

Against All Odds: Women Engineer Their Way In

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Abstract

Generally there are 2 females to every male in most institutions of higher learning in Malaysia today. This is due to the better academic performance amongst female students in schools, with their male counterparts trailing far behind. There are institutions which are said to offer a lower entry requirement to male students in trying to address the problem of the lack of male students.

However, in the field of engineering, the number of females still lags behind males except for some engineering degree programmes. Social scientists have reported that since the 1970s, men still greatly outnumber women in engineering.

The objective of this study is to find out more about the factors that encourage and discourage females to enter this traditional boys' club. Prompted by the media's interest to inform the public of the current trend, interviews were carried out by the researcher amongst engineering students and lecturers chosen at random in two institutes of higher learning in Malaysia as well as professionals. The data was collected over a period of three months in 2004.

The responses to the interviews revealed that personal interest, good grades and good role models were significant factors that contributed to the increasing number of female students in selective engineering courses. However, female engineering students had to overcome odds like convincing one's parents, traditional role-playing and discrimination.

The findings were later incorporated into an education cover story written by the researcher and carried in the New Sunday Times on April 25, 2004.

Keywords: Women engineer; Higher learning; Malaysia

1. Introduction

Social scientists have reported that since the 1970s, men still greatly outnumber women in engineering. Even though we have entered the age of globalisation, society can still hardly accept the reality that some females can be more creative and intelligent than male students.

This research focuses on a need for an analysis of the reasons behind a female student's interest/disinterest in engineering courses so that a more wholesome description of the reasons behind such decisions can be portrayed. The relationship between external factors, internal factors and their ultimate decisions in career choices can then be established. It is with this in mind that the researcher hopes to explore the following in this paper.

1. What are the factors that encourage females to enroll in engineering courses?
2. What are the factors that discourage females to enroll in engineering courses?
3. Are there discriminatory factors against female engineers?

2. Rationale of the Study

There is a growing concern over the enrollment and retention of female students in the engineering faculty. According to Susan Staffin Metz, president of Women in Engineering Programs and Advocates Network (WEPAN), "While women make up 46 percent of the total U.S work force, only 8.5% of the country's engineers are women. Women average 20% of the

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enrollment in engineering schools. The gender disparity grows when dropout rates are considered. Approximately, 54- 70% of women entering engineering programs don't graduate (compared to 39 – 61 % for men). Retention rates are a particular problem in the freshman and sophomore years.”

3. Methodology

The researcher makes use of the qualitative approach of obtaining data. Interviews and audio taping were carried out.

3.1 The Site and the Subjects

20 students (10 male and 10 female) from The Faculty of Engineering, Universiti Malaya and 30 students (15 male and 15 female) Universiti Teknologi MARA, Shah Alam were chosen at random and interviewed. 3 lecturers from each university and 4 professional engineers were also interviewed.

3.2 Research Design

The research design was based on Bruce L. Berg's (2004) model that encompasses both the research-before-theory and theory-before-research models. The research design was conceived as spiralling rather than linear as it progresses. The researcher began with an idea, gathers information related to theory, reconsiders, refined the idea, examined possible designs, reexamines theoretical assumptions and then refined these assumptions. There could be new information or insights that needed to be considered when the researcher was interpreting or reporting the data. Consequently with every two steps forward, the researcher could have taken a step or two backwards before moving on to the next stage. It was therefore not a linear, forward direction. Conversely, the researcher spiralled forward, but did not actually leave any stage behind completely.

3.3 Interviews

The researcher used an interactive approach and a more or less unstructured interviewing style. The aims of these interviews were to find out why the respondent chose the engineering field and whether she faced any obstacles in the process.

4. Results and Discussion

In all other engineering programmes, the number of male students doubles female students. (See table 1) Table 2 show that female students pursuing postgraduate studies

in Chemical engineering outweigh male students. However, in all the other engineering programmes, male students dominate.

Among the factors that encourage females to enter this traditional boys' club are personal interest, good grades and good role models. However, female engineering students have to overcome odds like convincing one's parents, traditional role-playing and discrimination

4.1 Factors that encourage females to enter engineering courses

- **Personal Interest**

Personal interest reigned uppermost in why girls chose engineering. In materials engineering and civil engineering, there is an equal number of males and females. Although the courses were demanding, one female respondent said,

"I believe that hard work will see me through. I enjoy laboratory work. We once carried out materials testing to find out whether bottle glass can be converted to ceramics. I thought that was cool."

