Research Briefing

Encounters with Engineering:
First Experiences of Women Students

Introduction

In the UK several Government initiatives have been introduced to encourage women to pursue careers in the engineering professions. Such initiatives have had some success in increasing the number of women studying engineering. In 1973 only 3% of engineering and technology students were women[1] , compared to 15% in 2004/05[2]. However, only 1.6% of all female students in higher education are based in engineering[2]. Furthermore, the increase in women engineering students has failed to translate into an equivalent increase in women engineering professionals, with indications that less than 10% of professional engineers are women[3]. This briefing is being circulated to engineering educators and employers and professional bodies; it offers an insight into women's experiences of engineering education and employment and some recommendations for moving forward.

The briefing draws on a recent ESRC funded study conducted by Professor Barbara Bagilhole, Dr Andrew Dainty and Abigail Powell of Loughborough University, and Professor Richard Neale of the University of Glamorgan. In response to the issues outlined above, the study aimed to develop an understanding of women engineering students' earliest encounters with engineering workplaces on their future career intentions. Workplace experiences were examined in the form of the year-long industrial placement taken in higher education, as this usually represents women's first major contact with the engineering industry. The industrial placement also represents a key transitional stage in each student's process of becoming (or not becoming) an engineering professional.

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Research methods

The research adopted a mixed methods approach using qualitative interviews to explore the experiences and reflections of women engineering students, from a pre- and post-1992 university, before, during and after their industrial placement. Alongside this, an email survey of all male and female engineering undergraduates, again at a pre- and post-1992 university, was conducted. The study explored the experiences of students from a range of engineering disciplines.

Key Findings

Student Characteristics. The research found a significant difference between students studying at a pre- and post-1992 university. Students from the post-1992 university were more likely to be mature students and therefore had different priorities to the mostly post A-level students at the pre-1992 university.

"I knew that having an engineering degree wouldn't, didn't just lead you to doing engineering. I knew that if I came out with an engineering degree, I could go off and do all sorts of stuff,"
Eve, Civil engineering student, pre-1992 university, non-placement student.

A Good Degree. Women engineering students identify engineering degrees as a good basis for a variety of career paths, not just in the engineering sectors. Women engineering students have not necessarily decided to pursue an engineering career.

"It kind of opens doors I suppose, to other things. You can't go into management, then into engineering, but you can do it the other way round,"
Emma, Mechanical engineering student, pre-1992 university, placement student.

Career Ambitions. Women and men engineering students that go on industrial placement are much more likely to have clearer career ambitions than those students who choose not to go on placement.

"Some of the work we do, you're like, why? Why do I need to know this? Or, why are we learning it now? I think we could have spent more time on other stuff,"
Hannah, Civil engineering student, pre-1992 university, placement student.

Teaching and Learning Methods. Women engineering students are not always comfortable with the teaching and learning methods used in higher education. Women and men students want a more practical, relevant curriculum.

"I expected it to be a bit more practical. The theory isn't too bad, but there's so much to take in and to understand. I'd personally like a bit more practical,"
Chloe, Mechanical engineering student, pre-1992 university, placement student.

Transferable Skills. Women engineering students found that the skills most transferable from higher education to the workplace are practical and generic skills, such as report writing and presentation skills, not the technical knowledge gained throughout their degree programmes.

"I went to the motorclub … to watch a couple of my friends take out an engine. And while I'm doing all these things about engines and systems, I couldn't tell you what these things were. I think that probably affects what I can do in industry,"
Emma, Mechanical engineering student, pre-1992 university, placement student.

Transitions to Work. The transition from education to work can be difficult for students in terms of adjusting to the practicalities and routines of work as well as the context of their work (including bureaucracy and office politics). The industrial placement can facilitate the transition to employment following graduation.

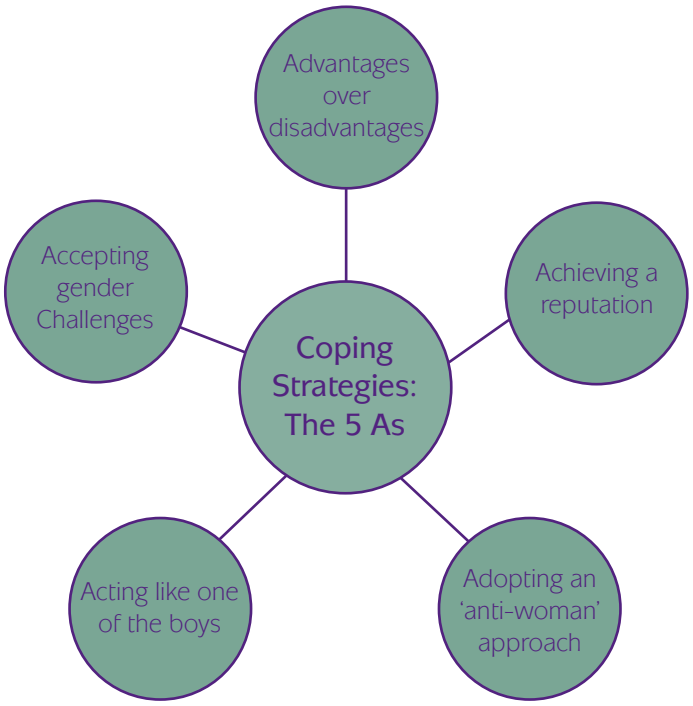
"One of my lecturers said when you get out to work forget everything you've been taught and start again … I don't think I could take anything I've learnt just now and put it in the workplace,"
Carolyn, Air Transport management student, pre-1992 university, placement student.

