AN INVESTIGATION OF WOMEN'S CAREER CHOICE IN CONSTRUCTION

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In response to skills shortages in technological expertise, a number of government initiatives have been introduced to encourage women to pursue Science, Engineering and Technology degree courses, including construction programmes. Women represent the most significant group of untapped potential for the UK construction sector and so their recruitment and successful transition into the sector is vital for the future prosperity of the industry. This paper reports on the initial step of an ESRC-funded project, which is the latest phase of a programme of research conducted by the research team over the last 10 years. Specifically, it investigates the career choice decisions of female engineering students through in-depth interviews. The data are also used to explore possible ways of encouraging more women into the construction profession. It is concluded that the industry must invest in tailored promotional activities if women are to be attracted, and that construction courses must be designed to take account of women's, as well as men's, needs.

Keywords: career, education, engineering, women.

INTRODUCTION

All parts of the construction industry are quantitatively and hierarchically male-dominated. This is significant given the societal importance and impact of the built environment on people's lives. It is important to tackle this gender imbalance in the industry both as a response to predicted skills shortages in technical expertise, but also as part of a determined drive to tackle the gendered culture of the industry (Walker, 2001). This paper explores the career choice of women engineering students, specifically examining the factors and influences behind such choices. An understanding of why some women choose to study engineering can be used to develop policy to encourage others to do so. This research forms part of a larger ESRC-funded study investigating the impact of women engineering students' workplace experiences on career intentions.

WOMEN IN CONSTRUCTION

Nancy Lane, co-author of 'The Rising Tide' report on women in science, engineering and technology (SET), commented, '*Engineering … is a subject where women are currently catastrophically underrepresented*' (see Walker, 2001). Studies have shown, however, that women are not driven away from technology because of lack of ability, but rather because of 'an atmosphere of dominant masculinity' (Sagebiel, 2003). This is despite research by the Scottish Higher Education Funding Council advising that female engineers are generally perceived to be better qualified and more

Powell, A, Bagilhole, B M, Dainty, A R J and Neale, R H (2004) An investigation of women's career choice in construction. *In:* Khosrowshahi, F (Ed.), *20th Annual ARCOM Conference*, 1-3 September 2004, Heriot Watt University. Association of Researchers in Construction Management, Vol. 1, 477-84.

highly motivated than their male counterparts (SHEFC, 1998a, cited in Walker, 2001). Bagilhole (1997) presents a business case for increasing the number of women in the industry. She explains that by failing to increase the number of women, the industry is under-utilising the full range of skills and talents in the population. In addition, a more gender-balanced construction organisation should be able to increase their efficiency and effectiveness by projecting a more pluralistic self-image.

As a result of such arguments numerous initiatives have been employed to increase the numbers of women entering engineering education and employment. In 1984, for example, the Women into Science and Engineering (WISE), campaign was established, with the support of the Equal Opportunities Commission and Engineering Council. The campaign promotes science and engineering as a suitable career among girls and women across the UK through brochures, websites, videos, presentations and hands-on courses. The publication of the Construction Industry Board (CIB, 1996) report also raised equal opportunities to the top of the industry's performance improvement agenda, particularly in the light of the skills shortfalls forecast for the sector in the millennium (Dainty, et al., 1999). Such initiatives have also had some success in increasing the number of women studying engineering. Glover (2000) reported that in 1973 only 3% of engineering and technology undergraduates were women. This is compared to 15% in 2001/02 (HESA, 2002). However, figures vary widely by subject, from 68% in polymers and textiles to just 8% in mechanical engineering. The figure for civil engineering is slightly above average (17%) but still significantly below the average across all subjects (56%) (ibid.).

Some research (e.g. the Institute of Physics, 2003) has indicated the need to address women's under-representation at every point where women and girls have the choice to opt out of SET. This, they suggest, means starting in schools, where girls can rule out careers as engineers by dropping physics, chemistry or mathematics. It also means improving the quality of careers advice and information available about engineering and construction, as children with no engineers among their family and friends may simply not know what being an engineer involves. Correll (2001) has argued that much career-choice research focuses on the stage when individuals actually choose to enter jobs, rather than on the decisions to move into activities at earlier stages, that lead to particular career paths. She maintains that gender differences in career choice occur at these earlier stages, for example, students who fail to study maths and sciences at 'A' level are highly unlikely to choose a degree in construction. It is therefore important to consider the early socialisation processes that bias men and women toward particular career paths.

