CHAPTER III

ENGINEERING EDUCATION AND PROFESSIONAL STRESS – AN OVERVIEW

3.1 INTRODUCTION

Indian Engineering Education represents one of the largest educational systems in the world. The challenges posed by this rapidly growing system in our country are extremely complex. Engineering education is facing a number of challenges with increasing societal, organizational and professional student’s demands. This has a direct effect on the academics who are constantly striving to find ways to improve the effectiveness of their teaching. Developing countries like India needs high quality faculty members in turn to improve the teaching and learning of engineering subjects, necessitating the environments for effective professional development. However, many professional development programs for engineering faculty fall short because they fail to consider the faculty needs.

The system of education and teacher education established by the Indian Government is continuing without substantial modification. It was feared that an abrupt departure from the existing system might bring about disruption and destabilization. But as the situation improved, greater attention was paid to education and teacher education. The first step in this direction was setting up of the University Education Commission (1948), which made valuable suggestions regarding pre-service and in-service education of teachers.
and linking the programme of teacher preparation with the university system.

Today there are more than 2300 Engineering Institutions in the country turning out more than 6,00,000 engineers every year. Five Indian states - Tamil Nadu, Andhra Pradesh, Maharashtra, Karnataka and Kerala - account for 69 per cent of India's engineers. Uttar Pradesh, Bihar, Gujarat, Rajasthan and Orissa account for only 14 per cent. But despite the rise in colleges, the quality of Indian engineers is questionable on account of the lack of trained faculty and dismal state spending on research and development in higher education, as engineering education grows, its quality has to improve (Madhavan 2010).

The professional development of faculty members is a highly relevant topic at this time, when calls for institutional improvement are on the daily agenda. Since engineering subjects have been assigned a key role for future innovation, moreover building the basis subject for many other disciplines, professional development of engineering faculty is implicitly in the focus of any reform endeavor (Sowder, 2007; Lerman, 2001). Much research has been conducted in the area of teacher education.

However, while the knowledge base about learning and teaching engineering subjects as well as effective professional development is growing, conditions that hinder successful progress are still prevalent (Loucks-Horsley, Love, Stiles, Mundry and Hewson,
Finally, the first International Handbook of engineering Teacher Education (Wood, Jaworski, Krainer, Sullivan & Tirosh, 2008), solely dedicated to engineering teacher education, appeared in 2008.

3.2 EVOLUTION OF ENGINEERING EDUCATION IN INDIA AND ITS CURRENT STATUS

According to Government of India Report (1964) the development of human resources in the form of properly trained scientists and engineers has been the most essential prerequisite for sustained industrialization. This has led to the massive expansion of technical/ engineering education in India up to the highest levels. According to Council of Scientific and Industrial Research’s (CSIR) report (1984-1989) India was exploited by the Britishers before independence for their own interests. They have not taken any interest in the establishment of engineering institutions in the country. But after independence, there has been tremendous growth in engineering institutions. A total of 46 engineering and technology institutions were established by the time India attained independence in 1947. Most of them were having only bachelor’s degree level programmes. Four of them had Master’s degree level programmes also. However none offered the Doctorate degree programme.

Soon after independence India launched a programme both for expansion and diversification of engineering and technology education. In the 18 years between 1947 and 1965 the number of
engineering and technology institutions increased 3 fold. Between 1950 and 1965 on an average, 6 new institutions were established each year. Between 1965 and 1983, there occurred a doubling of engineering institutions. More than 20 engineering institutions were added each year between 1980 and 1985. In 1989 there were 383 institutions offering various types of tertiary level courses in engineering. Majority of them (372/383), offered bachelor level engineering education. A total of 143 institutions including the 11 which did not offer the bachelor level courses were giving either master’s level degree courses or post graduate diploma courses in engineering. Seventy four institutions offered doctorate level courses.

In 1945 the Sarkar Committee was appointed to suggest options for advanced technical education in India. The Sarkar committee recommended the establishment of higher technical institutes based on the Massachusetts Institute of Technology in the four regions of India. This resulted in the setting up of the five Indian Institutes of Technology at Kharagpur (1950), Bombay (1958), Kanpur (1959), Madras (1960) and Delhi (1961) (Delhi was added on to the original four). The All India Council for Technical Education was set up in 1945, to oversee all technical education (diploma, degree and post-graduate) in the country.

Sarkar Committee(1945) was set up to study Higher Technical Institutions for the Post-war Industrial Development recommended setting up of Indian Institute of Technology.
Thacker Committee (1959-61) was set up to study Post-Graduate Engineering Education and Research recommended funding for 100 Ph.Ds annually.

Nayudamma Committee (1979-80) looked into PG Education in Engineering and Technology recommended PG minimum qualification for Industry and R&D.

Nayudamma Committee (1986) reviewed IITs in India and recommended greater flexibility in Academic Programme, focus on Engineering Research and Faculty Mobility.

According to Chatterjee (1986) only an industrialized economy can provide sufficient resources for the balanced satisfaction of wants of all sections of society and engineering education can play a very significant role in this regard.

Chugh (1992) and Sonda (1998) prove that with the impact of information technology and integration among the nations the importance of engineering education has increased much. Chugh lists three significant opportunities for India in the emerging scenario if it can produce required number of engineers & technocrats.

i. Opportunity to become the premier production centre of the world.

ii. Opportunity for Indian corporations to go into world markets and to become India’s multinationals abroad.

iii. Opportunity to attract foreign investors to make India their home base for the world markets.
P. Rama Rao committee (1995) was set-up to study Reshaping PG Education in Engineering and Technology recommended 21 Months M.Tech, increased Scholarship Amount, Assured Employment for M.Techs. and National Doctoral Programme.

Qureshi (1996) while reviewing the reports of the TVET (Technical and Vocational Education Training) programmes and case studies of various countries in the Asia-pacific region remarks that there is a growing awareness in countries of Asia-pacific region for the need to adapt technical and vocational education to meet the rapidly changing requirements of the economy at the national, regional and global levels. The significant trends listed by him are:

i. Increased co-operation between technical and vocational education authorities and those in industry and the market place has progressively become a factor in several systems for updating curricula, equipment and facilities, as well as in introducing new programmes and cost-effective delivery approaches.

ii. There is an increasing awareness in the region that new information technologies are essential to improve the effectiveness of TVET systems and to make them more flexible and learner-oriented so as to promote life-long learning process. TVET curricula content is also evolving rapidly.

iii. Course designs are oriented more towards a combination of core and elective components as well as competency based training, so that they are more responsive to the needs of rapidly transforming economies.
iv. Curriculum planning priorities in most countries now place emphasis on the need to link education to enterprises, particularly in regard to orientation and the study of business economics for small enterprises and life-long education.

v. There is a new trend in many countries to provide contextual learning and also integrate traditional disciplines into one single course (for example, "mechatronics" based on mechanics and electronics).

vi. There is increasing emphasis in some countries, especially in Australia and New Zealand, on preparation of multi-skilled work force, providing job experience required for upgrading of skills, creating mechanisms for the recognition of existing qualifications and credit transfer, introducing competency-based training, and promoting retraining.

vii. In some countries, such as the Republic of Korea and Singapore, training content is increasingly selected not only for its relevance to specific jobs but also for job clusters, as well as for the transfer to jobs from related areas in business and industry.

**R.A. Mashelkar Committee (1998)** was set up to draw a Strategic Road Map for Academic Excellence of Future Regional Engineering Colleges recommended conversion of RECs into NITs with status of a Deemed to be University and structural changes in governance.

