Findings & Conclusions  
Chapter VI
CHAPTER-VI

FINDINGS & CONCLUSIONS

6.1.0 INTRODUCTION

"The nation's competitiveness depends, in part, on the skills of tomorrow's engineers". An accelerated growth of TE is imperative for developing a vision and a correct approach to ensure meaningful application of new knowledge and technology in the day-to-day lives of the people, particularly the disadvantaged sections. For this, the government has to provide adequate support for S&T. The need to support basic research in science and engineering to find solutions to basic problems of food, drink, shelter and health had never been as pronounced as it is now (Assam Tribune, 2009).

Present education is under of radical change in response to various factors like development in information technology, communication, privatization, globalization, etc. LIked with this, new areas of study are emerging in higher education in order to meet the vocational and professional needs of students. In this century, a new society is emerging where knowledge is the primary production resource instead of capital and labour. Efficient utilization of existing knowledge can create comprehensive wealth for the nation in the form of better health, education, and infrastructure etc. for improving the quality of life.

Institutions of higher learning are facing pressure of increasing number of students along with demands of accountability, reconsideration of social and economic role of higher education, and impact of new technologies especially the information and communication technologies. We urgently need a policy that enables and empowers the educational institutions to provide quality education and offer good opportunities for research to create new knowledge. Only through attainment of strength of quality education would many of our institutions become global players to offer good education to our students and education services internationally (Shetty, 2007).

Education in India is seen as one of the ways to upward social mobility. Good education is seen as a stepping stone to a high flying career. While higher education is the fascination of scholars, TE has been able to fulfill the job aspirations of thousands of students with the technological advancements in India. This has created a general tendency to go for technical education. The demand of getting admission is increasing every year. Since the government institutions cannot fulfill this vast demand, the big players of education sectors are highly involved in the horizontal growth of the institutions. Even the players of other sectors find this sector as a green field and have jumped into. And the scenario marks the mushrooming institutions throughout the country. The competition among the institutions has given the student of privilege of selecting the institute. The sector has become somehow student oriented (Praveer & Deshmukh, 2010)

TE is the application of scientific and technical knowledge to solve human problems. It is the use of imagination, judgments and reasoning to applied science, technology, mathematics, and practical experience, which resulted in the design, production, and operation of useful objects or processes. TE is a basic and essential for national development and for strengthening the industry, economy and ultimately the quality of life of people. TE in India contributes a major share to the overall education system and plays a vital role in the social and economic development of the nation.

It is required that all the technical institutions should take steps to redefine their quality policy to achieve excellence in academic and other activities to survive in the competition. New innovations in the teaching learning methodology can help to establish technical institutions with a healthy environment. Stating that there is a huge gap between quality and quantity in technical education, HRD Minister Mr. Kapil Sibal said there is a need to train faculty in both teaching and research. The planning of the TE system and the managements of the private institutions must take stock of the entire scenario to upgrade the quality.
India is at crossroads in TE with events overtaking faster than we could imagine. Major critical issues are listed and comprehensively discussed in this thesis. Admission procedure, bane of multiple tests, teacher scarcity, impact of globalization and IT, Resource crunch, Alumni and Industry linkage, PG and Research, Distance and Continuing Education, Infrastructure and Value education are relevant factors. Irreversible process of globalization and IT revolution will make major impact on TE and intelligence lies in converting threats to opportunities to make India a leader by effectively harnessing human and material resources. There is no alternative to strengthening indigenous technology base, a challenge for technical educators.

There is a mismatch between skills needed by industry/organization and skill supplied by technical institution and as a result in one hand, many engineers are unemployed, on the other hand engineers of required quality and competencies are not available. The role of technician (ITI product) in technology development is to be given due importance.

The impact of liberalization of economy is not felt very much in NE region because of poor industrialization and lack of poor communication facility but the market oriented economy has forced every organization/institution to look at its own activities more objectively. To utilize the abundant natural resources of NE region, special technical manpower development programmes/training has to be carried out with special emphasis for reducing unemployment problem.

It is not just TE but the entire realm of higher education beset with myriad problems that continues to be an area of concern in the North-East. Infrastructural constraints apart, lack of professionalism and administrative discipline in our institutions of higher learning has been a bane in the qualitative growth of this vital sector. Education is passing through a period of transition, which demands a greater level of dynamism, professionalism and discipline on the part of those imparting and managing education. While we are in an urgent need of new subjects and syllabi to delve in the age of globalization, a similar zeal and professionalism ought to be displayed by the teachers. The governments, too, have done precious little for expansion and consolidation of higher education over the decades. The absence of a sound, pragmatic policy has been having a debilitating impact on the development of our education. It is fact that no government can provide enough educational institutions to meet the need of the students, and therefore the role of private educational institutions will be more crucial in the days to come. An increase in the number of educational institutions will also lead to greater competition resulting in a corresponding increase in quality (Assam Tribune, 2009).

The linkages and interdependence of education and development are far too established to be argued. The developments to the North Eastern Region are no exception. Because of the topography, demography and a variety of social and historical reasons, educational development in the North Eastern Region has been halted. This has affected the national development. No nation can grow if its eight states are underdeveloped and weak. Lateral expansion of conventional education in the North Eastern Region states may not be right solution. India has the capability to do. But it requires better management skills to prepare for tomorrow (Parhar, 2003).

The present chapter brings out the important observations, findings & recommendations resulted from the analysis of data collected from various sources, both primary and secondary. The major findings & recommendations has been categorized on the basis of objectives of the study.

6.2.0 MAJOR FINDINGS

The major findings of the study are given below:

a) Sequential development of TE in the NER

• The growth of technical education in NER had been very dismal and gloomy before independence. There were only 3 Technical (degree and diploma) Institutes in the whole NER in the year 1951. In 1961, it went up to 10 and 77 in the year 2007.
• In the year 2000, there were total 10 numbers of degree level institutions in NER with the intake of 1520 students. The total no. of degree label institutions increased to 16 with an intake capacity of 3009 by the year 2008. There were 12 diploma level institutions in NER with an intake of 1797 in the year 1985 which went up to 24 with an intake of 3562 by the year 2008.

• There are 11 universities, 1 IIT, 8 NITs, 15 engineering colleges, 40 polytechnics, 68 ITIs and 2 junior technical schools are operational at present in NER. Out of which, highest number of technical institutes are available in Assam i.e. 59 followed by state of Manipur i.e. 22. The lowest number of technical institute is available in Mizoram i.e. 6. However, even after 60 years of independence there not a single Central Institutes such as IISER, IIIT, SPA has been established in the NE Region.

• The first technical institute in North Eastern states was established in the year 1920 (Govt. Weaving Institute at Gauhati) followed by Prince of Wales Technical School at Jorhat in 1927. The first diploma institute in NER was established in 1948 in Assam (Assam Engineering Institute at Chandmari, Gauhati). The first degree level institute of NER was established in the year 1955 in Assam (Assam Engineering College). First NIT for NER was established in the year 1967 in Silchar, Assam and first IIT for the NE Region was established in Gauhati in the year 1994.

