P.88.

development by providing short term skill and vocational training to rural community and unorganised sectors.

AICTE has permitted evening shifts in the engineering colleges and polytechnics, subject to court directions in a new states¹.

Action Plan for Polytechnics

- Upgrade 400 Government Polytechnics.
- Set up 125 new polytechnics in PPP mode in hitherto unserved districts.
- Run all polytechnics in two shifts to double the capacity utilization.
- Encourage much larger initiative in private sector since the demand for junior engineers is enormous and absorption and placements are nearly guaranteed.
- State governments may be encouraged to let their engineering colleges start polytechnics in evening shift to turnout junior engineers².

A study conducted by industrial body confederation of Indian Industry and Market Research Organisation named KPMG on the basis of available demographic data said that about 106 million people in the age group of 15-24 years would be in North India which include Bihar, UP, Rajasthan, Chattisgarh besides Punjab, Haryana, J&K and Himachal, by 2016. This implies that about 33.4 million students are likely to enter the higher and vocational education in North India.

HRD Minister Kapil Sibal proposed more emphasis on vocational training could contribute to development in the North region.

The report further suggested that North India needs to upgrade its education system on the whole. It shows, North lags behind in education as its ranking on the Educational Development Index (EDI) is low as compared to other parts of the country³.

1 *Economic Survey (2008-09). Govt. of India, Ministry of Finance. New Delhi, Deptt. Of Economic Affairs Economic Division.p.272*

2 *Opt Cited. 11th FYP 2007-2012, Vol.1.pp.93-94.*

3 *The Tribune, April 5, 2010,p.3. (www.tribuneindia.com) Accessed on 10.04.2010*

Present Polytechnic Education System

The system is mainly managed by the state agencies as per the state policies. Central intervention was initiated, particularly for quality improvement in polytechnics, whenever such a need arose.

Target Population

The entry qualifications prescribed for diploma programmes in most of the states is 10+2. A few states have recently prescribed entry qualifications as 10 + 2. The majority of students seeking admission to the diploma courses come from comparatively poor socio-economic backgrounds, from both rural and urban areas. Presently, some states have a Joint Entrance Test (JET) for admission to diploma programmes.

Regional Distribution of Polytechnics

Table below shows the distribution of polytechnics in the country, region wise. The total intake per year, the population and the intake unit of population are also given region wise.

Table Regional Distribution of Polytechnics

Region	No. of institutions	Total intake per year	Population in millions
Northern	202	33,180	228
Southern	557	88,730	164
Eastern	106	11,380	218
Western	85	8254	34,890

Course Offerings

Most of the polytechnics (about 80%) in the country offer three-year generalized diploma courses in conventional disciplines such as Civil, Electrical and Mechanical Engineering: During the last two decades, many

polytechnics started offering courses in other disciplines such as Electronics, Computer Science, Medical Lab. Technology, Hospital Engineering, Architectural Assistant, etc. In addition, many single technology institutions also were established in areas like Leather Technology, Sugar Technology, Beauty Culture, Textile Design, etc. Polytechnics also offered post-diploma and advanced diploma programmes of 1-2 years duration in different specializations¹.

Instructional Methods

The instructional strategy employed in the polytechnics is predominately classroom-based teaching. Laboratory practices are conducted as per requirements in specific subjects. Many of the polytechnics have acquired adequate audio visual hardware through special schemes of the central government. However, an adequate amount of courseware/software is not available, thus hampering the use of this media.

Equipment and Facilities

Many of the polytechnics in the country were established about 30 years ago and the infrastructure facilities in terms of buildings and equipment provided at that time continue to be used in the polytechnics. Changes in technology and field practices call for corresponding changes in equipment and laboratory facilities. Due to resource constraints, most of the facilities have not been updated adequately. The Government of India has been providing grants under Direct Central Assistance to keep the polytechnics updated. The present World Bank Assisted project has the objective of modernizing the facilities, resources and courses of polytechnics².