**Sonda (1998)** explains that the advent of information technology has played an important role in the field of engineering education. Many changes have taken place after the introduction of
Information Technology like rapid increase in number of engineering and Information Technology colleges, massive increase in student’s admissions, growing emphasis on newer areas like electronics and telecommunication engineering, etc.

**Walia (1999)** has studied the development of education and socio-political change in the Punjab from 1882-1947. He has found that it has been not British Government’s aim to bring advancement in technology but their need that vocational schools and colleges were established. The scientific training has been so poor in the pre Independence times that until lately, a man might become a B.Sc. without having touched a test tube. No adequate facilities existed for engineering education which otherwise is a significant branch of the technical education.

**Ahluwalia (2002)** reveals that private rather than public investment has been positively and significantly correlated with state level growth rates in engineering education in the fourteen Indian states that he has studied. He views that private organizers are taking a keen interest in opening new engineering institutions to earn big profits.

**Kukreti (2003)** maintains that independent India has paid a lot of attention towards the growth & development of technical education after 1947. The southern region has the largest number of technical institutions at all levels–MCA institutions, degree and diploma level institutions. Out of total 865 institutions running MCA courses in
India, about half of the total numbers i.e. 432 are situated only in south, whereas part of India had only 42 such institutions, which 4.86 percent of the total. After 1950-51 the number of girl students in engineering institutions has increased rapidly, but in comparison to boys enrolment in these institutions the proportion of girl’s enrolment is not satisfactory.

According to Praveen (2003), there is a real boom in growth & development of engineering education since 1980. Not only is there an addition to the number of institutions with corresponding increase in the intake and out turn, there has been significant addition of new courses to existing ones from time to time. He also describes that employment opportunities for engineers also vary from state to state.

Srivastava (2003) views that facilities for technical education specially engineering education in different states need to be related with parameters like population, net state domestic product, enrolment in XII class in science stream, employment and new emerging technologies. While developing the facilities developed during the last 10 to 15 years these parameters have not been taken into account rather the policies for development of engineering education have been based on infrastructure norms and standards, controlled by statutory bodies. Those policies have been financially highly rewarding. Indian society had got ample access to socially acceptable technical education. But on the other hand, in the absence of demand and supply mechanism unbalanced growth has taken place.
U. R. Rao Committee (2003) was set up to Revitalizing the Technical Education recommended Regional inequities to be removed, faculty shortage to be addressed, need for planning and coordination in the working of the AICTE.

P. Rama Rao Committee (2004) was set up to Review IITs in India recommended Increase UG output of IITs, fund infrastructure increase, and add new IITs but maintain quality.

A study conducted by Dhawan (2004) depicts that 2000 seats are vacant in engineering colleges especially in Haryana state. The institutions authorities can fill these seats at their level’s best but the national level tests are mandatory, therefore the institution are not permitted to do that, consequently has been age of resources is there.

Banerjee (2004) says that due to globalization and structural changes the country needs skilled persons. There is no doubt that many institutions are being opened by private enterprises, but the distribution pattern of these institutions is skewed in favour of the south and the south west.

Kumar (2005) reveals that shortage of technical manpower will have an adverse effect on the industrial as well as economic development of the country where as surplus may cause among other things, unemployment in such highly qualified manpower and also involve has been age of time, money and energy spent on its development. The study observes that electronics engineers will be in surplus even if the admissions to the course of the degree level is
maintained at the current level. Hence, there appears a need to regulate admissions to the degree level programmes to electronics engineering so as to avoid mismatch between demand & supply, both current & prospective.

A report given by **Sharma (2006)** depicts that the AICTE has reduced the total number of seats in some private colleges in Punjab due to lack of proper infrastructure. Although he treats it as a wakeup call for the engineering institutions to equip themselves as per the norms of the statutory body.

**A report of AICTE (2009)** has revealed that it has planned to assist financially those engineering institutions which are situated in those areas where the educational institutions lag behind the advanced states. The council has envisaged the following schemes to overcome the problems.

1. Modernization and Removal of Obsolescence (MODROBS)
2. Staff Development Programme (SDP)
3. Emeritus Fellowship (EF)
4. Entrepreneurship Development Cell (EDC)
5. Industry-Institute Partnership Cell (IIPC) especially for initiating skill development programmes and activities.

The council has also stressed the need of establishing engineering education to the underprivileged section of society in which rural, female and backward classes would be especially assisted.
Central Advisory Board of Education (CABE) (2009), in its fifty fifth meeting, has noted that the Government has decided to set up eight new IITs in Andhra Pradesh, Bihar, Rajasthan, Orissa, Punjab, Gujarat, Madhya Pradesh (Indore) and Himachal Pradesh. Out of these 8 classes for B.Tech courses have been started from July-August 2008 in 6 new IITs in Andhra Pradesh, Bihar, Rajasthan, Orissa, Punjab and Gujarat. These are being mentored by the existing IITs in Madras, Gawahati, Kanpur, Kharagpur, Delhi and Bombay respectively. Classes of IIT Andhra Pradesh, Bihar and Gujarat had been started from temporary premises while the classes of Rajasthan, Orissa and Punjab have been started from the campuses of their respective mentoring IITs. Sites for new IITs in Bihar and Andhra Pradesh have been identified at Bihta in Patna and Medak respectively. Committee for identifying the sites, has visited the sites suggested by State Government of Madhya Pradesh (Indore), Punjab), Orissa and Himachal Pradesh. It has been decided to start the classes the B.Tech courses in IIT Himachal Pradesh and IIT Indore from academic year 2009-10. To address the increasing skill challenges of the Indian IT industry and growth of the domestic IT market, the Ministry of Human Resources Development (MHRD), Government of India intended to establish twenty Indian Institutes of Information Technology during 11th Five Year Plan Period, on Public Private Partnership (PPP) basis.

It has also been noted that the process of opening of new NITs has already been initiated. In this regard Hon’ble Union Minister of HRD had written letters to Chief Ministers of 10 states / UTs which do
not have a NIT to send proposals for opening of an NIT in their states / UTs vide letter 19.07.08. Approval had also been granted for the establishment of Ghani Khan Chaudhary Institute of Engineering and Technology (GKCIET) Malda in memory of Late Shri Ghani Khan Choudhary, former Union Minister.

A news report in Hindustan Times (2009) states that the University Grants Commission (UGC) which is a regulator of higher education in India, has planned to rein in skyrocketing fees in Deemed Universities and make their controversial admission process transparent. The report quotes the chairman of UGC Prof. S.K. Thorat commenting that “No government regulations are applicable to institutions runs by Deemed Universities”. The 127 Deemed Universities run around 200 medical, engineering and management colleges around the country. Prof. Thorat has explained about the new plan of the UGC for the Deemed University that either they would have to pick upto 80 percent of their students from the existing all India engineering and medical tests or they would have to start their own entrance examination system and the rest 20% seats would be left for management quota.

A public notice (2009) has been given through the leading dailies of the country titled, ‘Attention to AICTE approved technical institutions, regarding matters concerning charging of fees, refund of fees and other student related issues’. The notice has been issued with the aim to alert the AICTE approved technical institutions which do not follow the instructions given by it regarding commercialization of
technical education. It has been mentioned in this notice that some AICTE approved technical institutions have been admitting students to technical education programmes long before the actual starting of an academic session; collecting full fee from such admitted students; and, retaining their school / institutions leaving certificate in original to force retention of admitted students. AICTE has warned the approved institutions not to indulge in such commercial activities and it has been stated that if any institution is found guilty of not following these instructions a punitive action could be taken against it.