One solution to the low numbers of women studying construction in higher education is to consider why women have chosen to study engineering, exploring influences such as careers advice and exposure to the construction industry. The implications of this are that if these influences can be identified, they could be exerted over other women in order that they might also choose the construction industry as a career path.

CAREER CHOICE

Before exploring the specific reasons women choose to study engineering, it is important to put the research in context by examining career theories that define processes of career choice and factors influencing career decision-making.

Dick & Rallis's (1991) career model states that students make their career choice on the basis of the relative values of the careers and their beliefs about themselves. The

relative value of a career relates to both intrinsic factors such as intellectual interest as well as extrinsic factors such as expected salary and length of study. According to the model, student beliefs about themselves are formed from their interpretation of past experiences and perception of the attitudes and expectations of others, such as teachers and parents (referred to as socialisers). Dick & Rallis posit a dynamic relationship between the student and socialisers in which interactions shape their experiences and aptitudes. All of this takes place within the context of a particular set of societal stereotypes and realities, such as the sexual division at the workplace.

Building on the theories outlined above and their own research, Jawitz and Case (1998) identified six categories of reasons for choosing engineering as a career:

- Career rewards (REW), including job prospects, salaries and bursaries;
- Contact with engineering career (CAR), including career events and exposure to engineers and the workplace;
- Socialisers (SOC), including the influence of teachers and the presence of an engineer in the family;
- School subjects (SCH), including enjoyment or ability in maths, science or technical subjects;
- Social Identity (SID), including statements about making a contribution to the community or country, working as a team, wanting to be different or to prove oneself; and
- Engineering activities, which was subdivided into three further categories

o1. Manual activities (MAN), including an attraction to practical activities, such as designing and building things, and working with real life situations;

o2. Mental activities (MEN), including enjoyment of problem-solving, research and a curiosity about how things work; and

o3. Challenge and variety (CHA), including the desire for a variety in one's work and the attraction to challenge.

CAREER CHOICE AND GENDER

Much early research on careers focused on white, middle-class males, so to what extent does existing theory and practice reflect women's needs and career problems? Whittock (2002) suggests that career decisions remain strongly influenced by gender, claiming that the career plans of young women have been found to be consolidated by the stereotypical nature of work experience undertaken by the majority and by lack of access to appropriate role models. Arnold, Cooper and Robertson (1998) reviewed several theories concerning aspects of women's career development. For example, Fassinger (1985) developed a model of college women's career choice. Betz and Hackett (1981) examined how self-efficacy influences women's career choices and aspirations. Gattiker and Larwood (1988) discussed what career success means for women. Arnold, Cooper and Robertson (1998) claim that these analyses recognise that the socialisation of girls and societal expectations of women's and men's roles are likely to have profound effects on the way women think about their careers. The same is true for men, but this is less often recognised because of the temptation to take male socialisation and values as an unquestioned norm.

A number of studies report that women and men have similar profiles of reasons for choosing engineering. However, they did find that: pay was a more important factor in career choice for men than women (Dick & Rallis, 1991); women were more influenced by involvement with human issues (Woolnough 1994; Shell et al., 1983); men were more influenced by their experience of engineering-related activities, while women seemed more attracted by the characteristics associated with the career itself (Shell et al., 1983); men citied scientific hobbies and 'fiddling with gadgets' more often than women (Woolnough, 1994); women were influenced by a wider variety of factors than men (Shell et al., 1983); men were encouraged more by their fathers than women (Rosati & Becker, 1996); more women than men cited 'wanting to be different' (Kent & Stublen, 1995); and ability in mathematics and science was cited more by women than by men (Kent & Stublen, 1995). Evetts (1998) found that women were attracted to engineering by the everyday practices of the work. The appeal of 'solving problems' and 'working problems through', 'identifying problems' and 'working to solve' them were mentioned again and again in the career history interviews about their work. The procedures and practices of doing engineering and the team discussions about applications, processes and practicalities were what made the work appealing. The 'hands-on' experience and the production of 'results' were what made the work attractive. These relate closely to Jawitz and Case's (1998) engineering activities category (MAN, MEN & CHA).