- **Getting good grades**

Getting good grades also helped female students maintain the choices that they have made. Generally girls were more disciplined and therefore they were more consistent in their grades. The lecturers from both universities agreed that there was no difference in capability or capacity between male and female students while they were in the university campus. The female students were obviously seen giving more concentration on their studies compared to their male counterparts.

A lecturer from UM said,

"Dedicated individuals are the ones who do well and this is not based on gender either. Some students are not prepared to sacrifice most of their time pouring over books and being involved in projects and laboratory assignments.

Another lecturer from UM, informed the researcher that some of his female masters students were involved in projects on power testing; even as high as 1 kilowatt and in the designing of a single faced inverter and a fuzzy controlled state of charge battery charger.

- **Good role models**

Good role models were not lacking either. A civil engineering lecturer who had been teaching engineering for over 20 years and was still very much invigorated by her passion to teach and to impart knowledge to her students said,

“I find engineering such an exciting subject and I want my students to catch the same fervour. Everything is hands on and we learn by doing.”

4.2 Factors that discourage females from entering engineering courses

Female engineering students had to overcome odds like convincing one's parents, traditional role-playing and discrimination when they chose to enroll into engineering courses.

- **Convincing one's parents**

A civil engineering female student at UiTM, Shah Alam said, “Before I entered the engineering faculty, I had to convince my parents that I could perform just as well. I know when I am an engineer there are many jobs opportunities and I don't mind working at construction sites. I was very inspired by my engineering teacher En. Ismail bin Yunus, at Sek Men Teknik Kuala Lipis, Pahang. He was very enthusiastic and he made engineering understandable. He erased the image that engineering is difficult.”

- **Traditional role-playing**

90% of the female respondents agreed that in most cases, females face the expected and added responsibility of keeping house and home. Despite the fact that women are professionals in their careers, many still have to juggle between domestic and work responsibilities. It would then be a struggle for many to be a successful female engineer and to be expected to play traditional roles at the same time.

- **Discrimination**

Respondents also felt that female engineers may also have to try their very best to cope with discrimination in their working careers. Some people think that hiring women engineers is one thing. Keeping them is another. They felt that most companies preferred to employ male engineers. Some male students attested to the fact that they were the advantaged lot because they were exposed

to aspects of engineering at an earlier age and thus had relevant prior knowledge.

5. Conclusion

Overcoming odds remains one of the main obstacles for a female wishing to pursue engineering. They tend to shy away from the heavy traditional engineering stuff like civil, mechanical and electrical engineering which requires long stays on construction sites as well as being physically more demanding at times

6. Suggestions for future research

In a study carried out by the Malaysian Council of Engineering Deans, IEM and BEM published in 2000, it was highlighted that female students with their excellent academic achievement should opt to excel in careers leading to advanced design and research and development, which is the emphasis given by the Malaysian Engineering Education Model. As a spin-off from this research, more research could be carried out on the advancement of women engineers in the field. Such research would then propagate the education and progress of women engineers and would lead to more females taking up engineering as a preferred choice.

7. Recommendations

The engineer of the future needs to have strong interpersonal as well as technical skills. There is a need not only to increase the number of women and minority engineers, but to produce engineers who are better equipped to succeed in a rapidly changing, global market. The society should not make it difficult for women to pursue rewarding industrial careers. People should have equal opportunities to pursue their academic and career choices.

A dramatic increase in the supply of engineers is required to maintain the nation's worldwide competitive position. More students to take up engineering in the country through career talks, the creation of Engineering Week within universities and the distribution of literatures on engineering.

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Biographical information

Table 1. Current Undergraduate students, Faculty of Engineering, Universiti Malaya Male: Female Faculty of Engineering

	2003/2004		2002/2003		2001/2002	
	Male	Female	Male	Female	Male	Female
Electrical Engineering	58	22	68	28	58	28
Telecommunication Engineering	27	32	13	38	15	30
Civil Engineering	69	30	70	31	56	24
Environmental Engineering	17	13	28	14	10	14
Mechanical Engineering	59	26	64	28	50	22
Material Engineering	20	17	24	18	13	10
Biomedical Engineering	15	10	17	12	22	14
Manufacturing Engineering	30	15	27	18	15	10
Cad Cam Engineering	20	17	30	25	32	23
Chemical Engineering	20	25	39	27	30	23

Table 2. Current Postgraduate students, Faculty of Engineering, Universiti Malaya (Research only (M.Eng and Ph.D)

	Male	Female
Electrical	26	4
Civil	30	12
Mechanic	17	5
Chemical	13	17
Bio-Medic	7	5
Cad/Cam	12	5