Prof. Yashpal Committee (2011) submitted its report to HRD Ministry in June 2011 wherein recommended that the deemed university status be abandoned and that all deserving deemed varsities be either converted full-fledged universities or scrapped -- and a GRE like test be evolved for university education. The committee said a plethora of regulatory bodies like UGC, AICTE, NCTE et al be replaced by a seven-member Commission for Higher Education and Research (CHER) under an Act of Parliament. It has also recommended, obviously, buffer the new regulator against political pressures, that the position of chairperson of the proposed commission be analogous to that of election commissioners. Expressing concern on the mushrooming of engineering and management colleges, that had "largely become business entities dispensing very poor quality education", Yashpal committee lamented the growth of deemed universities and called for a complete ban on further grant of such status. Existing ones, the committee said, should be given three years to develop as a university and fulfil the prescribed accreditation norms.
Despite several failures in the past, Union Government is committed to the cause of promoting research in Science and Technology sector. Keeping the priorities of Union Government in mind, the HRD ministry has constituted a high-level advisory committee to look into the possibilities of promoting research in universities and other institutes of higher education in the next five-year plan. HRD ministry has instructed the advisory committee comprising of Chairman of Jawaharlal Centre for Advance Scientific Research Bangalore Professor Rodam Narsimha, IIT Kanpur Professor Ashutosh Sharma, National Centre for Biological Sciences Professor Vijay Raghvan, Secretary Biotechnology Department Dr MK Bhan and Dr Anil Kakodkar to submit its report in the next four months. The recommendations made by the committee will help in drafting the policies to promote research in the 12th five-year plan. According to sources, the committee will examine methods to attract the younger generation towards research, study the problems faced by research scholars and suggest solution. To ensure that finance does not act as a constraint in research programmes, the committee has been directed to look for ways to attract investors. The committee faces the task of searching long term investments in research sector so that the projects remain undisturbed after the 12th five-year plan.

3.3 STATE OF ENGINEERING EDUCATION IN TAMIL NADU

Number of engineering colleges in Tamil Nadu is now around 570 (Not many people seem to know the exact number of engineering colleges in Tamil Nadu due to the number of colleges increasing every
It is reported that at least 35,000 to 40,000 seats in engineering colleges go unfilled in the recent years. Such trend is likely to continue in the forthcoming academic year also.

What is surprising is that in spite of the presence of many engineering colleges in the state and the seats not being filled due to want of students, more engineering colleges are sought to be set up in the state.

Even amongst the 1,50,000 odd students in the state engineering colleges, as many as around 30 percent of the students are reported to be recording poor academic performance and fail in one or more subjects every year and get degree only after writing arrear examinations several times. These conditions indicate that there is deep inadequacy and flaw in the engineering education in Tamil Nadu, which call for urgent remedial steps and correction. Many private engineering colleges in Tamil Nadu appear to be facing some basic issues.

### 3.3.1 Quality of engineering education

Various institutions of technical education play their role significantly in the economic development and social advancement of the country. The scientists and engineers of today are expected to anticipate, predict and be prepared to solve the future problems. There is a need to review the engineering education system in order to maintain the quality of education.

According to *Kothari Commission (1964)*, Engineering Education plays an effective role for industrialization. The success of
industrialization depends upon ability and skill of the workers that further depends upon the quality of engineering & technical education provided to them. The commission has recommended that 20% of the students after receiving their education at the secondary stage and 50% of the students after receiving their education after class X must have adopted professional and technical courses by the year 1986. The commission has also recommended that an eminent educationist should be appointed on the post of the president of the Board of Governors of Regional Engineering Colleges. The Principals of the colleges should be fully empowered to provide educational facilities in their institutions. Practical training should be imparted in the third year to the students of degree courses. In workshops, emphasis should be given on production works. The curricula of the degree should be determined keeping in view the changing needs. The system of frequent transfers of teachers in Government Engineering Colleges should be stopped. The acid test of the success of technical education lies in the quality of the training. NCERT studies (Sen Gupta, M. and Dhote, A.K.1990, Chopra, R. 1990, Mishra, C.K. and Verma, B. 1990, Sacheti, A.K. and Vaid, D.K. 1990) in many states have brought out the fact that while a few institutions have organized effective training in each of the states, the quality of practical training has left much to be desired in the majority of institutions in a number of states. Issues like provision of entrepreneurship and self employment support, availability of suitable instructional material and teacher training, employee’s assessment of quality of training, performance of Vocational & Technical products, on the job training and apprenticeship etc. if studied in depth and feedback is given to the
system highlighting the weak points, qualitative improvement can be brought about by undertaking suitable definite actions.

Raviparkasha (1991) has stated that all the engineering institutions in India are facing problems of quality. There is scarcity of qualified and experienced staff. Due to paucity of funds the quality and social relevance of education imparted in our institutions remains quite low and has been deteriorating.

According to Sharma (2001), engineering education is faced with many problems such as low quality, lack of practical experience, no intimacy with industry, old and defective curriculum, problem of medium, problem of administration and control, problems relating to research, unemployment etc. and in order to have qualitative improvement these problems have to be checked.

Shrivastav (2003) has described that there is a shortage of teachers in engineering colleges. Country will need about one Lakh teachers for degree level institutions by 2006, against existing 35000 teachers today. The intake capacity of degree level is expanding at a very fast rate but rate of supply of teachers has been extremely slow. As per AICTE norms, professors and readers must possess Ph. D. and accordingly we need about 40 thousand Ph. D. qualified teachers. According to a study, India has awarded only 10,000 Ph.D. degrees in engineering since 1966 till 2000. 75% of these were awarded by IITs and IISc. It is estimated that at the rate of awarding 600 Ph. D.’s per year by 2005 the total number would reach to 13000. All (Ph. D.)
degree holders don’t become teachers. The study also revealed that 75% of our Ph.D. qualified teachers are working in all IITs, 10 – 12 Technical Universities and 17 Regional Engineering Colleges. By and large only lecturers either qualified or experienced are teaching subjects of modern technology areas. Several of them are only fresh graduates. Very few are post graduates. These teachers are also not paid pay & allowances as prescribed by AICTE. They may be on contract for ten months and are paid renumeration on period basis. There are also no qualified paper setters and examiners, resulting in delay of declaration of results by the universities which further leads to poor quality of engineering education.

Hariharan (2003) views that due to various reasons there has been deterioration in the quality and standards of technical education. It is primarily due to insufficiency of financial input to system. The efforts of WTO to include education in the GATS agreement should be taken seriously due to competition with other countries. Indian educational institutions must prepare to appoint specialized faculty and to implement research oriented curriculum etc.

Karuppayal (2003) opines that barring a few institutions the majority of the institutions, which have opened, their shops at multiple locations do not offer excellent program worth the fees they are charging. Most of the engineering institutions that run the fashionable courses for high fees, lack in infrastructure or in qualified and experienced faculty. The program is taught by under qualified or faculty hired on contract basis. The teachers many times are fresh
postgraduates who are paid meager salaries that may be less than that of an unskilled worker. Some times retired teachers are hired. These are exploited and are at the mercy of their management. Often the syllabi are excellent but taught by ill qualified or less qualified people. Research has taken a back seat in many of the institutions where faculty recruitment has not happened for many years. In places their contributory teachers handle classes; research is out of question. This has greatly affected the quality of the students coming out of these institutions. The idea that quality may improve due to private participation has proved to be untrue. Privatization in engineering institutions in our country has clearly become a license for money making and exploitation.

**Kulandaisamy (2003)** has argued that all engineering colleges be granted academic autonomy and gradually do away with affiliated colleges to Universities. As a first step all leading private institutions must be converted as deemed technical universities. Market forces will ensure that only those maintaining quality will survive by attracting good students and faculty. AICTE should ensure that all private colleges maintain stipulated quality. Present status on this front leaves much to be desired. Periodic monitoring and assessment must be carried out to maintain or continue their recognition / approval.