Community Polytechnics

In the later half of the 1970s, about 35 polytechnics were identified as Community Polytechnics and provided with funds under a Direct Central Assistance Scheme (DCA) to take up activities relating to development of rural areas. The Community Polytechnics were expected to perform activities like: rural technical

1 <http://www.indiaedu.com/polytechnic-colleges/> (Accessed on 29.10.2010)

2 *Programme of Action: National Policy on Education (1986)*. New Delhi. Govt. of India, Ministry of Human Resource Development (Department of Education).p.55.

manpower development, transfer of technology and other technical services needed by the Community. Later, the Government of India also provided funds to selected institutions to develop Centres for the Development of Rural Technologies (CDRT). CDRTs are expected to take up research activities in areas of appropriate technology and develop technologies and devices for improvement in productivity and growth of rural economy. At present, there are about 180 institutions designated as Community Polytechnics. A number of these institutions have performed well in the area of manpower development and transfer of technology¹.

World Bank Assisted Project

In the year 1990, the Government of India, with the help of State Governments, developed a scheme for financing polytechnic education with the assistance of the World Bank. Massive investment of the order of \$600 million is envisaged in two phases covering almost all the AICTE recognized polytechnics in the country. Under the World Bank assisted schemes, the institutions will have projects of (i) capacity expansion to develop new institutions and programmes, (ii) quality improvement for modernization and removal of obsolescence, staff development, etc. and (iii) efficiency improvement whereby the management structures at different levels will be strengthened and maintenance cells established. The major constraint in the development of polytechnic education that of funding has been removed with the start of the World Bank assisted projects.

Technical Teachers Training Institutes

The four Technical Teachers Training Institutes (TTTIs) at Bhopal, Calcutta, Chandigarh and Madras were established in 1967 by the Government of India with the major aim of improving polytechnic education and continuously enhancing its efficiency and effectiveness. For this purpose, these institutions conducted programmes and undertook activities in the areas of teacher training, curriculum development, admission tests and examination reforms, promotion of educational research, extension services to States, Polytechnics, Industries and Community and Management Development.

1 Shah, Beena and Mishra, Pardeep Kumar (1996). Technical education: Historical review and future prospectus. *University News*. Vol. xxxiv(50).pp.1-5.

TTTIs have continuously assessed the needs of the States through surveys and consultations and also have benefited from the directions of the two Review Committees constituted to assess their performance. TTTIs have been offering a variety of long-term and short-term training programmes in the areas of engineering/technology, instructional methodologies and techniques, and educational management. The bulk of training programmes for polytechnic faculties is organized by them¹.

The curriculum development activity has contributed to the adoption of systematic approaches to the development of job-related technical programmes with the involvement of teachers from polytechnics and other technical institutions, as well as professionals from industry.

In the area of instructional material development, TTTIs have developed a variety of instructional materials both print and non-print; print materials such as textbooks, laboratory manuals, workbooks, data books, etc. and non-print materials like video films, computer-assisted learning packages, charts, OHP transparencies, models, slides, film strips, tape-slide programmes, experimental boards, teaching kits and multimedia packages. TTTIs have constantly involved industries in their activities and promoted the interaction of industries with the polytechnics. Promotion of entrepreneurship in polytechnic students is another area where TTTIs have contributed significantly to promote self-employment among polytechnic graduates.

Other Supporting Agencies

There are many other professional bodies and agencies who directly or indirectly support polytechnic education. Associate Membership of the Institution of Engineers (AMIE) has been one of the avenues for diploma holders to upgrade their qualifications. Recently, some states have made arrangements with engineering colleges to admit Diploma holders to engineering degree programmes in an extended period of three years. The Institution of Electronics and Tele-Communication Engineers, in addition, provides some post-graduate diploma programmes in Computer Science and Electronics. ISTE, DST, DOE, and the Computer Society of India (CSI), also

1 Sinha, Neelam. (1996). *Strategies, issues and concepts in vocational education*. New Delhi, Common Wealth.p.305.

have programmes to support polytechnic education. The Apprenticeship Boards have programmes to provide industrial training to polytechnic teachers and also provide apprenticeship training to polytechnic pass outs. Many industries and industry organizations have contributed in a significant measure to the development of polytechnic education. The Colombo Plan Staff College for Technical Education conducts training programmes for technician teachers and administrators. Polytechnic education also has the benefit of international input through fellowship training programmes and UNDP assisted projects for upgrading in specific areas. Presently, a massive input is being made to the polytechnic education system through the World Bank Assisted Project.