Coping Strategies. Women engineering students adopt a number of strategies for coping both as an industrial placement students and in a male-dominated environment. These include the five A's:

- Acting like one of the boys: women attempted to fit in with their male colleagues by showing that they did not require special treatment and by sharing their camaraderie;

"I give them as good as I get. So it's equal. And you have a laugh. If you give them respect, they'll give you respect back,"
Suzanne, Engineering environmental technology student, post-1992 university, placement student.

- Accepting gender discrimination: women were reluctant to admit they had been discriminated against, frequently justifying their colleagues' actions, suggesting, for example, that in the instance described they did not deserve to be treated equally;



"Now and then [male lecturers] make … female jokes, but I wouldn't say they treat you differently on purpose,"
Amanda, Industrial design and technology student, pre-1992 university, non-placement student.

- Achieving a reputation: women sought to overcome discrimination or negative attitudes by demonstrating that they were good, capable engineers, and believed that consequently their gender would be insignificant;

"If you've done something wrong – if it's a lad they'd get scorned for it, whereas if it's a girl, you get 'oh, she's only a girl, what's she supposed to know about it? She's not as good as everybody else' …you're having to prove yourself continuously."
Isabella, Mechanical engineering student, pre-1992 university, placement student.

- Advantages over disadvantages: women suggested that the advantages of working in engineering outweighed the disadvantages of being a female in a male dominated environment. Although women recognised that there were negative aspects about engineering, they felt that the positive aspects balanced them out at present;

"I wanted to do [engineering] because not that many girls are doing it and, to be honest, sometimes I think that girls are irritating."
Michelle, Civil engineering student, pre-1992 university, placement student.

- Adopting an 'anti-woman' approach: women engineering students were found to value their status as 'a novelty' in engineering, were critical of women engineers who used 'feminine tactics' (such as crying), and held traditionally stereotypical views of women outside engineering. These attitudes may be a result of women's assimilation into the engineering culture, but do little to further women's cause in engineering. If such women succeed they do so as individuals, failing to question the status quo. Any career success is unlikely to promote the interests of women in the sector .

"At uni, they all reckon that I'm gonna pass just cos' I'm a girl,"
Lindsay, Electrical engineering student, post-1992 university, placement student.

Employability. Women also perceived themselves to be more employable as a result of their gender. It was felt that companies were trying to recruit more women in order to improve their image. Whilst a drive to recruit more women into the industry is a positive step, this had the effect of making women doubt their own abilities ('Have I been employed for my capabilities or my gender?') Alternatively, this also led women to believe, possibly falsely, that engineering workplaces would be equitable to women, posing the question of whether 'getting in' is the same as 'getting on' in engineering industries.

"Even getting here because we didn't have Physics [A level], we found that it was 'girls, we do anything we can to get girls on the course,'"
Zoe, Automotive engineering student, pre-1992 university, non-placement student.

Positive Attitudes. Contrary to previous research addressing women in engineering, the women in this study were, on the whole, found to have a positive attitude towards engineering and their chosen professions. While students are unlikely to be critical of a career in which they are only just embarking, the young women did not feel that any negative aspects about the industry did not affect them as individuals. However, as women continue in their profession, they may realise that these issues can hinder them from progressing in their careers at the same rate as their male colleagues[5].

"I felt like they only employed me because I was a girl and yet they didn't want me to act feminine,"
Debra, Construction management and quantity surveying student, pre-1992 university, non-placement student.

Recommendations for Change

One-size Does Not Fit All: Different types of students at different institutions have different needs and priorities, suggesting a 'one-size fits all' solution is inappropriate; any policy development therefore needs to be adapted to ensure it is suitable for its target audience.

Careers Advice: Higher education should develop careers advice for students and mentor schemes in order to maintain individuals' interest in engineering and to encourage students to use their engineering education in an engineering career.

Teaching and Learning Methods: The structure of engineering education (teaching and learning methods) should be modified in order to attract more students and to maintain and stimulate the interest of current students, for example by introducing more practical, project based work, team work and optional modules.

Industrial Placements: Students should be encouraged to participate in industrial placements. This will prepare students for, and facilitate their transition to, industry. Higher education should seek ways to prepare students for industrial placements and employment. For example, using the experiences of students who have already completed an industrial placement to inform other students.

Gender-oriented Support: It would be appropriate to develop gender-oriented preparation and support mechanisms for students in higher education embarking on an industrial placement, for example, addressing specific problems women may face in the workplace.

Employer-University Links: Pro-active relationships need to be established between engineering employers and higher education institutions in order to develop appropriate teaching practices that prepare students for the workplace.

Recruitment Transparency: Engineering organisations should introduce greater transparency to their recruitment criteria, for example, stating specific criteria that are essential and desirable to carry out the job role.

Inter-organisational Networking: Engineering companies should facilitate networking for women engineers, to assist women in meeting others who may have shared their experiences. This is particularly important in areas where women are in a minority and as such it may be necessary for networks to be inter-organisational.

Transparent Career Paths: Engineering employers should develop transparent career pathways and development as well as structured training programmes for individuals to follow.

[1]Glover, J. (2000) Women and Scientific Employment. Basingstoke: Macmillan.

[2]HESA (2005) All HE Students by Subject of Study, Domicile and Gender. Available at: http://www.hesa.ac.uk [Accessed May 2006].

[3]Fielding, J. and Glover, J. (1997) Gender and Science, Engineering and Technology. Research Summary, Roehampton Institute, University of Surrey.

[4]Greed, C. (2000) Women in the Construction Professions: Achieving critical mass, Gender, Work and Organization, 7 (3), pp.181-95.

[5]Dainty, A.R.J., Neale, R.H. and Bagilhole, B.M. (2000) Comparison of Men's and Women's Careers in UK Construction Industry, Journal of Professional Issues in Engineering Education and Practice, 126 (3), pp.110-5.

Further copies of this research briefing are available from

www.setwomenresource.org.uk

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