**Human Resource Developments Report (2003)** illustrates that both government and private initiative in setting up institutions in north-east region on self financing basis by Trusts and Societies is being encouraged. Granting autonomy is the other recommendation
for those institutions possessing adequate infrastructures and complete faculty which are accessed through accreditation of the programmes and expert committee. Major concerns like delay in admission, delay in beginning of academic session, reduction of academic days required for semester, non uniformity in basic structure of curriculum etc. have been alleviated. It has also been recommended that heads of technical universities will be eminent experts in the field of engineering education. Another recommendation of the committee is that shortage of funds could be tackled through generation of resources by the institution

**Hariharan (2004)** is of the view that in the developing countries, engineering education and the people responsible for it are being increasingly criticized for not being in tune with the practice of the profession. The main difficulty appears to involve a mismatch between the education imparted in the technical institutions and the activities of the engineers in the industry. It is often pointed out particularly by industry that much of our engineering education is irrelevant because most of the engineering teachers are not practicing engineers.

**Vishwanathan (2004)** reports that the Subramani Committee (The Permanent Committee for Common Entrance Test for Private Educational Institutions in Tamil Naidu) ordered on June 14, 2004 that admission to engineering colleges under the management quota should be done under the Single Window System and that the consortium of self–financing professional colleges in Tamil Naidu should conduct the common entrance test for admission to all self–financing
Engineering Colleges in the state. Referring to the specific conditions lay down by the Supreme Court the committee said, “Merit has to be assessed only on the basis of one test”. The managements of several self-financing engineering Colleges have challenged the orders of committee.

According to Dharamvir (2005), “India has a large pool of world class institutions but not enough world class institutions. Admission in these institutions assures students of a good career and migration to many foreign countries. It is but natural for aspirants to cash on this brand”. He further appreciates the present IITs, because of their excellent faculty, diversified courses and a foolproof system of examination. He is of the view that some more IITs should be established in order to produce highly qualified and fully efficient engineers of the type of world-class institutes M.I.T. in the US. The author has also suggested that some top most management courses may also be started in these institutions.

Kashyap’s report (2005) reveals that AICTE has asked 73 institutions in Maharashtra to reduce their intake capacity by 5375 seats. The reason behind this move is poor infrastructure and shortage of faculty in the engineering institutions.

Singh (2005) throws light on the poor quality of engineering education system. Most of the colleges are unable to function according to the norms prescribed by AICTE. AICTE should ban the opening of new colleges because these colleges have no proper
infrastructure. He suggests that AICTE should implement grading system for evaluating the college functions. The institutions should present their annual reports as instructed by AICTE. AICTE should launch a fellowship scheme for initiating master degree programme.

**Ghose's (2006)** study revealed that in most of the places of excellence that currently exist in India, salaries were not the most critical factor in determining the quality of or success of the faculty. He also emphasized the importance of academic and other freedoms, social dignity and physical facilities, etc.

**Sandhu (2006)** reports that the mushrooming of private institutes in Punjab after the setting up of PTU looks like blessings for the state youth; considering the phenomenal growth in IT industry. The quality of education being provided by the institutions affiliated to PTU, coupled with government apathy, and would only produce an army of educated unemployed. But at the same time, if the university took it upon itself to improve the standards of education by upgrading the infrastructure, appointing quality teaching staff and redefining the syllabus.

**Sridhar (2006)** is of the view that when institutions of foreign countries enter engineering education in India. They are sure to provide better facilities to the students of engineering in every respect. The Indian engineering institutions will have to compete with them. They will be only successful if they provide better facilities to their wards.
Kumar (2008) has found that most of the private engineering institutions do not provide competent and qualified faculty because they do not want to pay the required salary to the well qualified teachers. The qualified engineers prefer to serve the private companies where they are paid much more than these institutions in the form of salaries and other perks.

In a report in Hindustan Times, Malhotra (2009) has revealed that the parliamentary standing committee on Human Resource Development had wrapped the All India Council for Technical Education (AICTE) for “It’s failure to effectively regulate technical education and virtually restricting its role to granting approval for starting new institutions”. It is also reported that the committee headed by Janardan Dwivedi found that the apex body had failed to check the commercialization of technical education. The committee also stated “there are allegations about corrupt practices, including exchange of money over wide-ranging aspects relating to admissions, recognition and approval of new institutions and courses. There is a lot of commercialization especially in engineering and management institutions. Different courses attract different rates the AICTE is also responsible for not regulating capitation fee”. The committee had also asked the council to take a suitable action against such institutions to Safeguard student’s future.

3.3.2 Equality of opportunity in engineering education

Universal Declaration of Human Rights (1948) in Article 26(1) states that “Everyone has the right to education. Education shall be free at least in the elementary and fundamental stages. Elementary
education shall be compulsory. Technical and professional education shall be made generally available and higher education shall be equally accessible to all on the basis of merit”. But such equal access has not been available to the Indian students especially in the field of engineering education which can be concluded from the following review of the related literature.

Shah (1964) reveals that the students of engineering & technical education came largely from upper caste families, residing in urban areas. Their parents were generally better educated and were largely occupied in high status occupations.

Bottomore (1964) has stated the differences which originate in economic inequalities are enhanced by engineering and technical educational differences.

Naik (1982) describes that in the developing countries like ours, technical education is considered as a speedy vehicle for upward social mobility especially by the socially and economically deprived and under privileged sections. But, in most of the cases the upper & middle income groups demand it more forcefully then other social groups. Nevertheless as indicated by the research studies people belonging to upper socio- economic classes have been the main beneficiaries of technical and engineering education system in India.

Chitnis (1987) has pointed out that engineering courses have been considered more prestigious since they lead to high income and
high status occupation. Admission to such courses has been based on stiff competition. Children from poor families are likely to lose out in this competition.

Regarding the socio-economic status of women participation in engineering and the choice of their trades and placement status has been made by Parikh and Sukhatme (1992) show that the percentage of women enrolment in engineering institutions has increased manifold in the last two decades but their share in IITs, REC, NITs has remained low. The electrical engineering is the most preferred branch followed by electronics, civil and computer, etc in case of women.

Kaul (1993) reveals that in the field of engineering education the dominant castes and classes have played a role in developing engineering education in Karnataka but this role is limited to consideration of caste and class politics, contending the right to equality in Indian constitution. A very high capitation fee is charged from the students and obviously the rich students belonging to the elite class can easily pay it but the lower and poor castes and classes cannot pay capitation fee therefore they cannot get higher and technical education despite the fact that a number of students among them are even more competent as compared to the students of higher classes who get admissions in various trades of engineering in various colleges of the state.

As far as equal opportunity for all the Indians in higher education and especially technical education is concerned, Chauhan
has described the situation in detail. “Prior to independence higher and technical education has been available only to the children of well to do families who found a microscopically small section of our population. Even now the situation is not very different. Research studies conducted by Government organizations have shown that more than 80% of the secondary schools pass outs and over 70% of University graduates come from the top 20–30% of the income groups. But the system of higher and technical education is heavily subsidized from the public exchequer to which poor masses make the largest contribution by way of direct or indirect taxes. This shows that the poor people who are deprived of education of all kinds are faced to pay for the education of the well to do through subsidy. This justifies the reduction of subsidy and enhancement of fees. In a democratic society, poor people cannot be taxed for the benefits of the rich.”

Kukreti (2003) has investigated that the number of girls admitted to engineering institutions has not increased at the rate at which the number of total student intake has increased.