• The first university in the NE Region was set up in Assam in 1948 i.e. Gauhati University. However, first department in engineering in a university was established in the year 1985 i.e. department of Electronics Science in Gauhati University. All 9 Central Universities of NER have started engineering dept like IT, ETE from the year 2006-07.

• Sikkim is having the highest number of engineering institutes per million populations while Mizoram is having the lowest number of engineering institutes per million populations in the year 1995. Whereas, in the year 2003-04 Assam was having lowest and Sikkim was having highest number of engineering institutes per million populations.

• One major findings of the study is that there was a quantitative growth of technical institutions over last few. However, the growth is more in polytechnics and ITIs than degree level institutions. In spite of this growth there is now a general feeling that the standard of technical education in NER is declining while concentrating on quantitative on expansion, little attention was paid to the quality aspect.

b) Status of administration, management and financing of TE in the NER

• Out of 24 TIs available in NER, 46% institutes (i.e. 11 nos) are governed by central govt., 17% (i.e. 4 nos) are governed by state govt. and rest 37% (i.e. 9 nos) are governed by private concern. Out of 11 universities, 82% (i.e. 9 nos) universities are governed by Central Govt. and 18% (i.e. 2 nos) are governed by state govt. Apart from this, 13 private universities are there in the NER.

• Out of 24 TIs, 26% institutes are funded by MHRD, 17% by the state govt. and 37% by private concern where as out of 11 universities, 82% universities are funded by central govt. and UGC, 18% are funded by state govt. and UGC.

• Financial allocations for technical institutions are made annually as well as under plan and non-plan category. It is observed the grant of the technical institutions has increased in successive years.

• Assam is spending highest amount on TE and Sikkim is spending lowest amount in NER.

• As far as budget is concerned, amongst NER Universities, NEHU topped the list; whereas Arunachal University is being in the bottom.
c) Status of TE in the NER with regard to physical facilities, ICT infrastructure, instructional facilities, admission procedure, academic courses, students intake & out turn, assessment procedure and quality assessment & accreditation etc.

- As far as infrastructural facilities are concerned, NIT Silchar is having the largest campus with 540 acres of land whereas the newly established private technical institutes are having smaller campuses. Among the universities, NEHU is having the largest campus with 1025 acres of land.

- The common facilities like Bank, Post Office, Canteen, Health Centre, Guest House, Sports Facilities, Library and Central Computing Facilities are available in all the institutes & universities. However, Multi Disciplinary Centre (MDC) and Campus Higher Secondary Schools are available only in 4 technical institutes & 5 universities of NER. The common facilities need to be strengthened.

- Advance instructional facilities like language lab., Educational Technology Centre, video conferencing facilities, modern teaching aids etc are not available in all the institutes.

- As far as ICT facility is concerned, IIT Gauhati is having the highest penetration of PCs with 64 Mbps lease line. The entire technical institutes (Degree & Diploma level) & universities of NE Region are having internet connectivity either through VSAT or ERNET or Lease line. All the universities of NER got internet connectivity through UGC-Infonet.

- As far as the hostel facilities are available, AEC is having the highest number of hostels i.e. 11 numbers with a capacity of 900 students whereas NERIST is having 8 numbers of hostels with 1500 capacity in the hostels. Among the universities, Gauhati University is having highest number of hostels i.e. 14 numbers.

- The physical growth of the institution was made without systematic and planned projection of institution path of growth.

- The data collected by the researcher reflects that 44% of institutions admit the students through AIEEE where as 22% institutions admit through CEE/AIEEE. Only IIT Gauhati admits students through JEE. Only 40% universities admit students through AIEEE and 20% universities admits students through NEE and others through their own admission tests.

- The overall enrollment across all discipline is observed to have increased.

- The first degree level engineering course in the deptt. of civil engg was started in the year 1955 at AEC. As far as the academic courses of the universities are concerned the first engineering course (Petroleum technology) was started in the year 1964 in Dibrugarh University followed by Earth Science in Manipur University in the year 1984 and Computer Science and ECT in 1985 at Gauhati University.

- The 5 common departments i.e. CE, ME, EE, CSE, ETE are available in all technical institutes. Departments like CSE, IT are available in all universities.

- The department of design is available only at IIT Gauhati. The Transportation and Production engineering department is available in only 4 technical institutes. Tezpur Univ. is the only Univ/Institute to offer courses like Food Processing Technology. TIFAC-CORE Petro Reservoir Engg department is a unique department available at Dibrugarh University.

- Over the years except the traditional courses, the technical institutions have not been successful in introducing new courses relevant to the local needs and local resources like tea technology, bamboo and cane technology.

- Out of 24 technical Institutes, only 5 institutes offer PhD programme in Engineering where as out of 11 universities only 4 universities offer PhD programme in Engineering.
- The availability of faculty varies from institutes. Most of the university engineering departments are having an average of 3 faculties per department. However, at the same time, the institute like IIT, NIT, and NERIST are having an average 10 faculty per department.

- The students enrollment in various departments varies from institute to institute i.e. from 15-120.

- The data reflects that there has been a substantial increase in the students intake in all the Institutes over the last few years. However, a detailed analysis of the statistics on International student's admission in the Universities / Technical Institutions of NE Region shows that only four institutions of NER are having International students.

- It is seen that in the NER, the number of students enrolled at degree level per 1000 populations is 1.01, 0.13 and 0.04 in science, engineering & technology and agriculture & veterinary, respectively. These and the figures relating to PG students enrolment are more or less comparable to that of the eastern region. However, these figures are far or less than the corresponding figures of the Southern region and All India. Similar deficit is observed in terms of proportion of students enrolled in different faculties. The total number of students enrolled per 1000 population in 2000-01 is 7.08 at graduate level and 0.40 at PG & above level in the NER. Of the total students enrolled for degree courses in the NER, 14.31 percent are in science, 1.17 percent in engineering & technology, and 0.62 percent in agriculture & veterinary. The corresponding figures for students enrolled for PG and above courses are 27.26, 1.54, and 2.11 percent, respectively.

- All the technical institutes of NER follow continuous evaluation & semester system.

- Out of 24 TIs only the courses of 3 TIs viz. NERIST Itanagar, NIT Silchar and SMIT Sikkim are accredited.

**c) Status of Inter-Institute networking facilities available in the NER**

- As far as inter-institute networking is concerned, it is observed that only few institutions of NER are having inter-institute networking facilities. Most of the institutions are working in isolation. Out of 24 technical institutions only 3 TIs namely IIT Gauhati, NIT Silchar and NERIST are having inter-institute networking facilities. There is no faculty and students exchange programme among these institutions. Only few students from IIT, Gauhati are doing internship programme in other countries. Further, very few institutes are having collaboration with industrial /corporate houses. At the same time, out of 11 universities, only 4 universities namely Assam University, Nagaland University, NEHU and Sikkim University are having inter-institute networking.