Strengths of The Polytechnic Education System

The polytechnic education system has witnessed an unprecedented expansion during the last four decades. A huge infrastructure is available in terms of about 500 recognized institutions, and about 450 self-supporting institutions offering programmes in nearly 100 disciplines. The intake capacity is of the order of 100,000. The diploma holders who graduated from the polytechnics three to four decades ago occupy senior positions in the industrial sector, and have contributed significantly to the industrialization efforts of the country. The infrastructure in terms of physical facilities and equipment is worth about \$ 1 billion at current prices. There are nearly 25,000 teachers in polytechnics. The infrastructure, expertise and student population is a great source of strength¹.

Educational Framework at Different Levels

Vocational training/craftsmen courses to train skilled workers are offered by Industrial Training Institutes (ITIs) under the overall guidance and supervision of the National Council for Training in Vocational Trade (NCTVT). The diploma courses to train technicians are offered in the polytechnics which are guided and supervised by the Board of Technical Education (BTE) in various states. Degree and postgraduate courses to train engineers/technologists are offered in engineering colleges affiliated to various universities and such other institutions.

1 Palit, S.K.(1997). *The development of engineering and technical education in India. 1st Asia pacific forum on engineering and technical education*. Melbourne. Monash University.pp.50-54

Programmes for Quality Improvement

Over the years, a large number of programmes and schemes have been formulated and implemented for improving the quality and standards of technical education. They include programmes related to faculty development, curriculum development of rural technology, modernization and removal of obsolescence, institutional networking, and technical manpower information system, advanced technician courses, continuing education, research and development, Industry-Institution-Interaction (III), and so on. Programmes of faculty development, curriculum development and practical training of teachers in industry were being implemented since 1970-71, under the Apprentices Act, 1961(amended in 1973), engineering graduates and diploma holders are provided training facilities in industry. Under this programme, there are today 9 community polytechnic which interact with the community training rural youth for productive employment, helping in transfer of technology, and providing technical and support services to the people in the locality.

The scheme of modernization and removal of obsolescence of technical education institution at all levels was started in 1981-82. About 74 thrust areas have been identified under this programme. The scheme of 'Thrust Areas in Technical Education' includes expansion of facilities in area of weakness and creation of infrastructure in areas of emerging technologies. In the same year, under the programme of 'Advanced Technician Courses', 10 institutions are given support to offer advanced level courses for technicians processing diploma qualification.

Problems in Technical Education

Various problems exist in the field of technical education. Some of the main problems are:

1. The administrative setup for managing technical institutions is highly centralized and does not give flexibility to institutions to respond to the needs of the society or organize courses in relevant technologies.
2. The technical institutions are by and large organizing traditional conventional and short term training programmes, mainly based on obsolete technologies

and this does not meet the fast changing requirements to today's industry/organized sector.

3. Due to lack of autonomy to institutions, the curriculum, development, evaluation system and testing procedures etc. are rigid and the principals and teaching community of these institutions are bound to follow these guidelines.
4. The passouts from these institutions lack skill orientation and most of their teachers do not have exposure to industry. On the basis of recommendation of the Damodaran Committee, some polytechnics and engineering colleges and some of them worked well for more than a decade initiated training-cum-production centers. Unfortunately, interference by Sales Tax Department, Labour Department, etc. vitiated the atmosphere and the teaching community is in no position to benefit by these centers.
5. Technical institutions are run hardly for a few hours every day and in a large number of these institutions, the facilities for practical exposure are obsolete and that too are not fully utilized.
6. The technical institutions do not have any organized setup to identify the needs of society, with the present changing scenario of development and liberalization they are ill-equipped to fulfill the needs of the community service sector and the industries.
7. All polytechnics are still running only diploma courses/programmes. Due to this, the technical training has not developed qualitatively and does not produce skill oriented technicians as per demands of new market oriented technologies¹.