Bhunia (2004) has opined that several educational commissions including Kothari Commission have argued for active industry and institute interaction for effective research and development. In this context private institutions play a positive role. He has also observed that in India most of the private engineering colleges offer courses in computers, electronics, IT & other subjects like mechanical, electrical, civil etc. The imbalance so created will have adverse effect in future both in terms of availability of engineers of proportional level and in related expertise and development. The
high tuition fees of engineering education in private sector will encourage only affordable societies to opt for. The meritorious poor students will not benefit from these educational opportunities offered by the private institutes. He also suggests a few possible solutions. According to him the solution lies in the proposed Institute-Cum-Industries (I-C-I). He also tells the idea that to change the admission procedure for engineering education in the changed scenario, the students may be admitted with no branch, after two years of common studies based on grade points earned and choice, the discipline may be allotted.

**Mullick (2004)** report reveals the tragic situation regarding equality. Almost all the colleges and university teachers belonging to PUTA (Punjab University Teachers Association) declared that, “The writing is clear on the wall. If you belong to a lower or middle class background then you would better forget about higher/technical education”. He further explains that it is because of the fact that the government wants to spend even less than 3% of GDP which is the current measure”. They stress upon self sufficient courses in which the students should bear all the expenditure which is becoming problematic even for the middle class groups not to speak of the labor classes.

**Shetty (2006)** is of the view that reservation policy has made no negative effect on quality of the engineering education especially in IIT’s. He also underlines the importance of giving the deprived a
chance to display their talent. According to him quality of faculty must be the main focus of any engineering institution.

### 3.3.3 Financing of engineering education

**Mathur (1987)** report reveals that the contribution of technological change in the economic growth in India has been quite significant. But the level of financing of engineering education is far from satisfactory.

**Dhananjaya (1992)** has given a very important suggestion regarding financing of the Indian engineering education. He is of the opinion that engineering education should be financed by a government sponsored bank called Educational Development Bank of India. It will be beneficial to both the financing institutions as well as to the institutions imparting engineering education.

**Bordia’s (2000)** study reveals the trend in funding Technical and Vocational Education (TVE). Bordia finds that during the past decade, funding mechanisms for universities and technical education institutions and colleges have undergone massive restructuring in developed and developing countries alike. Governmental support has generally decreased, resulting in greater reliance on fee-based education or creation of privately sponsored engineering/technical colleges or universities. The following are some of the trends that will likely result from changes in the funding of technical education:
(1) export of education will become an important component of the economics of advanced, rich countries such as Australia, New Zealand, the United Kingdom, and Canada;
(2) privatization, commercialization, and marketing of education, especially business, commerce, and information technology will increasingly play a dominant role in developing countries;
(3) Quality management in developing countries will also move away from government monitoring to professional monitoring, as is now the case in developed countries;
(4) The quality of education in developing countries will eventually be determined by market forces;
(5) educational funding from individual family budgets will become increasingly difficult in developing countries as privatization results in increased fees; and
(6) Education will move from being a totally governmental activity to a more commerce and industry-based activity and will eventually become a service industry.

Ambani and Birla (2002) in their high power report to the Prime Minister on the policy frame work for educational reform suggested that the government can concentrate on primary education sector as per constitutional guarantees and perhaps focus secondary education area too, totally leaving higher and professional education to the private sector. They felt private self-financed universities by legislation is perhaps the answer to the malady.

Hariharan (2003) is of the view that the deterioration in the standards of engineering education is primarily due to insufficiency of
financial input to system. The central and state government should take to the responsibility of adequately financing the system. The institutions and the management should also take steps to generate more funds by their own initiative. The educational authorities must study the system of regulation and accreditation of educational institutions in foreign countries.

According to the views given by Shaikh Saleem (2003) the Government of Maharashtra has been wrongly interpreting the Honourable Supreme Court’s Judgement. In this context Government of Maharashtra’s Higher and Technical Education Department issued a resolution dated 16th April, 2003 regarding the establishment of Educational Institution Regulatory Authority for private aided/non aided educational institutions. It is also shielding its responsibility of giving grants to the aided institutions. The government is trying to shift the burden of college expenditure of salaries and non-salaries on public by enhancing fees under Educational Institution Regulatory Authority. As a result the poor public will be deprived of technical education.

Natrajan (2004) has suggested that technical education should follow all the guidelines by AICTE regarding fee structure. But all the guidelines should be in the form of suggestions and not in the form of order to the institutions. The institutions should adopt a fee structure that is viable for the institutions as well as the students.

Indersen (2004) has stressed upon the need to restrict admission in technical education. He draws attention to two cross
currents. One rapid increase in emoluments is tempting more and more youth to join technical education program which offers the best prospects for high wages and the second is dismal growth in employment. According to him the current enrolment should logically be round 200000 for engineering and architecture, which should correspond to an annual intake of barely 50000, seven times less than the sanctioned figure which he admits that these figures are subject to correction, there is a gross mismatch between what the economy can support and what has been sanctioned by the AICTE and that at least in future the AICTE should as a matter of justice approve expansion of education on a rational basis, and not merely respond to speculative demand to start more courses. He further feels that fees in technical institutions should be pegged to 30% of India’s per capita income, or Rs.6000/- per year and that annual fees charged in private engineering colleges may be even described as anti social. Such high fees he feels is the consequence of the state virtually absolving itself of the responsibility to fund technical education and handing it over to self financing colleges where the students are expected to bear the full cost. He feels that it is unjust and even unwise to make engineering education unaffordable to able but poor students.

According to Rajpurohit (2004) the route to finance Higher Education for students is to make available abundant loans. With corporate scholarships not available in most of the Higher Education institutions and available only to a select few in the reputed institutions, educational loans from banks is the most viable option to students coming from middle income families. On bank loans the
Government of India in consultation with Reserve Bank of India and Indian Bank Association has framed various comprehensive educational loan schemes to ensure that no deserving student in the country is deprived of Higher Education for want of finance.

Varghese (2004) views that there are five different sources of revenue generation (a) Government (b) Students and their parents (c) Industries (d) Alumni and other philanthropists (e) International sources. The contributions from all these sources would include institutional contributions, tuition fees, student’s loans, sponsored activities, chair for academic positions and donations etc.

According to Sethi (2005) the review committee on revitalizing engineering education in Punjab has recommended that the engineering college fee be increased to realistic levels. The committee has suggested that the fee be revised from being barely 1 percent of the recurring expenditure per student per year to at least 20 percent of the recurring expenditure per student per year. The committee has also suggested freeships for economically weak students.

Valiathan (2007) views that due to the financial problems faced by the government, private entrepreneurs must come for opening of new engineering institutions. The government must watch the quality of these institutions and take necessary actions against sale of fake degrees. He also states that the country requires more IITs to control the student drainage.
A report (2008) reveals that hike in fee structure in the institutions of excellence like IITs has been approved. It has been raised from Rs. 25000 to 50000 a year. The reason behind is to facilitate better functioning and finer quality of education. Central Advisory Board of Education (CABE) (2009) in its fifty fifth meeting has noted that an allocation of Rs. 2000 crores has been provided in the Eleventh Plan and Rs. 50 crores has been allocated for 2008-09 for new IITs. One post of Director, one post of Registrar and 90 posts of faculty and 30 faculty posts, per year in the next three years have been created in each of new IITs. Moreover it has also been noted that IISERs (Indian Institutes for Science Education & Research) at Mohali, Pune, Kolkata, Bhopal and Thiruvananthapuram have started functioning from temporary premises. The appointment of Directors of IISERs has been done and allocation of Rs. 150 crores has been allocated for 2008-09 for IISERs.

