CHAPTER 3

WOMEN'S TECHNICAL EDUCATION

Women constitute about 50 per cent of the population of developing countries and with increasing educational opportunities their participation in the economic life of their countries has been increasing. There is no discrimination against them as such, notwithstanding traditional social barriers or inhibitions which may exist as a hangover of the past. Technical institutions are equally open to girls. However, the proportion of girl students in technical institutions is nowhere near that of boys in most countries, and even in those technical occupations which may be regarded as more suitable to girls the representation of girls leaves much to be desired. The main reasons are: lack of information about technical employment opportunities; less interest of girls in technical occupations; early marriage and home responsibilities; withdrawal from the work force for social reasons; unequal competition with boys; and comparatively less spread of education at the secondary stage (Unesco, 1980).

An interesting development, however, was the establishment of girls polytechnics in India and Pakistan.
These institutions came into existence not because of any discrimination against girls in other polytechnics, but because of the demand of women's organizations for separate institutions—a reverse of the women's lib. movement in the more advanced countries. These girls' polytechnics are in no way different from other polytechnics, except that they are exclusively meant for that sex. Most of the diploma courses conducted are the same as in other polytechnics, but with the addition of certain subjects like librarianship, medical laboratory technology, interior decoration, dress making, which are of special interest to girls. The women are increasingly aware of their need for technical and vocational education as a means of socio-economic progress (Kamte, 1973).

TECHNICAL EDUCATION IN DEVELOPING COUNTRIES:

INTRODUCTION:

In the last 25 years, two events have had far reaching effects on mankind. First, a large number of countries, accounting for nearly one half of the world's population, which were under foreign domination for many years became independent and free to decide their own destinies. Despite their different social, political and
economic ideologies, those countries are all engaged in the stupendous task of providing more and better food to their people, better health, better housing and better education, i.e. the quality and way of life of the masses is undergoing a drastic change.

Second, the last 25 years have witnessed unparalleled advances in science and technology. The impact of these advances on industry, agriculture, transport, communication, health and practically on every aspect of life, is not confined to the former rich nations alone, but is global. More and more people are now in a position to enjoy the benefits of modern science and technology and lead a fuller life.

All development studies must therefore recognise the importance of the human factor - the education, training and energising of human resources.

The structure of technical education and training systems in some selected developing countries, with particular reference to the education and training of technicians, is given in the Chapter 2. Technicians are defined as a middle level manpower group, between technologists and skilled workers, whose education/training enables them to understand and apply known technology to field operations (Lingen, 1951).
GENERAL CHARACTERISTICS.

The first Commonwealth Education Conference, held at Oxford in 1960, gave the following definitions for different level technical personnel.

Technologist: a person holding a degree or equivalent professional qualification in science or engineering, who is responsible for the application of scientific knowledge and method to industry.

Technician: a person qualified by specialist technical education and practical training to work under the general direction of a technologist.

Craftsman: Normally a person who has served a recognised apprenticeship in a trade, and who applies skills on the shop floor.

Although technicians are not identified and defined uniformly in all countries (excepting Maldives) a recognisable system of technical education which reflects the country's state of economic development, technology level and other factors exists in every country. In some countries like India, Pakistan, Bangladesh, Thailand, Singapore, Korea, Sri Lanka, Burma and Fiji, the system is well established as a distinct form of education. In other countries like the
Philippines, Indonesia, Nepal, Iran, Afghanistan, Malaysia and Bhutan, the system is either in transition from earlier forms of vocational education or in the process of being established and developed. Generally, all the existing and emerging systems of technical education are at the tertiary level i.e at the post high school stage, after 10, 11 or 12 years of school education, depending upon the general education pattern in each country. Maldives has yet to start its own system of technical education.

In some systems, as for instance, in Singapore, Thailand, Malaysia, Korea, Laos, the Philippines and Nepal, there are two distinct levels of technical education, one for industrial technicians and another for engineering technicians. General industrial technician courses have a higher proportion of manipulative manual skills, and engineering technician courses a higher proportion of knowledge or theory. In all other developing countries there is only one level of technical education.

Afghanistan's technical education system has some distinctive features. The system has a three tier course. All the courses are styled as technical courses and start from different stages of school education. It is understood that these different courses are a result of the programmes
of technical education development aided by West Germany, 
the U.S.S.R. and other countries. Afghanistan has apparently, 
imported some part of the technical education systems of 
all the aid-giving countries (Chandrababu, 1976).

