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Education and Employment of Women in Engineering in India

R. NATARAJAN
Professor of Mechanical Engineering, IIT, Madras 600036, *India*

The trends relating to education and employment of women in engineering in India are similar to those in developed countries. Policy initiatives by the government are being undertaken to tackle the existing imbalances. A recent comprehensive study has sought to develop a profile of women students in engineering education, in terms of their level of participation and branch-wise distribution—and also the career profiles of women engineering professionals—for the period 1975–90. In addition to statistical information, the study brings out the perceptions of women on engineering education and engineering careers. Some of the problems faced by women in engineering in India have been identified, and recommendations have been proposed for their mitigation.

INTRODUCTION

IN LINE with the global concerns for a fair deal for women in education, employment and other sectors traditionally dominated by men, and in view of the particularly low proportion of women in the engineering profession in India, policy initiatives have been taken by the government to bring them into the mainstream. A comprehensive study has been conducted recently [1] to examine three distinct facets of the issues relating to women engineers, namely enrolment levels, employment opportunities and career development.

SCOPE AND RESULTS OF THE RECENT STUDY

The study by Parikh and Sukhatme [1] was conducted in two parts. The first part was intended to develop a profile of women students in engineering education, comprising their level of participation and branch-wise distribution. The second part involved the development of career profiles of women engineering professionals. The study encompassed all women engineers who graduated during the period 1975–90.

It was estimated that the percentage of women taking up engineering increased from around 1% in 1975 to about 10% in 1990. In a few colleges in some states, however, women now constitute up to 30% of the enrolment in certain disciplines. On the other hand, the percentage of women in Indian Institutes of Technology (IITs) and Regional Engineering Colleges (RECs) has remained low.

The national stock of women engineers is estimated to be 18,875 up to the year 1990. Out of these, 16,162 women engineers were located through systematic efforts. A carefully structured questionnaire was prepared and mailed to over 5000 women whose current addresses were available; 2753 completed replies were received and analysed.

The data showed that the state of Kerala has the largest population of women engineers, closely followed by Tamil Nadu, and Karnataka. Electronics is the most preferred branch among women, followed by electrical engineering, civil engineering, computer science and engineering, chemical engineering and mechanical engineering.

Perceptions of women in engineering education

An analysis of the academic career of the respondents showed that about 75% ranked in the upper 10% of their class at the high school/junior college level, and that their performance in the engineering degree examinations was very commendable. Most of the girls made their decisions on taking up engineering as a career at the secondary or higher secondary school level; in arriving at this decision, they seemed to have received the maximum encouragement from their parents.

A study of the personal background of the respondents showed that opting for engineering education did not have a negative effect on the age of marriage. Over two-thirds had an arranged type of marriage, and nearly one-half felt that their marriage prospects were enhanced because of their being engineers. The husbands of women engineers generally had an equal or higher level of education, with a large proportion also being engineers. Engineering was also the dominant profession among the fathers of the respondents. On the whole, it was found that most women engineers have family and social attitudes similar to other educated women in India.

Employment data

Data on the job status of women engineers indicated that 66.3% were employed, 2.4% were

self-employed, and 5.2% were postgraduate students. An analysis of the unemployed engineers showed that about 40% of those who graduated in 1989 and 1990 were unemployed, with the highest percentage in the state of Kerala, and in the civil engineering branch. As far as the sector of work is concerned, the largest proportion (26.9%) of women engineers were employed in educational institutions. This was followed by the government/civil service (22.0%), the public sector (18.9%), large-scale private sector (12.7%), small-scale private sector (9.1%) and government R&D (8.99%). An analysis of the salaries and designations of the respondents showed that, in general, salary levels were low, and the pace of career advancement was slow. The large-scale private sector paid the best salaries, while the small-scale private sector paid the least salaries, with the government R&D organizations, educational institutions, government/civil service and public sector industries falling in between the two extremes, in the order indicated. The number of respondents entrusted with top-level management responsibilities was very small, indicating that the pace of career advancement was slow.