**e) Status of information and library services in the institutes and to develop an action plan for designing the North East India Technical Library & Information Network (NEI -TECHLIBNET).**

- It was observed that the development of libraries were not the priority areas of the technical institutions. Most of the libraries are neither being computerized, nor being adequate with professional staff.

- Among the technical institution IIT Gauhati is having the highest collection of books, journals, databases and e-journals whereas RIST Shillong is having the lowest. Out of 24 institutions of NER, only 3 institutions have been computerized and 5 institutions are part of INDEST-Consortia and member of DELNET Network. Only IIT Gauhati and NIT Silchar have Digital library. IIT Gauhati is having largest number of library professionals and offers a variety of library services to its user. It spends around 3 crores for library resources followed by NIT Silchar.
Among the universities, Gauhati University is having highest number book collection where as Sikkim University is having the lowest. All the university libraries are part of UGC-Infonet library consortia and getting online databases through UGC – Inflibnet. While NEHU got highest number of online databases i.e. 31 at the same time Mizoram University is subscribing 19 numbers of databases. Out of 11 universities, only 3 university libraries are found to be computerized. GU, Gauhati is having largest number of library professionals. NEHU Shillong offers a variety of library services to its user and spends around 1 crore for library resources followed by Tezpur University.

Action plan for designing the North East India Technical Library & Information Network (NEI - TECHLIBNET) is enclosed as Appendix- E.

f) The problems & prospects of TE in the NER

Some key problems of TE in NER are listed below:

• The growth of technical education is very slow in comparison to other regions of the country. The students' intake is comparatively low in the technical institutes of NE Region in comparison to the technical institutes of other regions of India.

• There is an acute shortage of qualified faculty members specifically in the areas like IT, ETE, CSE.

• Despite the best efforts, government bodies like Directorate of Technical Education of NE states, AICTE and universities have not been able to achieve much in maintaining desired quality standards of the technical institutions.

• In order to produce technical manpower of right quality, it is extremely important that all policies and procedures relevant to technical education are standardized and their variations from one institution to another are substantially removed. Absence of accreditation in large number of institutions is a major weakness in NE Region.

• Some technical institutions are inadequately equipped with infrastructures. The maintenance of IT infrastructure is very poor due to lack of skilled technical manpower. Significant up-gradation of academic infrastructure in many institutions is urgently required.

• Institution-Industry Partnership is weak in the technical institutions of NER. Strong Industry-Academic interface and collaboration which could have been beneficial are also absent in most of the technical institutes & universities.

• There is a lack entrepreneurial spirit amongst the budding engineers (fresh graduates).

• A major weakness amongst the fresh graduates/technocrats is their lack of communication (written and spoken English language) skills, presentation and report writing skills.

• Lack of motivation for research and development in general cause a major weakness for quality technical education in NE Region.

• Absence of systematic planning and designing for development of infrastructure and learning resources.

• The utilization of library resources is very poor as the download statistics is very low in comparison to number of courses and students admitted in the institute.

• The inter-networking among the institute is very limited and there is no exchange programme.

• Most of the Institutes lack transparency, accountability, monitoring, evaluation & feedback mechanism.
6.3.0 CONCLUSIONS

Though substantial development in the field of technical education in NER has been made so far, there are lots of things needs to be done specifically in relation to quality concern. Specialized institutions like IISER, IIIT and SPA need to be established in NER to overcome the regional imbalances. While infrastructure need to be improved in certain institutions and universities, major incentives for the NER technical institutions are to be given to attract qualified faculty members.

The road ahead for technical education in NER is paved with at least five mega challenges. These are: (1) increasing capacity; (2) improving infrastructure & quality; (3) intensifying research; (4) Technology transfer (5) internationalizing faculty and postgraduate student pool.

Technical education in 21st century will have to be redesigned and reconfigured to meet the rapid development in information technology. Many challenges arise as technical educations integrate management styles, learning styles and modes of delivering knowledge. It is essential that institutions and universities should have a centre that is dedicated for providing training for computing skills. The faculty should also be given-extensive training in modern tools of information technology otherwise they will resist the change. Institutes must revamp their policies to incorporate private sectors. The development of technology parks must emphasize the need to open opportunities for students, faculty, and industrialists.

Education in the next millennium must take a global and international perspective. Government and leading organisations must cooperate to ensure strategic plans, and standards are made to enable the delivering of technical education via the latest technology. Institutions must transform from merely academic agents to the dynamic research and industry oriented organisations. These institutions should serve as leaders and supply technically updated human resources for the growth of the nation (Sharma & Dhar, 1999).

In order to achieve desired results, the technical education system needs to re-invent itself to meet this changed environment. It can do so only if it interacts more closely with industry and industry too takes a greater interest in the operation of NER's technical education institutions. Such close interaction will occur if educational institutions induct industrial experts into teaching programmes and pave the way for retired senior engineers to teach, securing thereby useful contacts and mutual interactions. Likewise industry too should, in its own self interest, open its doors, fund design projects, offer internships and engage in more intimate dialogue with technological institutions. In short, industry and education should cease to be two separate castes. Institute should take steps to introduce the courses relevant to local needs & resources like tea, bamboo & cane technology.

6.4.0 RECOMMENDATIONS

Based on the description of the status profile of various technical institutes and in the light discussion held with several experts the Strengths, Weaknesses, Opportunities and Threats (SWOT) Analysis is presented: strengths and weaknesses are listed and opportunities and threats are foreseen. Further, based on the SWOT analysis, analysis & interpretation of the data, based on major findings and discussion with experts in the field; the recommendations are presented.

6.4.1 SWOT Analysis of TE

Inherent Strengths: We have the following inherent strengths:

- A large human resources of high intellectual caliber
- A large number of expert faculty in almost every field
- A growing middle class with a high priority for education
- A number of world class institutions of learning & research
- Technological and Communication backbone to take their advantage in the field of knowledge empowerment of the mass of learners
- A large number of technical institutions
- AICTE- a nodal agency to control quality of education
- Apprenticeship training schemes
- Community polytechnics to interact with the community by training rural youth for productive employment, helping in transfer of technology and providing technical and support services to the people
- Post graduate level institutions to promote post graduate education and research.
- National Science and Technology Management Information Systems (NSTIMS) to update and meaningful man power projection on a continuing basis
- Advanced technician courses for technicians possessing diploma qualification
- Continuing education programmes for updating skill and technology of working professionals
- R&D in selected technical institutions for promoting research culture in technical education institutions
- Aspirations of youth to pursue Technical Education
- Private Sector initiatives complementing government initiatives
- Increasing interest of industry associations (such as CII, FICCI, ASSOCHAM) and of professional societies to become partner and collaborate with academic institutions
- The accreditation initiatives of NBA are serving to promote quality Improvement in educational sector
- The upcoming World Bank project will provide the necessary resources for upgradation of technical education in the country
- The QIP scheme has contributed significantly to the up grading of qualifications of faculty in technical institution.
- The MODROBS, TAPTEC and R&D schemes of AICTE, as well as of MHRD, has served to modernize the infrastructure and remove obsolescence, promote work on thrust areas, and R&D programmes in technical Institutions.
- Pursuit of higher education is a major attraction to country’s youth
- Impressive infrastructure in a good number of universities and colleges.
- IISc, IITs, IIMs and a few other reputed institutions are global brands
- Formal as well as open education is flourishing ventures in India.
- Excellent research facilities in some universities and IITs.
- Environment for Technology Innovation building up
- Research culture emerging even at UG level.