3.3.4 Placement of engineering graduates

Chowdhary and Nandy (1974) have stated that qualified scientists and engineers occupy a pivotal position in society and at given point of time, the higher the degree of malutilization, the higher is the volume of social disaffection generated by the sections affected by imbalances. They have discussed that there is a mass unemployment in the engineering and technology field. They further say that the impact of social tension is that students who constitute the would be entrants into the labour force tend to develop a morbid attitude towards social goals and practices.
The National Policy on Education (1986) stipulates that graduates of engineering courses will be given opportunities, under predetermined conditions for professional growth, career improvement and lateral entry into the courses of general technical and professional education through appropriate bridge courses but suitable vertical and horizontal linkages on a long term basis have not yet been established although there have been adhoc arrangements to circumvent the problem. Experimentation and research are urgently required to redefine criteria of admission to existing courses, design and develop suitable higher level degree courses, coupled with specially designed placement services.

Mohanty (1992) states that the main aim of a course on entrepreneurship during an engineering degree is to motivate the engineering students and to equip them with the appropriate knowledge and skills which would enable them to launch and manage their entrepreneurship ventures. The teaching of entrepreneurship in engineering colleges will go a long way in broad basing the industrial base of the country. It has the potential to become a force for industrial development based on modern technology and for alleviating the problem of growing unemployment.

The studies conducted by National Science and Technology Management Information System (2003), of Department of Science and Technology reveals a lofty migration rate from IITs and other premier technical education institutions. The basic problem lies with the kind of economic pricing strategies adopted in the country.
Moreover on account of highly rigid structures and a general lack of autonomy in the working environmental lists, there exist very limited challenging opportunities for the young and dynamic talent being produced by engineering education system.

Kukreti et al. (2003) tells that engineering education has perennial significance to import progressive outlook to its citizens. It changes the perspective of human being by providing him a vast domain to choose between suitable job and self employment. In the present highly competitive age when the proportion of unemployed people is higher than ever. Technical education functions as the strongest weapon against this disturbing phenomenon.

According to Mohan (2004) Haryana state has several thousand strong workforces of jobless engineers on the one hand and on the other 2000 seats in engineering colleges with no takers. The vacant seats pose a threat to the financial viability of private colleges. According to news the problem is two fold. One the degrees awarded by colleges hardly carried any value outside the state. Parents are in a fire. They spend lakhs of rupees on admitting their children to colleges but even after that the children continue to be dependent on them albeit with a worthless engineering degree.

Mahajan (2006) is of the view that due to lack of industrialization process in the state of Punjab highly skilled manpower engineers and technicians prefer to migrate to other the states.
Malhotra (2006) is of the view that electronics and communication engineering and computer science engineering are much sought after courses among the students. This study has been conducted in National Institute of Technology (NIT), Jalandhar. Due to the ongoing boom in telecom sector, communication and IT Industry has rate of campus placement [90% to 95%] and ever increasing pay packages offered by MNCs have been noticed. The craze for these courses has witnessed an upward trend during the past five years. The pay packages offered by major players like Infosys, Ericson, range between 2.5 lakh to 5 lakh per annum.

After reviewing the related research literature it has been found that various authors and researchers differ in their convictions and viewpoints about various aspects of growth and development of engineering and technological education in India. It has been inferred, that there has been a phenomenal expansion in the field of engineering education but the unit cost has increased much and the quality of education in general has not been upto the mark. However IITs and other institutes of excellence are still providing qualitative education. Literature on social distribution of engineering education does not signify any positive trend towards achieving the constitutional commitment. While, on one hand the increase in number of institutions suggests that opportunities of engineering education are expanding, but on the other hand proliferation of the privately managed, self-financed institutions restricts economically weaker sections of society from getting admission to these institutions because of very high rates of fees. It has been found in the review that number
of women getting higher education is increasing but it is much below the rate of increase in total sanctioned intake.

Moreover, the review also suggests that financing of engineering education is also facing a number of problems. On one hand a large system of public engineering and technological education requires a huge amount of money to run it properly whereas on the other hand government is squeezing the grants for technical and higher education sector after adopting the new neo-liberal policies. Further, a huge number of trained engineers are unemployed due to inferior quality of training but many of them who get quality education usually migrate to the developed world. All these factors call for a detailed and in-depth study of the growth and development of engineering education in the country in general and the problems posed by the privatization and proliferation of engineering institutions in Tamilnadu in specific.

3.3.5 Quality of the students

In view of huge capacity creation for engineering education, any student who get minimum marks in Plus 2 level and can find money to pay for fees etc., can get admission into engineering college. With so many seats remaining unfilled, there is practically no filtration of the students at admission level. Therefore, many students who join engineering colleges are found to have inadequate merit level to undergo the tough engineering education.

In earlier days, students used to chase engineering colleges to get admission. But, today it is the other way with the engineering
colleges chasing the students to increase the intake. It is rumoured that some engineering colleges even go to the extent of employing middlemen to increase the students strength. This seems to be the reason why number of students from distant states like Bihar, Orissa and northeastern region come to the engineering colleges in Tamil Nadu. In such conditions, while reputed and established engineering colleges get students with merit, most of the other engineering colleges get students whose merit level may not be of requisite standards.

3.3.6 Scarcity of teachers

With the rapid increase in the number of engineering colleges, the numbers of available qualified and experienced teachers are not adequate to meet the demand.

In view of such severe shortage of qualified and competent teachers, many retired professors are re employed for a long period. There is really nothing wrong in this. But, the ages inevitably tell upon efficiency and alert level of these senior professors. There are reported to be seniors in age group of above 70, who are still employed by the colleges as teachers (full time or part time). Those who get superannuated in jobs in industries but without necessary teaching experience seek teaching positions in engineering colleges and get the jobs as part of the second innings in their career. There are also those who have passed out in previous year and become a teacher in the subsequent year and taking full fledged classes.

3.3.7 About management

In recent time, most of the engineering colleges in Tamil Nadu have been set up by politicians, cinema stars and businessmen. It
appears that the top administrative positions in these private engineering colleges have now become hereditary, with the relatives of the promoters occupying the key positions, who may not have the requisite relevant qualification and experience.

As a result, there seem to be a big gap in communication between the promoters and teaching community and teachers sometimes feel “small” in front of the relatives and friends of the promoter occupying Key positions.

It is not to say that all engineering colleges lack quality in Management. Some of them are managed reasonably well but quite a number of others leave much to desire.

3.3.8 Lack of job opportunities

The unfortunate truth is that while numbers of engineers passing out of engineering colleges have increased substantially, the job opportunities for such engineers in the market have not increased in equal proportion.

As a result, the level of unemployment amongst fresh engineers is steadily increasing every year. While the graduate engineers passing with impressive academic record get jobs, those with lesser academic performance have to settle down for under employment or take up jobs in entirely different fields where the engineering knowledge are not required. Such engineering graduates have now been forced to
compete with the science and arts graduates and sometimes even with +2 passed students in job markets.

This has created tremendous level of frustration amongst large number of graduate engineers, many of whom regret their decision to opt for engineering education.

### 3.3.9 Gullible and the poor students suffer

Attracted by the marketing campaign of the promoters of the engineering colleges and enamoured by the prospects of their sons and daughters becoming engineers, many poor families are eager to admit their sons and daughters in engineering colleges, even though they can not afford to meet the expenses involved. Many of such poor families have been forced into debt burden to finance engineering education.

When the graduate engineers do not get the jobs at decent salary level after passing out, the hopes of the poor families about paying back the debt disappear and the entire family is driven to economic despair. There are many poor families in Tamil Nadu facing this situation.

### 3.3.10 Responsibility of the government and All India Council for Technical Education (AICTE)

Such grave situations have developed since the government
and All India Council for Technical Education have been according permission to start so many new engineering colleges, without relating the intake capacity to the employment prospects and availability of teaching faculty.