Problems and Challenges

Over the year and for variety of reasons, several imbalances and distortions have kept into the technical education system. They include:

1. While a large number of habitations in the country are even today without any facilities for technical education, about 38% of the degree level institutions and 30% of the diploma level institutions recognized by the

1 Thakur, Davendra and Thakur, D.M.(1996). *Technical education in India: Studies in educational development*. Vol.6. New Delhi, Deep and Deep.P.360

AICTE are concentrated in 4 states - namely, Andhra Pradesh Karnataka, Maharashtra and Tamilnadu. Almost all the engineering colleges and polytechnics unrecognized by the AICTE are in these 4 states; most of them are sub-standard institutions run as commercial basis.

2. The enrolment of girls in technical education institutions at a degree level is only 12% while at diploma level it is about 17%.
3. The enrolment of SC/ST students in degree level institutions is less than 5% and in diploma level institutions less than 9%.
4. In most of the institutions, both at degree and diploma levels, there is hardly any R&D activity.
5. The annual student intake of unrecognized institutions is almost the same as that of recognized institutions.
6. There is serious unemployment among engineers and technicians. Employment exchange records indicate that on 31.12.1987, there were 57,292 graduate engineers and 2,48,179 technicians diploma holder unemployed. Wastage in the system is enormous. An analysis of the intake and out turn figures of recognized institutions shows that wastage at degree level is about 30%, at diploma level 35% and at post graduate level 45%. The situation in unrecognized institutions is still worse.
7. There is acute shortage of faculty. About 25% to 40% faculty positions remain unfilled¹.

Perspective for Further Development

In formulating a perspective plan for technical education, an orchestrated increase in our efforts and inputs have to be built into 8th 'five-year plan and beyond. Clearly, the perspectives of development of technical education should also mesh and match with the national development goal. Taking into account the national perspectives and social relevance, the NPE has emphasized the need for recognizing the technical education through the induction of improved technologies, supply of adequate technical education through the induction of improved technologies, supply of adequate technical and managerial manpower to the services sector as well as to the unorganized sectors, promotion

1 Vocational Education. At <http://www.wikipedia.org> (Accessed on 29-09-2009).

of continuing education and distance learning, computerization, entrepreneurship development, strengthening of the community polytechnics system as well as innovative research and development.

A radical change in thinking is needed if technical education is to address itself to the changing pace of science and technology. Scientific and technological advances are not so rapid and unpredictable that they preclude any one from obtaining a knowledge of all that needs to be learnt in a fixed period. The pure lecture-home work quiz format existing today can no longer train the engineers and technologies of tomorrow, who have to take on the challenges of the future. The aim of technical education must therefore be to prepare the students for a professionally productive life. Any valid approach to technical education must therefore be to prepare the students for a professionally productive life and to encourage development of motivation and skills for continuous independent learning. Technical Education tomorrow must train professionals for interdisciplinary approach to problem solving. The technical education system has to be redesigned to produce a substantial percentage of self propelled individuals who would be able to grow into any new area and make their contribution. Since, technical education is essentially an investment and forms a crucial input for national development, it should no longer be treated as just a part of general education but it should be organized, managed and administered independently. The state of being the implementing agency for most technical education programmes, the State Directorates have a variety of academic, professional and managerial roles to play, the State Boards of Technical Education need to be reorganized and vested with statutory powers in order to be more effective.

Taking into account the present scenario and the perspectives of developments of technical education vis-a-vis the national development goals, it is felt that while consolidating and strengthening the ongoing programmes and the new schemes based on NPE, we should concentrate on:

1. Improvement of quality and standards of all levels
2. Upgradation of infrastructural facilities
3. Establishment of effective linkages with development sectors, national laboratories, industries and other institutions/bodies.
4. Technology watch and assessment of manpower in crucial area
5. Measures to prevent brain drain

6. Promotion of research and development programme.
7. Steps to ensure cost effectiveness
8. Special programmes for SC/ST students, women and the handicapped candidates
9. Entrepreneurship development
10. Continuing education and in service retraining programmes.

Conclusion

Polytechnic education has responded to the challenges of industrialization for self-reliance through:

- a. Capacity expansion, by increasing the number of polytechnics and intake.
- b. Diversification, by offering courses in various disciplines to cater to the needs of industry and other employment sectors.
- c. Starting advanced and post-diploma courses.
- d. Starting courses in special technological areas like leather, Textiles, Printing, etc.
- e. Providing increasing opportunities for women in technical education by opening polytechnics exclusively for women.