**Weaknesses Identified:** Our ambition of India becoming a knowledge super power by effectively utilizing her abundant human resource faces the following weaknesses:

- The growing digital divide.
- Lack of timely and easy availability of knowledge resources to all
- Opportunities lost because of difficult access to information and guidance
- Lack of access to institutions
- Mismatch between demand and supply of knowledge and skills
- Lack of collaborative learning
- Questionable quality of teaching at various places
- Non-standardized examination patten
- Lack of personalized monitoring and long term tracking of growth and enhancement in learning, skill and performance
- Lack of encouragement to excel
- Substantial duplication of efforts at various levels
- Time mismatch between school hours and employment hours for those learners who have to simultaneously earn the livelihood for their families
- Lack of access devices to digitally bypass shortcomings of Institutions and teachers

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• Lack of multi-layered networks for knowledge absorption and knowledge propagation.
• Lack of a strong contingent of motivated teachers
• Severe shortage of qualified and competent faculty especially in ICT and emerging area.
• Inefficient functioning of the knowledge delivery mechanism.
• Some technical education institutions inadequately equipped with infrastructures.
• Problem of serious unemployment and underemployment of engineers and technicians.
• Brain drain of high quality engineers
• Lack of sufficient linkage/partnership between technical education institutions and industries
• Large dropouts of candidates registered for examinations conducted by professional societies.
• Technical Education perceived as a business opportunity by some
• While there are islands of excellence, these are rather few in number
• Lack of interest among graduating engineers to pursue teaching careers
• Lack of interest for pursuing research degree programmes
• Lack of availability of PhDs in Engineering for faculty positions
• Lack of adequate Industry-Institute Interaction
• Mismatch between education and training (knowledge and skills) received by graduates, and job requirements
• Inadequate manpower needs assessment and manpower planning
• The widely prevalent affiliating system in our universities precludes timely curriculum updating and introduction of innovative reforms
• The recent boom in IT industry caused a disproportionate increase in admission capacity in this area, at the expense of other disciplines
• While the admission capacity at the UG degree level has been on the rise, a corresponding growth at the PG level has not taken place
• Universities require a major overhaul of curriculum
• Significant upgradation of academic infrastructure in many institutions
• Private participation from large corporate houses is a small component at present.
• Gap between a graduating engineer and a professional engineer is still wide enough
• Absence of accreditation to a large number of institutions
• Lack of flexibility and student-friendliness in the system
• Absence of non-formal system
• Less emphasis on practice-oriented subjects
• Absence of a competitive spirit among students

Opportunities on the Horizon:

• Falling cost of hardware
• Falling cost of bandwidth
• A high growth in mobile density
• Availability of EduSAT
• Availability of infrastructure for narrowcasting using DD (Doordarshan) HPT (High Power Transmitter) & LPT (Low Power Transmitter)
• Rapidly expanding optical fibre cable network for terrestrial broadband connectivity.
• The advent of very low power consumption connectivity & computing devices
• The abundance of knowledge on the internet
• Rapidly expanding network of cyber kiosks and cyber cafés
• Knowledge enhancement at any age, any place, any time, any direction
• Participation of the private sector in providing computer education
• For setting up quality Indian institutions sponsored off-shore campuses
• IT tools are becoming available for Technology Enhanced Learning for widening the reach of technical Education.
Distance education possibilities for continuing education
Networking of technical institutions at different levels for mutual benefit, sharing of resources, undertaking major projects, etc.
Networking of technical institutions with R&D labs and Industry
Many alumni are offering substantial support to their Alma Mater.
Large global education market opportunity for India
Linking education to economic system and industry needs
Building corporate academia partnership in education
Developing a global mindset
Major flip to world-class research – setting up Globally Distributed Research Nodes
Making India as a Global Knowledge Hub

Threats Looming Large:

- A growing knowledge divide may soon endanger the fabric of social harmony
- Other countries, managing their educational infrastructure well, may provide initial lead to their children which might get multiplied as the time progresses
- Confirm to World-class Quality in higher education or else face exodus of talent to foreign university campuses in India
- Unattractive teaching profession in colleges and universities is driving talented graduates to turn away from career in teaching and research in universities and colleges, reverse this by proactive measures.
- Lack of use of technology in educational delivery is making Indian higher education system less productive
- Lack of focus on ethics and values in technical education has created educated class of people less responsive to society and good governance
- In the emerging GATS scenario, quality concerns need to be addressed urgently.
- Competition from international players
- The non-uniformity in the distribution of technical institutions in the country, causing regional imbalances, and inter-state migration of students
- The technical institutions in the rural and industrially-backward areas are not as popular with students, leading to unfilled capacity in these institutions.
- The tendency of research scholars to prefer computer-based research over experimental research
- The ratio of diploma programmes to degree programmes is on the decline (much unlike other countries).
- The science-base in the country is getting weaker, which will have an adverse impact on our capacity for technology development.

However, the above threats can be taken up as opportunities to respond to the local and global challenges knocking at the door steps of technical education. We need to turn India’s technical education system towards making India a Global Knowledge Hub without a further loss of time (Sharma, 2001).

Based on the SWOT analysis, interpretation of the data, looking on major findings and discussion with experts in the field, the recommendations are given below:

Access & Inclusiveness

1. There should be qualitative and quantitative expansion in technical institution in NE Region.
2. Government should set up more new engineering institutions (both Undergraduate & Diploma level including ITIs) in the north-eastern region specifically in Mizoram and Nagaland. Public Private Partnership could be explored for the same purpose. All polytechnics should be operated in PPP mode.

3. Central Institutes such as IISER, IIIT & SPA should be established in the NE Region.

4. The Ministry for Development of NE Region (DONER) as well as the state governments has to invite the investors to setup their industries. The investment advantages and fiscal concessions offered by the North East Industrial and Investment promotion policy should be implemented to attract the investors from outside of this region and abroad.

5. Core engineering disciplines like Production, Chemical/Petrochemical, Metallurgical, Mining Engineering and Architecture, Textile, Leather and Ceramic Technology etc. should be introduced in Engineering institutes of NE Region to attract more students.