The government and AICTE have the responsibility to ensure that investment in engineering colleges would not be wasted and the students would not be misled. Capacity creation for engineering colleges can not be done in similar manner like creating capacity for production of consumer products. It is high time that the policy towards according permission for setting up new engineering colleges should be reviewed with utmost care.

3.3.11 Advise to students

Considering the fact that the supply of engineers from the engineering colleges far exceed the demand and good and well paying jobs are available only for those who pass out with good academic record, the students whose academic performance are of average standards should avoid getting into the engineering colleges, particularly since the engineering course is tough and demanding.

 Particularly, the families of students form lower income group who cannot afford to pay for the engineering education should desist from getting into huge debt or selling their properties for raising money for engineering education, as many of them are found to face difficult conditions, when the passed out students are not able to get well paying jobs. It is extremely important that the students
should carefully evaluate their academic capabilities and financial strength of the family before opting to join engineering colleges.

1. I always believed that if teachers are good, students will be good.

2. Poor performance of an engineering student at degree level does not make him a poor engineer. He can still learn while on job. Apart from technical knowledge an engineer on the shop floor requires leadership qualities.

3. Fresh engineering graduates need not look at only government jobs. They may be trained to set up their own businesses. Thanks to IT many are being absorbed there irrespective of disciplines.

4. In India ME and M.Tech courses are of two years since long. But in UK, the PG courses are of one year and University Grants Commission needs to act now. Ph. D under a good guide and institution can be completed in three years. But in India students are taking five years normally and even 10 years or more in some cases. This is mainly due to the inefficiency of the guides and the institutions. This issue needs review.
3.4 FACTOR AFFECTING TEACHING

To know factor affecting teaching is so important because after analysis all factors which affecting teaching, teacher can improve himself and can become good teacher and create better citizen for country. If study teaching subjects, we find many factors which affecting teaching which can write in list of these factors.

1. Educational qualification of teacher

Higher qualified teacher can provide high scholarly instructions which can effect than general graduate teacher. Many teachers hold different degrees which is the sign of their higher education
qualification. A teacher is just B.A. and other teacher is M.A., M.Ed., PhD, if we compare both, then is sure that higher qualified teacher can cede good teaching result.

2. Skills

Skill is an ability to do any work with better way. If a teacher has teaching skill then he can provide effective teaching. Often says that teaching is God gifted but getting good education training and Psychologize best educational books, we can get this skill and create better result. In teaching talent we can include following skills: 1. Communication skill of teacher, 2. taking teaching aids, 3. technique of teaching, 4. method of teaching and 5. Human relation skill.

3. Experience of Teacher

Experience of teacher affects also the teaching. After increasing teaching experience, a teacher learns many new things in teaching experience which he can employ in next time teaching. First day teacher may not effect on students but after 5 years teaching, a teacher can more effect on students.

4. Class room environment

Class room environment also effects on teaching. This environment is made both by teacher and students. Without both active participation in education, teaching never effects. If the
concentration lives in class room and students listen teacher’s voice and teacher also cares the activity of teacher doing interacting with students.

5. Economic Factor

Economic background of teacher and student is also affected teaching. Even salary of teacher will effects on his thinking level. Poor and rich students can also classify economically and sometime these factors can affect on effective teaching.

6. Administrative policies of school or college or university

Administrative policies also effect teaching. Teacher wants to instruct with his way but administrative policies is not allowed, so the voice of teach can stop and effect of teaching may slow in class room.

7. Subject Matter

Sometime when a teacher teaches that subject in which he is not specialize , he can not create any effect through his teaching but same teacher can teaches his specialize subject with better way.

8. Parental expectations

what are the expectations of parent on students? This factor can be defined psychologically. If parent wants to frame up his children
doctor or engineer and continually stress on student, sometime student may not at that rank, so mentally he can create depression and which can stop effective teaching of teacher.

The scope of educational activities that should take place in colleges has been, and continues to be, a matter of controversy. Most people involved with private colleges agree that a major objective of colleges is to promote the scholastic achievement of the students (Goodlad, 1984). There is little doubt that teachers are directly involved in the academic progress of their students. Research has established that a relationship exists between teacher satisfaction and student achievement (Doyle & Forsyth, 1973; Goodman, 1980; and, Stanton, 1974).

In general, the findings tended to indicate that teachers in engineering colleges whose students achieve relatively high scholastically had higher morale than did teachers in colleges with relatively low pupil achievement. Similarly, student achievement tended to increase under teachers with high morale and decreased under teachers with low morale. It appears that teacher morale or satisfaction does make a difference in the scholastic achievement of students. For this reason, teacher satisfaction and a closely related issue, the retention of qualified teachers, has been a concern for several decades.

The literature review progresses from very broad, theory-oriented research to more specific studies concerned with technology
teachers. The term “technology teacher” will be used as a generic term to include all Engineering, technology and industrial education and related fields.

3.5 JOB SATISFACTION OF TEACHERS

Historically, job satisfaction was viewed as a continuum. Certain factors if present, contributed to job satisfaction; and if absent, contributed to job dissatisfaction, and vice-versa. Herzberg, Mausner, and Snyderman (1959) developed what has been called the Two-Factor Theory of job satisfaction or the Motivation-Hygiene Theory. In contrast to conventional theory at the time, Herzberg concluded there were certain conditions of employment that, if present, acted as job satisfiers (motivators) and other conditions that acted as job dissatisfies (hygiene factors).

The absence of motivators did not contribute to job dissatisfaction, nor did the absence of hygiene factors contribute to job satisfaction or motivation. Fourteen factors were identified as contributing to job satisfaction or dissatisfaction. The factors identified were: achievement, recognition, interpersonal relations, responsibility, advancement, salary, job security, personal life, status, working conditions, policy and administration, supervision, and the work itself. Herzberg believed these factors to be universal in the workplace. Several research studies have attempted to replicate and/or apply Herzberg's (1959) famous “Motivation to Work” study in educational settings.
Johnson (1967) identified five factors (achievement, recognition, interpersonal relations, work itself, and responsibility) that had statistical significance in affecting teacher satisfaction. Four factors (policy and administration, working conditions, status, and personal life) were significant in affecting teacher dissatisfaction. Johnson suggested that “the personality of the principal seemed to be the factor which controlled the attitude of teachers” and that “the findings of this study indicated that the organizational climate of colleges contributed to teacher satisfaction-dissatisfaction” (p.139).

Sergiovanni (1966), in another replication of Herzberg's study in an educational setting, interviewed teachers to find out about events associated with their jobs that made them feel unusually good and unusually bad. According to Sergiovanni's classification of the teachers' responses, achievement and recognition were ranked first and second as factors contributing to good feelings about the job.

Robert Simmons (1970) found three “content” factors (achievement in the job, the work itself, and recognition) that contribute to satisfaction in teaching. Achievement in teaching contributed most to satisfaction. Recognition from the principal was determined to be a significant part of the recognition factor.

In a study of job satisfaction that focused on high school business teachers in Ohio, Lacy (1968) identified 27 factors that were significant for a high level of teacher job satisfaction. School
administration was found to affect teacher job satisfaction. That is, teachers with a high level of job satisfaction indicated, “[they] received recognition for a job well done ... administrators had democratic methods of dealing with teachers” (p. 222).

Graham (1985) believes that unreasonable burdens and too little time drive more people from the teaching profession than low salaries. According to Graham, an approach that would make a big difference would be to reorganize teachers' days and priorities to save precious time that is lost. The suggestions offered by Graham centered primarily on working conditions: reduce class size, provide clerical help, reduce non-reaching activities, give every teacher a student assistant, seek help from parents, and provide monthly, on-teaching work days.