Basically, polytechnic is mainly related to technical education. However, vocational education is a part of technical education. Hence, it is also related to polytechnics. These are value oriented. Vocational education has similar type of courses as polytechnic do.

The present technical education system of the country is not able to keep pace with the industrial development and technological advancements. The requirements of technical education in 21st century will be different both in intentions, extension and executions in comparison to that of today. Keeping these points in view, National Policy on Education (1986) recommended some measures to uplift the standard of technical education which are as follows:-

1. The reorganization of technical education should take into account the anticipated scenario of the century with specific reference to the likely changes in the economy, social environment and production.
2. A large segment of people will be offered access to technical education programme through distance learning process.

3. Appropriate formal and non-formal programmes of technical education will be devised for the benefit of women, the economically and socially weaker sections and physically handicapped.
4. Networking between technical education, industry, R&D organizations, programmes of community development and other sectors of education will have to be established.
5. AICTE will initiate formulation of guidelines for identifying and awarding academic, administrative and financial autonomy to technical institutions.
6. Continuing education departments will be established in selected polytechnics and engineering colleges. These programmes will lead to diploma, advanced diploma and degree in engineering etc.
7. Projects for application of S&T for rural development will be undertaken by selected community polytechnics in order to understand the problems and process of rural development through action research and evolve replica models.
8. Introduction of Industry -Institution Interaction Scheme which aims at promoting interaction between academic institutions and industry in a variety of ways¹.

There are 86 polytechnics exclusively for women in the country. Still, in terms of their population, women have fewer opportunities for technical education. In terms of percentage enrolment, women students account for only 12 per cent of the total enrolment in diploma programmes. Economically and socially weaker sections of society, population in far flung areas and the physically handicapped have limited access to polytechnic education.

About 30 to 40 per cent of teaching positions remain vacant in polytechnics in most of the disciplines. In certain emerging technological areas, vacancies may be as high as 60 per cent. For the professional development of polytechnic teachers, TTTIs were established by the Government of India in the year 1967. TTTIs conduct long-term teacher training programmes, awarding a diploma in technical teaching and a large number of short-term refresher courses. Some States have recognized the diploma in technical teaching as a qualification for promotion to the post of lecturer

1 Husen, Torsten and Postlethwaite, T.Weville (1985). Indian system of education. *The International Encyclopedia of Education, Research and Studies*. Vol.5. Oxford, Pergamen. pp.2426-2428.

while others have not. In most of the States, the pay-scales are comparatively poor. AICTE recommended pay scales have been implemented in a few States only. There is no specific programme (like Quality Improvement Programme (QIP) for engineering college teachers) for upgrading qualifications of polytechnic teachers¹.

Funding

There are three types of institutions in the country, namely: Government Institutions, Private and Government aided institutions, and self-financing institutions. The polytechnics are generally funded by the State Governments both for initial capital expenditure and for recurring expenses. In the case of aided institutions, the Government provides grants to the extent of about 90 per cent of the recurring expenses. Self-financing institutions are not provided with any funds from the government. Polytechnics were generally starved of funds and the system as a whole had very meagre allocations in all the five year plans. The amount provided was hardly sufficient to maintain and run the institutions. Developmental needs and modernization could not be met. There were some central intervention schemes like Direct Central Assistance (DCA) which provided some funds to selected polytechnics Optical Character Recognition (OCR) document. Challenges and future perspectives for modernization; but the amount of funds provided was low and could not support many of the institutions. There were no institutions to generate resources by offering their services to the community and industries around. Any income generated was taken as a part of general revenue and the budgetary allocation was correspondingly reduced.