Jawitz and Case (1998) found in their research in South Africa, that the reasons students give for studying engineering are independently and significantly associated with gender and discipline. With reference to the categories of choice, identified earlier, they found no significant difference by gender or race between career rewards (REW) and contact with engineering career (CAR). The categories socialisers (SOC) and school subjects (SCH) showed similar differences in response. Both these categories of reason were mentioned significantly more by white students than by black students, and, amongst white students, by female students more than by male students. Manual activities (MAN) were mentioned significantly more by white students than by black students and more by male students than by female students. Mental activities (MEN) were mentioned significantly more by white students than by black students. Challenge (CHA) was mentioned significantly more by female students than by male students. Within the category social identity (SID), wanting to be different or to prove oneself was particularly mentioned in relation to being a member of an underrepresented group in the engineering profession. These reasons were mentioned significantly more by black students than by white students, and by female students more than male students. The attraction to challenge and variety of engineering (CHA) was the only category of reasons that revealed a significant gender difference but no difference by race. However, the women in the sample had chosen a non-traditional career and, according to Jawitz and Case (1998), are therefore likely to be the type of person not deterred by a challenge.

These findings have implications for initiatives aimed at attracting more female and minority students into engineering studies. Not only do the social dimensions of an engineering career need to be emphasised in the publicity aimed at students, but curricula and workplace experiences need to build on and sustain the differing initial motivations in order to retain these students in the profession.

CAREER AND CONSTRUCTION

Interestingly, Jawitz et al. (2000) interviewed non-engineering students to explore the position of engineering as a potential career option in their career decision-making process. They found that the only students who had engaged with engineering as a potential career were students who had chosen to study science. They had attended what they called 'strong science schools' and had a positive attitude to science. Their decisions away from engineering were based on careful and strategic choices. It seems that the experience of science in schools is a significant factor influencing the choice of engineering and prospective candidates to study engineering are likely to be found amongst those young women considering registering for a Science degree. Jawitz et al. (2000) noted the phenomenon of top female maths and science students being pointed towards medicine by a range of socialisers. It is interesting to consider that it is only very recently that this profession has become 'gender neutral', and it might be useful to uncover how and why this happened, to see if there are any lessons for the engineering profession. Webster & Burrowes (1998) have made a preliminary analysis in this regard, and suggest that women's experience as consumers of medicine has influenced the ease with which they have recently entered the profession.

Rodgers (1991, cited in Bennett et al., 1999) addressed why women chose a career in construction in the first place, and their career expectations. Rodgers evaluated the perceptions of the construction industry held by 'A' level students, civil engineering undergraduates, and graduates. She found that both male and female 'A' level students lacked the specific knowledge required to consider a degree in engineering. She suggested that professionals should be encouraged to pass on their knowledge and experience of the industry to the younger generations, in particular women, so female students may have role models in the profession. Gale (1994) also found that male and female students considering a degree in the construction industry held the same image of the industry as those undergraduates already studying for a degree.

METHODOLOGY

The research presented in this paper is based on the early stages of a larger ESRC funded, research project investigating the influence of women engineers' earliest encounters with engineering workplaces on their future career intentions. The research centres on exploring women's experiences of their industrial placement, as in most cases, this will be women's first major contact with their chosen engineering profession. The larger study is longitudinal and investigates the students' experiences and expectations before, during and after their year long placement. The study explores the experiences of students from a range of engineering disciplines, including civil, aeronautical, mechanical, design and technology, and other degree courses. The research therefore recognises that engineering is not a single, homogenous sector, as it has often been treated in previous research (e.g. Evetts, 1996).