Perceptions of women on engineering careers

A number of questions had been posed in order to determine the career expectations and values of women engineers. Among the various sources of satisfaction in their professional life, 'exposure to new techniques/technologies' and 'involvement in creative/pioneering activities' were rated as the primary factors. As far as their personal life was concerned, while married respondents placed 'happy family life' as the primary source of satisfaction, single respondents rated 'own career development' as their primary source of satisfaction. Even among single respondents, over one-third were looking forward to a happy married life. By and large, women engineers wished to fulfil the roles expected of them as wives and mothers, while at the same time assigning equal importance to their careers and success therein.

Most women engineers had no preference regarding whether their colleagues should be male or female. Professional competence and co-operative attitudes were considered to be the important qualities expected from colleagues. In spite of some difficulties faced by them, most respondents had no hesitation in recommending engineering as a career to other women. They believed that with increase in their numbers, acceptance would follow and the present difficulties would get resolved.

Some problems faced by women engineers

There is a variety of problems that women engineers have to face in their career. A significant percentage had difficulties as students in obtaining practical training in preferred places. The percentage having difficulties in being called for job interview was even higher; it increases further when one considers those having difficulties in getting a job. Many organizations did not even hesitate to state that women engineers were not acceptable to them. A large number of respondents reported that their careers had been adversely affected by unsatisfactory work opportunities or an unsatisfactory work environment. Low salaries and the lack of suitable accommodation facilities were often cited as the major reasons for respondents having to refuse jobs.

Some recommendations to alleviate the problems

Finally, a number of recommendations have been made in order to improve the present situation. Some of these corrective measures are educative in nature, and some regulatory. The educative measures are principally concerned with the formulation and implementation of awareness programmes for schoolgirls, their parents and their teachers, to inform them about the career opportunities for girls in the engineering profession. Awareness programmes have also been suggested for employers. It has been recommended that the IITs should take special initiatives for attracting more girls. Some of the urgent corrective measures to increase enrolment are free professional education for girls, more scholarships and awards for deserving students, provision of additional admission capacity, and adequate provision for residential hostels for women.

In order to ensure increased participation of women in the engineering profession, it has been recommended that industrial concerns should be required to submit annually a record of employment of engineering personnel, with a specific mention of the number of women engineers employed; and that all interview boards should include a woman member. The creation of physical facilities such as working women's hostels and childcare centres in major cities has also been one of the suggestions. As far as service rules are concerned, it has been recommended that married women engineers should be eligible for long leave up to one year, twice in their working career, during the child-bearing and child-rearing periods, and that they should be given the option of flexible working hours and part-time jobs, at least for some part of their working career. It has also been suggested that a national forum of women engineers should be formed to create awareness of the issues and problems relating to women engineers, under the umbrella of the existing National Commission For Women.

CONCLUDING REMARKS

In the global context, it is worth investigating whether there are specific occupations in which women outperform men because of their special physiological and mental make-up, and vice versa. This might help to put in proper perspective the aspirations of women to become engineers. There

are several careers and jobs in which there is a preponderance of women—teaching, banking, office work, nursing, etc. That this list does not include engineering need not be considered a 'problem'. There are two ways in which one can look at women engineers: as women first and engineers second, or as engineers first and women second. Arguments may be advanced depending upon which way one looks at women engineers.

In the Indian context, with so much unemployment in the country, is it possible for the nation to provide jobs for both husband and wife in each family? From a socio-economic point of view, it is necessary to ensure that there is one bread-winner in each family before thinking of providing jobs for both.

It is also necessary to take into account the substantial differences between developed and developing countries, as far as women workers are concerned. The role of women in the family and office is quite different, although the differences are narrowing in urban, middle-class families. In the developed countries, almost all office secretaries are women, unlike in India. Important physical facilities, such as washrooms, are readily available in those countries, unlike here. As in other matters such as technology, education, industry, economy, national goals, form of government, etc., the role of women in engineering is country-specific, and requires 'appropriate' strategies for tackling the issues.

REFERENCES

1. P. P. Parikh and S. P. Sukhatme, *Women Engineers in India*, Report prepared for the Department of Science and Technology, New Delhi (May 1992).