6. Multi disciplinary areas like Biotechnology, Pharmacy, Biomedical Engineering, Environmental Engineering and Materials Science etc, and emerging areas like VLSI Design, Mechatronics, and Micro Electronics in Mechanical System, Nanotechnology and Intelligent Manufacturing Systems etc. should also be included in the technical institutes.

7. As majority of NE population is in rural area and is involved in agriculture, Rural Technology and Agricultural Engineering courses may also be included in Technical Institutes.

8. Attempts are made to ensure that all deserving and meritorious, even poor or other underprivileged students of NER have an equal access to the opportunities in the higher education to garner a broader pool of intellectual resource. There should be a provision of soft loans to the poor students with minimum possible guarantees and conditions.

**Industry and Industry Interaction**

1. Joint research programmes by industry and institute should be encouraged & enhanced.

2. Linkage between institution and industry must be strongly forged. Strong Industry – Institute partnership is necessary for which all the institutes including universities should set up small cells or appropriate forums to interact with industry on a regular basis. Faculty should be encouraged to take up industrial consultancy and solving industry problems with active participation of the students with the time frame negotiated.

3. The Institute should encourage Entrepreneurial Development Programme (EDP) or should teach EDP as an elective or special subject, if possible, and an entrepreneurial spirit should be imbibed amongst the students in Pre-final/Final year classes.

4. Faculty guides should visit the concerned industries where the student projects are pursued.

5. Frequent dialogues among Educational Institutes, Industries and Government through seminars and workshops are necessary to keep all informed about the latest trends and issues.

6. In order to solve the issue of employability of engineering graduates, an exposure to industry in form of Industrial Training should be provided to students during their tenure. Finishing schools should be started as a joint venture to train the students in Industry specific skill sets upon graduation.

7. Establishing Science & Technology Entrepreneurs Park (STEP) by engineering colleges and polytechnics to promote entrepreneurship development activities.

8. Providing extension services on regular basis to help socio-economic development of the region. Community Polytechnic Scheme in Polytechnic is to be made more effective with necessary financial autonomy.

**Governance and Management**

1. An autonomous higher Education Council/Commission, consisting of prominent stake holders, is needed to act as a national think-tank for planning a world class higher and technical education in the country. Further, Roles of UGC and AICTE need to be redefined and confined to development, standardization, monitoring and regulation.
2. To enhance academic atmosphere among students & faculties, it is better to follow the work culture of IITs, IIMs etc. Much better infrastructure must be provided by the Govt. to achieve excellence with new work culture.

3. AICTE should develop and establish a consortium of engineering institutions devoted solely for encouraging, fostering and supporting innovative ideas generated by students and faculty and converting them to commercial products with the support of interested industry through venture funds.

4. India needs a large number of world class institutions which would require participation and collaboration of public, private, and foreign players for which a suitable legislation and level playing field need to be in place.

5. A full-fledged training & placement (TP) cell with a very active, dynamic and informative TP office is essential. The post of TP Officer should be in the rank of Professor. The company/industry also prefers an active, dynamic and informative officer of higher rank of the Institute to deal with the placement.

6. Reforms in our educational systems require, inter alia, restructuring of institutions. This is not easily achieved. The following four items are required to be addressed immediately, viz., (i) public-private partnership; (ii) effective regulatory authority particularly where private sector is involved; (iii) measures to attract foreign students and teachers and (iv) building bridges between technical institutions and R&D agencies.

7. An effective regulatory authority, as well as an accreditation system, has to be crafted whose role should be focused on universities and institutions where the private sector is involved. Such a regulatory authority will also concern itself with the entry of Foreign Service providers in education.

8. Emphasis must be given on Technology Transfer which is three distinct steps i.e. invention, innovation, dissemination.

9. A National Education Development bank should be set up to provide loans to students at normal rates of interest, with judicial empowerment to recover loans.

10. An autonomous and self-sustaining National Testing Service for both UG and PG admissions on a continuing basis needs to be nurtured by premier institutions to replace the existing multitude of such systems.

11. All technical institutions should be sensitized to follow a similar system of continuous evaluation, credits and semesters, with in-principle possibility of inter-institutional migration and mobility of students.

12. Liberal policies are needed to encourage foreign students on our academic campuses which would challenge our teaching-learning process, change the cultural ecology, and earn us a brand name.

Research & Development (R&D)

1. R&D priorities should be fixed in four thrust areas: globally competitive basic research, mission-oriented research, industry-oriented research and country-specific research.

2. The progress of R&D activities in engineering and technology has not kept pace with the ever-changing national and global requirements. 57% of college professors lack either a master’s or PhD degree. The technical institutions should make the best efforts to develop the R&D culture through various AICTE funded R&D schemes like MODROBs, TAPTEC etc. research publication, Patents, Consultancy etc. by the faculties are the assets of any institute. The faculty members should also explore the possibilities of getting R&D grant from other funding agencies like DST, CSIR and NEC etc.

3. Strong bridges to be erected to bring together R&D agencies and the university system, which possess complementary resources-one with facilities and challenging projects and the other with abundant large human resource. A good model to achieve this objective calls for the agencies to set up one or more major laboratories with focused R&D programmes on the campuses of universities/academic institutions.
4. Instituting Research studentships (subject-specific studentships, project studentships, etc.) and research fellowships (e.g. postdoctoral, advanced, senior, industrial, etc.).
5. Facilitating global engagement through Govt.-to-Govt. agreements, exchange of researchers, participation in international projects, technical mission, licensing of technology, purchase of equipment, publications, seminars/workshops/conferences etc.
6. Encouraging increasingly interdisciplinary and international approach in research, coupled with greater flexibility to respond to changing requirements and opportunities.
7. Allowing academic institutions and users to pursue their knowledge transfer aspirations in a flexible manner.
8. Facilitating knowledge/technology transfer and commercialization of R&D.
9. Supporting and encouraging research community to engage meaningfully with general public including schools and young people.
10. Conveying creativity and excitement of innovative research and rewards of technical education to secondary school students and young people at formative stages, to encourage them to pursue related careers.
11. Stimulating public interest in advance and issues in research to contribute to a more informed society.
12. Ensure inventions in the universities and educational institutes. They should become the centres for development and upgradation of technology. This would help in expedited availability of better quality products at lower or competitive costs. University-industry consortia should be formed for the technological advancement in the country.
13. Creation of a separate department of technology, focusing on development of agro-based industry and modernization of the agriculture sector for increased production.

Quality Assurance, Accreditation
1. The quality of Technical education in the whole NE Region may be elevated by forming a network of technical & higher institutions.
2. Engineering Institutes of NE Region should make all efforts to obtain accreditation (programme-wise accreditation from AICTE-NBA & institutional accreditation from UGC-NAAC) from AICTE-NBA/UGC-NAAC by developing good infrastructures and qualified faculty for which liberal funding is important.
3. Institutions of NE Region which have had their programs accredited may be given more funds & autonomy.