Management Structure

The Bureau of Technical Education, in the Ministry of Human Resource Development, is the main funding agency at the national level. The Bureau of Technical Education funded some polytechnics through central intervention schemes for modernization, removal of obsolescence, community

1 *Opt. Cited.* Programme of Action. p.69.

polytechnics, establishment of audio-visual centres, advanced diploma courses, industry-institute interaction, computerization, continuing education, etc. At the State level, the State Directorates of Technical Education are the funding and administering agencies of polytechnic education. In some States, there is a Board of Technical Education, which has functions of an academic nature like: curriculum development, conducting examinations, institutional evaluation, accreditation and certification. In most of the States, State Boards do not exist and where they are established, they function as a part of the Directorate. State Boards of Technical Education function independently only in a few states. Through an act of Parliament, the All India Council for Technical Education has been made a statutory body and is vested with powers to control the development of technical education. AICTE is just beginning to perform the statutory role vested in it by the Act of Parliament. One of its roles will be to establish a National Board of Accreditation (NBA) which will have the exclusive function of accreditation of institutions and programmes. The NBA, functioning independently, will have statutory powers to inspect institutions and evaluate programmes for accreditation¹.

Linkages

The current linkages between the different sectors of technical education, such as engineering degree education, diploma education and certificate training, is very limited. Polytechnics, in particular, have little interaction with the industries that employ their graduates. No mechanism or strategy exists for the industry to participate actively in the management, curriculum development, instructional processes or evaluation procedures in polytechnic education.

A state level Annual Review Meeting of the I.I.I. activities should be held every year in each state to disseminate the activities completed by the Polytechnics and to strengthen the Industry-Institute-Interaction (I.I.I.). The linkage between the institutions and industry are highly important. Such linkages help to inculcate an attitude of professionalism in the young minds².

1 *Opt. Cited.* Sinha, Neelam.p309.

2 Khambayat, Rajesh P. and Srinivasan, R. (2005). A case study of Industry-Institute-Interaction (I.I.I.) Practices in Polytechnics. *The Indian Journal of Technical Education*. Vol.28(3).pp.24-30.

Financing Technical Education

Financing higher and technical education is the main problem in most of the developing and underdeveloped countries. Every nation seeks for globalization of its local and national standard of engineering and technology education, so as to make it competitive in the international market.

Technical education has expanded enormously from 1947 onwards. There have been considerable efforts from the government to provide a universal approach in its growth and development. At the same time, it is crucial to analyse financing of technical education that had been quite low in the budget that led to the increased role of private providers during eighties.

The Ist Five Year Plans provided about Rs16.33 crore by the Central government for the technical education. During 2nd Plan, the amount raised to Rs 40.1 crore along with the foreign aid which was provided by many countries generously¹. The analysis is that the plan allocation for technical education since the first plan to eighth plan, there has been a growth of 11.5 percent per year. In 1960s, the share of plan expenditure was highest that declined in the following years² as shown in the Table-12.

The plan allocation during the 10th Plan was 4734.23 crore was earmarked for 16 programmes of technical education. Of this, the major share goes to the World Bank-Aided Technical Education Quality Improvement Program (TEQIP) with an outlay of Rs. 900 Crore; AICTE with an outlay of Rs. 600 crore; and IITs with an outlay of Rs. 612 crore. The outlay for Annual Plan 2004-05 for technical education was Rs. 750 crore and expenditure Rs. 615.85 crore. Of the 11th Plan outlay is Rs. 3940.25 crore.

1 NCERT, *Review of education in India 1947-61. First yearbook of Education*, (1961). New Delhi.

2 NIEPA(2005). *Report of CABE Committee on Financing of Higher and Technical Education*. (<http://www.education.nic.in>) Accessed on 16 December 2007.

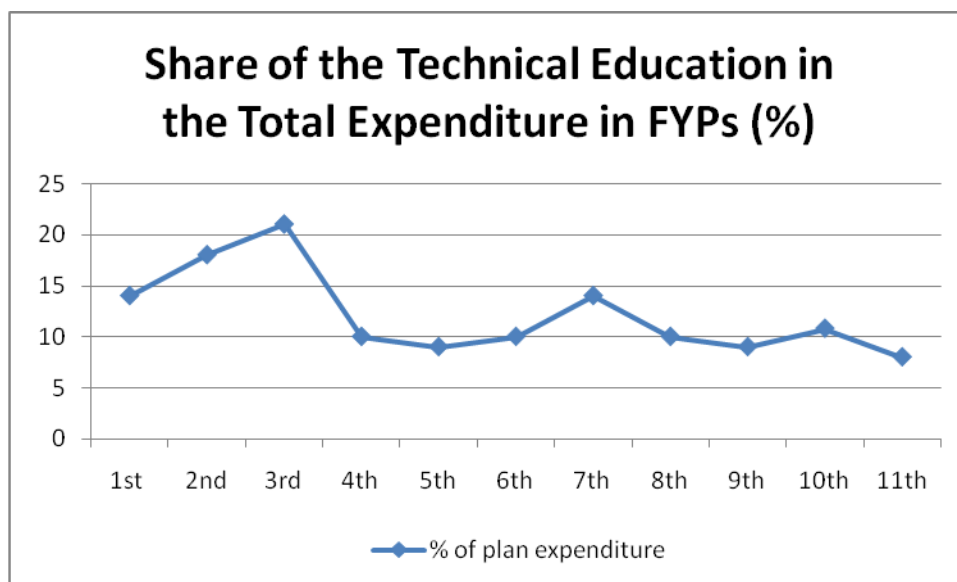
TABLE - 12
Plan Expenditure on Technical Education in India 1951-2012