TYPES OF TECHNICAL INSTITUTIONS

Technical courses are generally conducted in separate 
institutions set up for the purpose. These institutions 
are named differently in various countries — polytechnics, 
technical institutes, junior technical colleges, institutes 
of technology, vocational institutes, technical colleges 
and so on. Even in the same country, different types of 
technical institutions are named differently. For instance, 
in Singapore, institutions which conduct three year diploma 
courses are called polytechnics while those conducting two 
year certificate courses are called technical institutes. 
In Malaysia, institutions conducting two year industrial 
technician courses are called polytechnics and institutions 
conducting three year diploma courses for higher technicians, 
institutes of technology. In Sri Lanka, one set of techni-
cal courses is conducted by the University of Sri Lanka, in 
its Faculty of Engineering and another set by polytechnics 
outside the university system. In Nepal, all technical 
courses are a part of the university system and conducted 
at different campuses. In Malaysia, the university of 
Technology conducts courses for higher technical diplomas.
and polytechnics conduct technical certificate courses (Chandrakant, 1976).

It is ironical that while the economy of most countries in the region is largely agricultural and vast sections of the population live on and by the land, technician education specifically addressed to agriculture and agriculture-based activity is limited, as compared to other sectors of the national economy. Apparently, this reflects an imbalance in the perception of national priorities on the one hand, and on the other, the socio-economic urges of the people for an urban life (UNESCO, 1980).

ADMINISTRATION OF TECHNICAL EDUCATION.

In all countries, technician education is a part of the public education system, subjected to the laws and regulations of each country which vests the Government with authority to regulate its development and administration. Each country therefore has a particular ministry or department with sole responsibility for technician education. It is usually the education ministry. The nature and extent of governmental responsibility varies from one country to another. In almost all countries, the government is responsible for policy making, planning and coordinating with national development. In some countries the government also prescribes the curriculum, holds examinations, awards
diplomas, coordinates standards and directly administers technical institutions. The Government discharges these responsibilities either directly through its ministers/department of education or through an executive wing called the directorate of technical education. India, Pakistan, Bangladesh fall in this category. To minimize direct governmental intervention in or control over purely academic matters and to associate experts with educational administration, these countries have also set up boards of technical education whose main responsibility is to prescribe curricula, coordinate standards, hold examinations and award diplomas or certificates. In Sri Lanka, technical education is a divided responsibility between the Ministry of Education and the university. In Nepal, it is the responsibility of the university. Similarly, Malaysia is another country where the responsibility for technical education is divided between the government and the university. In the Philippines technical education is in process of major reorganisation (Chandrakant, 1976).

TECHNICAL EDUCATION IN INDIA.

INTRODUCTION.

Next to USA and USSR, India has the third largest number of trained technical personnel and it ranks among the first ten major industrialised nations of the world. The number of qualified technical personnel has increased from
188,000 in 1930 to over 1,30,000 in 1978, a seven fold increase during the last 45 years. It is a unique country. It has a richness of thought, philosophy, heritage and unlimited potential - richly endowed by nature with such resources as fertile land, water, metals and minerals, bright sunshine and above all large mass of human resources in our villages, who are intelligent, resourceful and hard-working. The country presents a spectacle of plenty and yet at the same time hard breaking scarcity (Damodaran, 1981).

There are 22 states and 9 union territories in India. Education is primarily the responsibility of the state governments. The Union Government is concerned with the coordination of educational facilities, determination of standards of education and research. The Centre runs central universities and other institutions of national importance through the Ministry of Education. The Ministry of Education operates through different statutory and advisory bodies like the University Grants Commission, All India Council for Technical Education and Central Advisory Board of Education. Education is in the concurrent list of the constitution (Ramanathan, 1976).

On the recommendation of the Education Commission (1966) the Government of India recently introduced a uniform pattern
of 15 years duration leading to the first degree. The pattern is known as the 10 + 2 + 3 pattern - 10 years of high school, 2 years of higher secondary education and 3 years of degree course.

Technical education in India is a four tiered structure comprising of:

(a) Post-graduate courses and research
(b) Under-graduate courses
(c) Diploma courses
(d) Vocational and technical training

A diagramatic sketch of the structure of technical education is given in Fig. 3.1.