Academic Issues
1. The present examination system needs to be improved. There is a need for introduction of a credit based, semester system in all engineering institutions with a common core of engineering/science in the first two years and a flexible professional stream in the last two years. Transfer of credits from one major to another major within the Institute and also between institutions should be enabled. The common core could consist of courses in mathematics, physics, chemistry, biology, humanities and social sciences, computing skills, communication skills, workshop practices and laboratory practices.
2. Examination system should be need based and modernized with pre-exam, exam and post-exam reforms. Pre-exam phase should encounter the curriculum modules, teaching plan, working days, students’ seminar and workshop, collaborative work, visiting fellows, self study notes and reading materials and examining methods etc. The actual exam phase, setting up question paper, pattern of questions, semester, internal examination, trimester, credit system, continuous assessment, practical and work experiences are important. The post exam phase should encounter the scheme of central assessment, moderation, HR audit, model answers, non examination and students’ feedback etc.
3. Examination reforms system involving the university examinations and assessments of the students need continuous attention on the part of university / Administering Deptt. to maintain
quality technical education in NE Region in view of a large population of the students studying at
different colleges spread all over the states in contrast with the examination and assessment
systems adopted by the Unitary Universities.
4. Continuous assessment of the students to be given more weightage, in order to reduce the stress of
the examination System
5. Pedagogy - Where appropriate teachers should be encouraged to use audio-visual aids including
computers in the classrooms to improve communication between them and the students. At least a
few modern class-rooms should be set-up in each department.
6. Feedback on Teaching – Evaluation of teacher and courses must be conducted scientifically using
different feedback forms for theory and laboratory.
7. Special attention should also be given for introduction of courses in the multidisciplinary and
emerging areas like, Biotechnology, Materials Science, Intelligent Manufacturing, Environmental
Engineering, Pharmaceutical Technology etc. Care should be taken to include subjects like Bio-
informatics, Nano Technology, VLSI Design, MEMS Technology, Ceramic, Leather, Textile
(Fibres ) etc. as sub-sets of the courses in the emerging areas.
8. Strong science background will become essential for new era engineers. The course curriculum
should be strengthened with the teaching of science subjects like the Physical Science, Chemical
Science, Mathematics and essence of Biological Science with good laboratory backup and
qualified faculty.
9. Communication and Report Writing Skills should be imparted to the students in UG engineering
courses right from the first year level to enhance their employability, for which suitable language
laboratory may be established.
10. For enhancing faculty strength in Technical Institutes of NE Region 20 % of PG seats
(MTech/ME/MS) to be reserved for teachers in reputed institutions like IITG & NITS.
11. A reorientation for some new job oriented courses relevant to available resources and avenues that
exist in NER is a must to transform the pass outs/outputs as per need of the changing technology.
12. Intake in engineering field must be increased by pruning down few intakes on conventional
courses like CE, ME, EE etc.

Teacher – Related
1. There must be periodic assessment of teachers.
2. Teachers should be provided periodic training in Industry; the Institution should continue to pay
salary, and Industry should offer him/her the facilities.
3. The technical institute and universities need to steadily recruit the competent faculty based on
performance and promise. The number of the teachers should be increased immediately. A part
from this academic plans and calendars need to be brought to the notice of the stake holders well
in advance. The administrative and financial alertness should also be maintained optimally. Teaching
and non teaching staff should be trained by the professional organizations. Visiting
faculty scheme will work effectively.
4. Relaxing the criterion of holding a PhD degree for undergraduate teaching – Though faculty with
PhD degrees are desirable, given the current state of affairs, this criterion must be relaxed to
faculty holding Master's degree in institutions that only offer undergraduate education.
5. Adjunct/Additional Faculty – Professionals from industry and research laboratories should be
invited to participate in the teaching process. Institutions should be encouraged to create adjunct
positions for them. The upcoming research institutions should be co-located with academic
institutions and vice-versa to facilitate this participation. Existing institutions with active research
programmes should be supported by the government to set up high-tech industrial research parks
in the vicinity of their campuses. Internationally competitive talent must be attracted by providing
incentives such as better working environments and globally competitive opportunities.
6. Other incentives – In the absence of research opportunities in undergraduate degree granting
institutions, a teacher needs incentives which enable him/her to grow professionally. This could be
achieved through provisions like secondment to industry during vacation time enabling a faculty member to improve his /her practical skills.

7. Continuing Education in Distance Mode – Opportunities should be available for faculty of NE Region to enhance their knowledge and teaching skills through coursework of a rigorous nature using open distance mode. Institutes of excellence like IITs should be encouraged to make available such courses in all modes.

Student Related

1. Team spirit so essential for an engineer is missing which results in derailed projects. Technical education must have component to develop personality and leadership qualities in students. H.R. professionals are available to impart such training for teachers, students and administrators.

2. Each institute should devise effective schemes to increase alumni interaction, which is beneficial to both. We must bear in mind that any interaction succeeds in a Win-Win situation. Alumni can help in resource mobilization, laboratory development, scholarships, library upgrade, sponsoring projects etc. Institutes must reciprocate in offering their facilities to alumni such as guesthouse, sports, recreation, organising social events to make them feel they are welcome. Alumni office in leading universities like MIT is really massive and it is a worthy investment. It is necessary to keep in touch and to have collaborative work regularly.

3. Keeping in view the present sinario, India should offer seats to countries from the developing world. This is the best way by which we can distinguish and influence other countries in the world. The relationship between India and USA is strong (in spite of political differences), mainly because of large number of students from India, who are getting higher education in US. In the same way, India should become the destination for engineering, management and medical education.

With the growing world attention of India, this country could aim at welcoming more and more foreign students and teachers. Absence of international flavour among our institutions needs to be overcome. It is relevant to recall that Nalanda of India was the world’s first-ever residential international university. Home to 10,000 students and 2000 teachers from all over the world, Nalanda flourished in the 5th century AD.

Library & Information Service

1. Provision of adequate funding facilities for infrastructure facilities. IT based Information Product and Services should be made.

2. Priorities should be given for Library automation & networking.

3. Union catalogue of books & periodicals of NER technical libraries should be prepared on priority basis for resource sharing & collection development.

4. Short-term trainings, regular workshops, seminars and workshops are necessary to facilitate the current awareness of information professionals in acquisition, classification, storage, repackaging and dissemination of information. However, staff expertise has to be put to practice what they have learned.

5. Motivating the information professional people to go in for IT based information handling services in LICs.

General

1. Effective and intensive deployment of ICT for the purpose of education delivery, automation of educational administration, curriculum development, online counselling, online testing and evaluation, virtual library etc. should be adopted. ICT should also be used for promoting development of innovative global network of educational institutions.