	Plan Expenditure	Amount (In Crore rupees)	Percentage of plan expenditure on Education (In percentage)
1.	First Plan(1951-56)	21.5	14
2.	Second plan(1956-61)	49.0	18
3.	Third plan(1961-66)	125.0	21
4.	Plan Holiday (1966-69)	81.0	25
5.	Fourth plan(1969-74)	78.6	10
6.	Fifth plan(1974-79)	101.5	9
7.	Sixth plan(1980-85)	256.3	10
8.	Seventh plan(1985-90)	1083.3	14
9.	Seventh plan Expenditure (1990-92)	823.0	17
10.	Eighth plan (1992-97)	2198.7	10
11.	Ninth plan outlay(1997-2002) (Central sector)	2373.5	9
12.	Ninth plan expenditure(1997-2002) (Central Sector)	2109.5	9.5
13.	Tenth plan outlay(2002-2007) (Central Sector)	4734.2	10.8
14.	Eleventh plan outlay(2007-2012)	3940.5	8

Source : Five Year Plan Documents, Planning Commission and Analysis of Budget Expenditure, Ministry of HRD. In India: A Reference Annual 20010, 54th ed.p.242.

Note. 1.Figures is in crore of Rupees.
2.Figures in col. 1-10 includes the share of States and UT's @ included under Elementary Education.

There has been a decline in the share of technical education in the total expenditure from Third FYP that was 1.5 percent to 0.3 percent in Sixth Plan Later, It was regained as shown in the following Graph - 8 .



Source : <http://www.education.nic.in/cd50years/g/6D/7F/6D7F0701.gif>

Graph - 8

The share of technical education also varies at the level of Central and State Government from 1971-74. It is revealed that while the states take on a heavier burden of technical education expenditure, they allocate only around 3% of the total educational expenditure on this layer. Thus, indicated a low priority to technical education in the state budgets. The Union Government's allocation to various sections of education shows that the spending on technical education which was about 29% in 1971-72 had declined and was about 18% of total amount spent on education in 1993-94. The priorities set for resource allocation appear not so favourable towards technical education, since the overall allocation to the education increased by 14% per annum, while that to the technical education showed the growth rate of only 13% per year¹.

Similarly had been the case from 2004-05 to 2007-08. The budgetary allocation for technical education received a boost at this time and it was increased

¹ Duraisamy, Malathy (2000). Financing technical education in India. *Journal of Educational Planning and Administration*. Vol. XIV(i), PP. 23-43

from Rs 1595.0 crore in 2004-05 to 16,000 in 2005-06, 1718.0 in 2006-07 and consequently 3870.0 in 2007-08. The growth rate was quite high at 125.3 from 2006-07 to 2007-08 but for the period from 2004-05 to 2007-08 it was only 7.7¹.

The total financial outlay proposed in the 11th Plan is Rs. 3940.25 Crore to achieve the target of 0.5% of Gross Domestic Product (GDP) for technical education by the end of 11th FYP.

The financing of technical education requires additional funds to meet the target of achieving quantitative and qualitative aspects of the future development. The progress had been stable over the year that needs a greater attention to sustain and increase it further.

1 Mukherjee, Amit. (2007). Implications for education. *Economic and Political Weekly*. April 7, 2007. pp.1273-1276