HISTORY OF TECHNICAL EDUCATION

The first technical institution was established at Guindy in 1794. In 1946 the All India Council of Technical Education was formed. In 1947 a Scientific Manpower Commission was set up. The report of the Scientific Manpower Commission pointed out the tremendous gap between the immediate requirements of the country and the turn out of technically trained personnel. This led to the planning and execution of expansion in technical education (Ramachandran, 1976).
STRUCTURE OF TECHNICAL EDUCATION IN INDIA

ENGINEERING COLLEGES FOR DEGREES

1 2 3 4 5

POLYTECHNICS FOR TECHNICIANS (DIPLOMA)

1 2 3

INDUSTRIAL TRAINING INSTITUTES
BASIC TRAINING OF CRAFTSMEN
1-2 YRS

APPRENTICESHIP IN INDUSTRY
1-2 YRS

FIG. 3.1
Today, the institutional framework for technical education in India provided by 5 institutes of technology, 141 engineering colleges at the degree level and 291 polytechnics for technician training leading to the award of a diploma and 356 industrial training institutes. In addition, there are 28 polytechnics providing technician courses exclusively for girls, with an intake of 2,800 students per year. Some of the other specialised institutions that have been set up are the Institutes of Management at Ahmedabad, Calcutta and Bangalore, the National Institute for Training in Industrial Engineering (NITIE) at Bombay, the School of Town Planning and Architecture at Ahmedabad and specialised institutions in printing technology in few states. In order to train teachers for polytechnics, four Regional Technical Teachers Training Institutes have been established at Bhopal, Madras, Calcutta and Chandigarh.

In terms of financial investment, the technical education system represents an investment of over Rs.2000 million in building and equipment (Dassadaran, 1973).

TECHNICIAN EDUCATION PROGRAMMES.

Technician courses, popularly known as diploma courses, are offered in polytechnics. They are generally of three years duration after 10 to 11 years of schooling. The main
aim of the course is to give the students a sound and broad based knowledge in a chosen field, supplemented with actual practical experience in industry. The following pattern of courses have so far been evolved for technical education.

(1) Full-time courses (2 - 3 years)

(ii) Sandwich courses (3½ - 4 years)

(iii) Part-time courses (4 years)

(iv) post diploma courses (1 - 1½ years)

The courses offered include agriculture, automobile, civil, mechanical, electrical, electronics, production, mining, industrial engineering, metallurgy, textile technology, printing technology, ceramics, refrigeration, sound engineering, architectural assistantship, town planning, commercial practice, etc.

ADMINISTRATION OF TECHNICAL EDUCATION

The state government is responsible for organisation, development and administration of technical education. The formulation of general policy, planning, co-ordination and determination of standards rests with the Central Government. The All India Council for Technical Education is the National body, established by the Ministry of Education, to advise Central and state governments on the development of technical education. The Council consists of representatives of all state governments, Ministries of Central Government, industry,
labour, commerce, professional bodies, universities, technical institutions, parliament and various other concerns. The Council is assisted by a Co-ordinating Committee, Regional Committees and Boards of Technical Studies. The Boards of Studies advise the council on all academic matters. The Bureau of Technical Education in the Ministry of Education functions as the secretariat to the council, its Committee and Boards. The Regional Committees act as coordinating bodies between the states and their agencies in the region on the one hand and the Centre and its agencies on the other. The regional offices of the ministry provide administrative machinery to the Regional Committees. At the state level, the State Boards of Technical Education discharge the functions and responsibilities. The Directorate of Technical Education in the state governments provide the necessary secretarial service. A diagramatic sketch of the administration of technical education is given in Fig. 3.2.

GROWTH OF WOMEN'S POLYTECHNICS.

In 1961, on the recommendation of the "National Committee on Women's Education", the All India Council of Technical Education decided to make a small beginning in establishing technical institutions for girls in India. It recommended ten courses specially suited to the aptitude of women. They were namely electronics, pharmacy, stenography...
ADMINISTRATION OF TECHNICAL EDUCATION IN INDIA

1. TECHNICIAN EDUCATION
2. UNDER GRADUATE STUDIES
3. MANAGEMENT STUDIES
4. POST-GRADUATE STUDIES

FIG. 3.2
and secretarial practice, architectural draughtsmanship, costume design and dressmaking, medical laboratory technology, library science, civil engineering draughtsmanship, commercial art and institutional management. Each women's polytechnic was designed to select any six courses with a total annual intake of 200 students. The duration of the courses was 3 years.

Around 22 institutions were proposed to be started after scrutiny by the regional committees. Now the number has gone up to 28. Recently, the concept of a girl's wing in a boys polytechnic has developed. The administrative machinery remains the same, while courses and faculty members differ. The new development in the country is in the form of girls wings only. The following additional courses are now offered to women: cosmetics technology, laboratory technician course, computer technology, commercial art, textile designing, ceramics, photography, journalism, radio and television, beauty culture and interior decoration, etc. Each state has one or two such polytechnics (Ramchandra, 1976).