2. The e-learning framework must provide access to knowledge and related data anytime anywhere. The e-learning environment must provide a flexible workflow and process model that can be fine-tuned and configured to meet the needs of the organization. The e-learning framework must allow additional components to be integrated easily using open software. The e-learning framework
must allow content and other data to be exchanged and shared by tools and systems connected via internet. Through the course management tools (Learning Management System), syllabi and other education information are to be made more accessible to the students.

3. It is essential to establish a Staff College for TE, which has been under discussion for 50 years, and yet it has not been implemented.

4. To make mandatory, 6-months industrial training instead of currently practiced 3-months training. Six-month period is enough time to have a deliverable project, which benefits both the industry and the student.

5. Qualified faculty and competent technical staff are essential for quality education. Faculty training for post graduate and doctoral programmes should be arranged for which study leave, sponsorship with salary or fellowships to the teachers should be encouraged by the institutions.

6. The recruitment of qualified teaching and technical staff should be given priority. Most of present privately owned institutions do not offer proper scales of pay to their staff. As a result, very poor quality staffs are recruited. This adversely affects the quality of technical education. The AICTE scale of pay with Government approved allowances should be provided to attract good candidates.

7. A certain degree of mobility for teachers and students should be permissible. Such a feature is essential for a large country like India, which incidentally will promote integration.

8. An awareness drive should be given amongst the faculty members of NE Region about the copyright, patenting laws and IPR.

9. Periodic monitoring of various colleges in respect of their academic standards and infrastructure should be done regularly by the affiliating University and the Higher Education Department of the Government.

10. The Governing Body of the Institute of NE Region should include Academicians of repute, Industry leaders besides Government and University representatives or nominees for corporate governance and policy formulation.

11. The cost of TE should be reduced through optimum utilization of infrastructure.

12. Guided industrial training, handling of industry oriented projects, case studies and seminars are some of the aspects to be strengthened as a part of curriculum. Moreover, a Training and Placement Cell should be established in each of the Institution to have better industry- Institute interaction.

13. Laboratories with contemporary experimental set-ups and other associated infrastructures including internet facility should be developed in each college for imparting quality TE. Qualified technical assistants (diploma holders) should be engaged for the upkeep of the equipment of the laboratories and workshops created at the institutes.

14. The following suggestions are made for reviewing the entire aspect in the NER:
   a) Immediate survey is made regarding the need of technological background of the manpower required by industries.
   b) The all round effort for establishing large scale and small scale industries be made and effort be made so that they may compete with sound financial background.
   c) The natural resources of the region are successfully utilised.

15. Education technology may be used to upgrade the courseware and there is a need to establish digital library with E-journal facilities.

16. North East Library Consortia should be developed.

17. Technical Institutes mostly being residential institutes, no of hostels & their intakes need to be increased.

18. The recommendation of NERC (attached as Annexure: F) may be implemented.

Strategy and Vision

There is a need for the industry, government and academia to formulate a strategy for engineering and science education in India. India has the potential to be a leading research and design hub in the world. We need to have a mechanism to identify important areas/disciplines that should grow and develop policies and institutions that facilitate this. There needs to be a high level think tank
that reviews the higher engineering and science education system in India and provides direction for future growth. This need not be a one-time committee or an ad-hoc arrangement but should be a continuous activity. This think tank should not be saddled with administrative and financial responsibilities like AICTE or UGC. The think tank can facilitate debates and discussions on the future directions of higher technical education and provides the visions, the new directions required (Banerjee & Muley, 2008).

In conclusion, it can be stated that the game of hardship with excellence and competency no doubt is a challenge before North East India, but nothing is activated till today. North East India has immense potential. Efforts must be directed to energize the human resources through quality technical education and training for equipping the skills required to participate in the growth and developmental process of nation.

6.5.0 EDUCATIONAL IMPLICATIONS OF THE STUDY

The primary educational implications of the study are:

1. This type of research work provides a gateway to many challenging research questions in the area of technical education and also in the area of general education.
2. The study will help the administrators of technical education, educationist & general people to know about the growth and development, status, facilities available in the field of technical education and the policy makers to make new policies regarding technical education of NER.
3. It will also help the interested learners to know the terms and conditions for getting enrolled into the technical education system of NER.
4. The study will be helpful for administrators to know what problems are faced by the institutions in facilitating quality technical education.
5. The study will though light on the present status & networking facilities of technical institute libraries of NER.
6. It will help in comparing the growth and development of technical education in NER with other states of the country as well as with the international scenario of technical education.
7. This will help institutions of technical education to improve their status

The secondary implications of the study are:

Based on the major findings, SWOT Analysis & recommendations of the study; it is important that necessary steps should be taken immediately to address the following issues to enhance the quantitative & qualitative growth of TE in NER.

Admission and Control

A Statutory Board of Education in every state, coordinating the activities of various agencies of education towards a common goal is needed.

The Need for Technical Man-power

The expansion of technical education in India should, however be done with caution and full regard to the development of organized industries. Technical education should be both quantitative and qualitative. The problem of training technical manpower involves the mobilization of resources to ensure that the requirements for national development are adequately met at all levels and in all section of industry.

Training of Technical at Lower and Middle Levels

Training of technicians at lower and middle levels need greater attention since worker are needed in industrial concerns in the interest of increased efficiency. It is necessary to start technical and
trade schools to train the young boys who came out from elementary schools than to start engineering colleges and technological institutions. High school drop-out may be trained as lower level technicians.

On close estimate, it is found that after the completion of their elementary education, about 20 percent students would join working life. It will be very desirable to provide adequate facilities for suitable forms of vocational education, either on a part-time or full-time basis, for these students. The Education Commission has stressed on the need for expanding the vocational courses to cover about half of the total enrolment at secondary stage. These courses are to be of various types from one to three years and would prepare young persons for employment.

**Provision of Post Technical Education and Training**

There must be provision of post technical education and training in our country through correspondence courses, part-time training, sandwich courses, short-time courses, refresher courses, close contact with the technical institutions and industries.

The correspondence courses may be organised for those workers who need enough orientation in latest theoretical principles. For in-service workers, this is a good device. The part-time courses develop the theoretical knowledge and skill of the in-service workers. But the part-time courses may be possible only at some technical institutions. Morning or evening classes may be arranged for this purpose.

In short-time courses, the in-service workers are invited to attend certain courses for two or three weeks at some technical institution. This programme may be conveniently arranged during the holidays of some relevant industries. Through refresher courses also the in-service workers may be trained in latest techniques and devices. Obsolete techniques shall be replaced this way.

**Need for Better Programmes**

We must have a pattern of engineering education which should produce all the high class engineers and scientists. A new image of technical education has, therefore, to be created. The ideas and concepts have to be experimented and a new “personality” of technical education has to be built up.