Litt and Turk (1985) surveyed Technical teachers to identify sources of stress and dissatisfaction that might induce teachers to leave teaching. The results suggested, “the role teachers perceived for themselves and the college climate, particularly the relationship with administrators, may be extremely important in predicting job stress” (p.178).

The “context” aspects of work (e.g., working conditions, school policy, and salary) identified by numerous studies, serves only to reduce dissatisfaction in the lower-order needs identified by Maslow (1954); they cannot lead growth or satisfaction. The “content” aspects of teaching (e.g. recognition and the work itself) correspond to esteem
and self-actualization, the top of Maslow's hierarchy. Psychological growth and satisfaction depend upon successful job completion, so only those factors that are content centered (intrinsic aspects of teaching) can contribute to satisfaction.

3.6 TECHNOLOGY TEACHER SATISFACTION

Technology teachers have an instructional role that is different from many other teachers. The nature of their teaching is primarily the problem-solving approach, frequently utilizing one-on-one instruction. Technology teachers tend to develop a sense of “ownership” over their labs, partly due to the amount of maintenance and other personal time they have invested in the facility. Lab sharing for technology teachers can be a source of frustration when needed supplies and/or tools for a class have been used or abused by someone other than the person who ordered and maintained them. In addition, many technology teachers have skills, which can be utilized in business and industry employment at salaries, and benefits that are frequently greater than they receive from teaching.

Steinbach (1979) to measure the level of job satisfaction for public secondary industrial arts teachers in Minnesota used the Job Satisfaction Questionnaire. The evidence from Steinbach's study indicated certain job reinforcers of industrial arts teachers were significantly associated with their level of satisfaction. The strongest associations were among the following characteristics: steady employment, working conditions, position in the community, feeling of accomplishment, supervisory competence, administrative support,
judgmental freedom, organizational practices, authority, doing for others, and competitive pay.

**Wright (1985)** interviewed technology teachers to determine if relationships existed between esteem, autonomy, job satisfaction, and the intention to quit teaching. Wright found that teachers' over-all job satisfaction was positively correlated with the perceived amount of esteem and negatively correlated with the intention to quit teaching. The study also indicated that teachers' install colleges have more esteem, but lower salaries, than teachers in Government and aided colleges. Building principals could have tremendous impact on teachers’ perceived esteem, and therefore, their over-all satisfaction and their intention to remain in teaching.

A significant finding from Wright's study was that neither actual salary nor the teacher's satisfaction with their salary was related to the intention to quit teaching. Perceived esteem was the variable most highly correlated with the intention to quit teaching. The research related to the variable “esteem” (recognition, praise, status, and high-regard), based on Maslow's hierarchy, and has identified several distinct groups from which teachers receive esteem (Johnson, 1967; Lacy, 1968; Sergiovanni, 1966; Simmons, 1970; and Wright, 1985). These groups included students, parents, the community, and school administrators.

### 3.7 TECHNOLOGY TEACHER TURNOVER
There are several studies of technology teachers who had left teaching (Dye, 1981; Edmunds, 1982; Lindsey, 1979; and, Tomlinson, 1982). The results of these studies provide a foundation from which to build. Vocational industrial education teachers in Texas who had quit teaching cited salary as the primary reason (Lindsey, 1979). In addition, three of the top ten reasons were related to the teachers' relationship with the school administration. In another attempt to identify factors involved in vocational industrial teachers' decision to leave teaching, Dye (1981) identified several characteristics where mobile teachers differed from stable teachers. Mobile teachers were defined as those who had left a teaching position while stable teachers were defined as those who remained in teaching. Low teaching salary was identified as the most significant difference between mobile and stable teachers.

Mobile teachers had a low opinion of teaching salaries, whereas stable teachers had a relatively high opinion of teaching salaries. Mobile teachers were found to feel significantly less support by the local school system than did stable teachers. The issue again appears to be one of individual perception. Dye’s (1981) and Wright’s (1985) results would suggest that teacher perceptions of conditions are perhaps more important than “actual” conditions in affecting job satisfaction and the intention to continue or discontinue teaching. This perception presents a challenge to the building administrator: how do they make technology, or any other, teachers feel that they are supported. Regardless of budget appropriations, the building administrator must convey the spirit of program support to the
teachers. Technology teacher turnover and filling technology vacancies have become significant problems in many states. Technology teachers in Illinois, for example, have had a turnover rate as high as 14% per year. The technology teacher vacancy situation has been further compounded by the reduction in the number of graduates that are certificated and elect to teach technology. During the ten-year period from 1992-2002, the number of persons that graduated with eligibility to teach technology in Illinois declined by 68%. In addition to the attrition from teaching by first and second year technology teachers, significant numbers of veteran teachers are approaching retirement age.

In 1980, 17.5% of all industrial education teachers in Illinois were 50 years or above (Tomlinson, 1982). Similarly, Devier and Wright (1987) assessed the status of technology education in Ohio and reported some rather alarming data. In 1987, 25% of all practicing technology teachers in Ohio were either retiring or eligible to retire within the next five years (1987-92). Perhaps even more alarming, 50% of the technology teachers would be retiring or eligible to retire within ten years (Devier and Wright, 1987).

In an effort to determine if the supply of new technology teachers would be able to keep pace with the demand to fill vacancies, Devier and Wright (1988) surveyed teacher education institutions and secondary school district superintendents in Ohio. The projected supply of graduates certified to teach technology, which is down approximately 50% from 1980, cannot meet the retirement rate in the
best-case scenario. In the worst case scenario, in which not all graduates decide to teach, many teachers elect early retirement, and the state mandates a proposed technology education course in the middle grades, the supply will be just one-fourth of the demand! Although no one can accurately predict demand, it would appear that the current supply of technology majors in college (1988-92) would fall short of the demand. The effects of school climate are readily apparent to the trained observer; yet, school climate is incredibly complex and difficult to assess empirically. Recent studies have clearly indicated the importance of the principal's leadership style in determining the school climate (Goodlad, 1984; Lipsitz, 1984; Sergiovanni & Starrett, 1983; and Wright, 1985). One manifestation of the school climate is the professional freedom afforded to teachers to carry out their assignments in support of the school's mission. The importance of achievement, recognition, and organizational climate for teacher satisfaction was documented by Johnson (1967), Lacy (1968), Sergiovanni (1966), and Wright (1985). The principal, then, may influence these factors. Lipsitz (1984), Sergiovanni and Starrett (1983), Weller (1982), and Wright (1985) concluded that the administrator was one of the key factors influencing teacher morale and satisfaction.

3.8 SUMMARY

20 years back - Have you ever heard of a cardiac arrest, blockage in angina, high cholesterol and high diabetic to an employee in the age group of 30 to 40? Similarly have you heard of early retirement, mental strain, absenteeism and burnout? Obviously no,
which you have not come across such a scenario. Occupational stress is the interaction of the worker and the conditions of work. Downsizing, increased workloads, high competition, growing population etc are taking their toll. “Stress, in essence, is a feeling of doubt about being able to cope, a perception that the resources available do not match the demands made. When it persists, stress can cause physical and psychological ill-health and adversely affect social functioning.” Occupational stress has become a common and costly problem, leaving few workers untouched. Not all stress is bad. Learning how to deal with and manage stress is critical to maximizing job performance, staying safe on the job, and maintaining physical and mental health. Survey of the literature on occupational stress reveals that there are a number of factors related to job, which affect the behaviour of the employees and as a result of it, normal life is disturbed (McLean, 1974; Brief, Schular and Vansell, 1981).