Estimates of the demand for technicians are made by the Employment and Manpower Division of the Planning
Commission. The Planning Commission is assisted by the Institute of Applied Manpower Research in making manpower studies. In addition to making reliable estimates, efforts are being made to determine the different types of technical branches of engineering and specialisation. The speciality-wise assessment of technicians, aimed at job analysis and specifications in terms of levels and clusters of skills and responsibilities for technicians, is carried out in co-operation with industry.

Students are selected on the basis of their performance in the qualifying examinations and sometimes on the basis of aptitude test, which vary from polytechnic to polytechnic. Evaluation of students is a mixed one now. It consists of continuous internal assessment and external examinations. The weightage given for the internal assessment is between 3 to 40%.

Most of the polytechnics are government polytechnics. Private polytechnics do exist, but they are in a minority. (Ramachandra, 1976).

TRAINING OF TECHNICIANS IN INDUSTRY.

The Apprentices Act, 1961, was passed in 1961 to provide apprenticeship training to young people in order to prepare them for skilled employment as tradesmen and craftsmen. This Act was amended in 1973 to provide training
to engineering graduates and diploma holders also. The aim of apprenticeship training is to provide practical training in industry at the end of theoretical training in educational institutions in order to condition the students for gainful employment. Sandwich course students are provided training during their programme. Under the provisions of the Act, it is obligatory on the part of every employer, including the state and Central Government departments, to provide training to a specified number of people depending upon the training facilities available with them.

The duration of training for technicians is one year. A stipend is paid to every trainee to enable him to defray his living expenses. The cost of the stipend is shared equally by the training establishment and the Central Government. The expenses on training are borne completely by the training establishments. The training is administered by the Ministry of Education through four Regional Boards of Apprenticeship Training. These Boards are registered as societies and are autonomous in character. They are financed entirely by the Central Government.

The Board consist of 19-20 members, which include representatives of industry – both public and private
sector undertakings, professional bodies and educational institutions. The boards which are advisory in nature, have regular fulltime technical and administrative staff to look after their functions. Training is provided in nearly 60 fields of engineering and technology. About 14,000 training places have been located under the Act for the training of technicians. A Central Apprenticeship Council, established under the provision of the Act, advises the Government on various issues relating to the training (Chandrekant, 1976).

TECHNICAL EDUCATION IN GUJARAT.

INTRODUCTION.

Technical education in Gujarat State covers all levels from secondary to college education. The intake capacity per million of population is about 80 students for the degree and 150 for the diploma courses. The State is ahead of the all India average figures. This is because of the keen interest shown by the Government in the development of technical education.

There are 4 institutions at the post-graduate level with 19 types of courses, 7 degree level with 13 courses, 19 diploma level institutions with 31 types of courses, 44 technical high schools and 266 certificate level institutions with 36 types of courses. The sanctioned intake is 183 for
past graduate degree, 1,820 for first degree, 3,285 for diploma, 3,825 for technical high school and 13,173 for certificate courses. The state also has post-graduate diploma and post-diploma level courses.

The state also has two autonomous institutions of national status, namely the National Institute of Design and Indian Institute of Management (Kelwachwala, 1971).

FRAMEWORK.

The state has given special attention to the development of courses specially designed for women. In 1964, the Ahmedabad Girls' Polytechnic and in 1965 the Surat Girls' Polytechnic were started in order to give full scope for the development of technical education of girls. The courses offered at present are electronics and radio engineering, commercial practice, architectural assistantship, commercial art, costume designing and dress making, textile designing, garment-making.

It was felt necessary that girls' wings should be started at boy's polytechnics to cover a wider range. Two girls' wings one each at Rajkot and Adipur (Kutch) were started in 1974-75 and two more were started at Bhavnagar and Patan during 1978-79.
The total intake capacity of 365 for girls diploma courses is distributed as follows: electronics and radio engineering - 65, commercial practice - 120, architectural assistantship - 60, commercial art - 30, costume designing and dress making - 45, home science - 30, garment making -15.

These courses are functional with a view to create high grade technician, who could be more acceptable to industries. They would serve as an effective link between the craftsmen and engineers.

All the girls' polytechnics and wings are managed by the Government, except the Adiput girls's wing which is run by a private management. All are functioning under the Directorate of Technical Education. The Technical Examinations Board is responsible for examinations, curriculum, setting academic norms etc. (Mehta, 1973).