With the advancement of S&T, it is now being gradually recognized that it is enough to adhere to the traditional courses of study. On the other hand, new courses of study aimed at specialization and diversification will have to be planned at the post-graduate and graduate levels, e.g. traffic engineering, industrial engineering, management, corrosion science and engineering, computer technology, television technology, urban and regional planning, mechanised system, nuclear engineering, chemical process designing and engineering, environmental engineering, and man-made fiber technology, alternative energy resources etc. For the Polytechnics also a number of new courses like electronics, production technology, power plant engineering, electrical instrumentation and control, tool engineering, petroleum refinery, public health engineering, food technology, rubber technology, leather technology, paper technology, plastic technology and aeronautical engineering will have to be devised.

To enable an engineer (or a technician) to discharge his duties efficiently, apart from professional competency he must have a clear understanding of himself and of the social, economic and cultural values of the society in which he is a member. The technical students in India should be taught in social sciences and humanities. Such a study prepares an engineer to make a critical analysis of any technical problem, solving socio-economic consequences, in a broader vision and thereby add to his professional competency. Under the circumstances, technical education should not only be accompanied by but also be even based on the structure of general education.

It is also necessary to evaluate the various courses of different levels to meet to changing needs. These should be carried out in co-operation with industry, and should aim at job analysis and specification in terms of levels and duties of skills and responsibilities of technicians.
Medium of instruction

In the technical institutions the regional languages should be accepted as the medium of instruction. The trainee should not be compelled to acquire proficiency in English, unless they themselves insist for the same. For making regional languages as the medium of instruction, it is necessary to produce standard books in regional languages in the various areas of technical education. The teachers for technical institutions should be so trained that they may be able to impart the training through the medium of the languages concerned. But English should continue as a compulsory language in the curriculum of the technical school and universities, and Indian languages.

Need for Research

There is an urgent need for concentrating attention on industrial research work, which is still in his infancy in this country. In a country like India, which has to withstand an ever-growing competition from foreign markets, it is high time we rationalized our industry and followed scientific methods of production in the interest of country’s economy. For the modern machinery to be installed in industry, we have to depend to-day entirely upon foreign machinery which cost us more that what we had manufactured. Transport and packaging charges further enhance the cost. The time factor in getting them to our premises is another unhappy matter. It is therefore, essential that our scientists, technologists and engineers do co-operate and put in their best efforts to enhance production, to control quality, to reduce the cost, and thus to do away with foreign machinery.

What is required is a formula for making the best use of creative and inventive talents to meet the requirements of industry and a change in the qualitative atmosphere. It is of utmost importance that engineers and scientists combine their talents and experience with the knowledge available in the manufacturing units with actual users, the university professors and visiting foreign experts. Such an approach alone could secure rapid economic growth.

What is needed is a co-operation between technical institutions and industrial units in research leading to inventions and innovations. We can also entrust the universities with a number of research projects.

New Glossaries

During recent years, there have been serious attempts for evolving glossary of technical terms. Still the pace of compiling glossaries has to be quickened. Hundreds of new terms are regularly coming into use. It is best for us to adopt them. As they are accepted internationally instead of inventing tortured local equivalents. The goal must be for a number of information clearing houses which facilitate a quick transit of ideas.

Improving the Status and Salary of teachers

The whole superstructure of technical education will collapse due to shortage of competent scholarly teachers. The salary and service conditions of teachers should be improved and the importance of the role of a teacher in the nation-building should be recognised. It will also be desirable to set up an all India cadre for engineering colleges; it is in vogue in other services. The notion that an engineer in a factory is more productive and more important than a lecturer in engineering institutions is far from the truth and should be removed. These steps will ensure the mobility of academically qualified and professionally experienced staff to the teaching profession.

Proper Workshop Practice

The technical institution with its workshop and laboratory is, no doubt, the main centre of instruction, but real practice and experience can be given in outside workshops, factories and farms only. Efficiency in technical training largely depends on a proper co-ordination of these two scenes of action. As such practical training and apprentice schemes should be properly organised and coordinated with education at workshops, schools, and technical colleges. The central and state
Governments can spare some of their productive units for such purposes, and should see that technical institutions get adequate facilities for such a type of work.

Active co-ordination of the private sector should also be sought for providing workshop practice. Without incurring much expenditure, the industrial concerns (both private and public) could open practical training departments in their industrial plants and conduct technical training programmes like “Blitz Training of Scandinavian Models”. The cost so incurred by the individual units for training their workers will be automatically compensated by the increase in the efficiency attained by the workers through such training in the long run. Tax incentives may also be considered for conducting such training by industries.

To circumvent difficulty in the way of getting foreign exchange allocation in the import of laboratory and workshop equipments, it may be worth to make these equipments and tools as far as possible indigenously and thereby saving foreign exchange.

Co-operation between Industry and Technical Education

In the planning of technical courses and their contents, the industry should, therefore co-operate actively with the institution. This co-operation may be in the form of releasing staff for short periods to take up teaching assignments in colleges. Requirement of engineers who have actually done practical design and development work as part-time professors may help to get a proper feedback from industry.

Professional institutions must also provide the necessary facilities for the continuing education of the practising engineers. These institutions must hold frequent discussion on technical problems encountered in day-to-day work as they will not only be useful but enlighten the young engineer with an approach to practical problems.

Accreditation and Co-ordination

It is high time that a system of accreditation of national level should be strengthened. Unless the political influence of the State Governments (where the institutions are located) is reduced, the quality of our technical education cannot be improved. One of the suggestions to avoid political influence is to have an All India cadre for Engineering Colleges as it is vogue for other services. Reforms in the system of examination can be implemented only if the institutions are given autonomy in their internal administration and to award their own degrees. AICTE may consult professional bodies like the Institutions of Engineers (India) and the Indian Society for Technical Education (ISTE) before launching such a programme.

6.6.0 SUGGESTION FOR FURTHER RESEARCH

A research being a time bound programme, often fails to comprehensively address the problem proposed to evaluate. Besides, during the process of research the investigator discovers various other dimensions that, if addressed, could have revealed a better result. But due to fear of deviation and the need to achieve the degree in the stipulated time often restricts the investigator to experiment. This leaves a great scope to progress the research further on a issue but viewed from a different dimension and considering various other variables.

1. In the present, the researcher has covered all the 8 states of NER. However, it is suggested that such type of study may also be conducted by taking each individual states of NER.
2. It is suggested that the management of technical institutions of NER may also be taken as a research study.
3. Further, it is also suggested that the study may be conducted on different variables like financing of technical education in NER.
4. Specific studies may be undertaken on the library information services, networking, library consortia, and library automation issues of technical institutes of NER.
5. Also, a comparative study on technical education between NER of India and the NER of neighbouring countries like – Nepal, Bhutan, Bangladesh, Myanmar & China will also be an interesting study.

6. The enrolment of foreign students in the TIs of NER is also expected to make a significant study.

7. Research may also be conducted by comparing the growth and development of technical education of NER with other states and with national norms.

There may be many more issues to research with, but the researcher in course of his study felt the above mentioned study to be important to study the technical education issues of NER.