The research presented here is based on the first phase of the larger study. The principal research method used was in-depth, semi-structured interviews with 38 second year female students. Qualitative interviews were used to gain an understanding of why students had chosen to study engineering, rather than to provide a taxonomical or quantitative account of career influences. All of the data collected were tape-recorded and transcribed verbatim, before being conceptually labelled and

analysed under themes emerging from the literature. Key findings were then explored to assess the salience and relevance of career choice to the wider study.

KEY FINDINGS

The analysis of interview data revealed several key themes relating to career choice among women engineering students. These themes were categorised as (i) educational experiences, (ii) individual factors, (iii) career prospects, (iv) family influences and (v) information. However, these themes are not mutually exclusive, and almost all are interrelated, as will be revealed as the themes are explored. Furthermore, all the informants expressed a different combination of influences affecting their career choice.

Educational Experiences

The first theme to emerge from the interviews when students were asked why they had chosen to study engineering, were individual factors, such as ability, interests and attitudes, and educational experiences. Most of the students in the pilot study found that the subjects they had chosen to study at school often led to a natural progression into engineering:

"I was doing maths and physics at 'A' level, and I was trying to find a degree that would have substantial proportions of that in it."

Individual Factors

Choice of school subjects is, however, clearly related to individual factors such as an interest in the subjects and an ability to succeed in the discipline:

"They were just the subjects that at GCSE I enjoyed, I was good at, and I knew I could cope with doing them at a higher level. There were other GCSE subjects that I might have enjoyed but I couldn't see myself actually managing to complete an A level course. So, it was a combination of being good and enjoying it."

Long-term career ambitions were also identified as a reason for studying engineering:

"*I wanted to join the air force … [but] I was too short and I thought well if you can't fly them, why not learn how they work and how to design them … and it ended up carrying on from that really."*

Career Prospects

Although appearing very similar, a further theme that emerged was the career prospects an engineering degree provided. This category was purposely separated from individual or personal career ambition. Career ambition was seen as relating to an individual choosing engineering as a specific career path to follow. Career prospects, on the other hand, has a broader definition, relating to students who's career ambitions were less clearly defined, and who perceived an engineering degree to be a good basis for a variety of career paths not just in the engineering industry:

"I knew that having an engineering degree wouldn't, didn't just lead you to doing engineering. When, I knew that if I came out with an engineering degree, I could go off and do all sorts of stuff."

"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."

This also relates to students' interest in engineering in another way. Students identified engineering as interesting because it was so broad and covered such a variety of issues and topics, which is also why they appeared to rate it as providing good career prospects or opportunities:

"I think it's a bit diverse. Again, you can come into whatever discipline you choose afterwards."

Family Influences

The above findings, however, are lacking in two respects. Firstly, they do not explain where an interest in subjects such as maths and physics (also male-dominated) originated. Here family influences, including childhood experiences were found to be influential in stimulating an interest in traditionally 'male' things, raising questions about how children are socialised into particular roles:

"as a kid I always sort of played with technic lego and stuff like that"

Information

And secondly, they do not reveal how students knew about engineering, in order to make a decision to study it. Knowledge of the engineering industry was found to be related to raising awareness and access to information from teachers (this links back to educational experiences) or contact with the engineering industry (either through the father, relatives or family friends and careers advice):

"my physics teacher at 'A' level was really good and I went spoke to him and said, look, these are the bits I've enjoyed, what do you suggest? And he suggested civil engineering and I looked into it a bit more"

"when I was at school, the careers people said what are your favourite subjects? I said maths and physics, and they said, OK look at engineering and I said, no. I'd never looked at it and I'd, it just didn't interest me, but one day I looked at a prospectus and it looked it really good."

This final quote shows the importance of promotional literature once an awareness of or interest in engineering has been developed. Conversely, the following quote from a mechanical engineering student shows how influential a lack of information can be:

"I hadn't ever really considered doing civil and things like that, because it never really got talked about."

This shows the importance of providing students with information about engineering, as even a student who is interested in the subject, failed to consider all of her options because of a lack of information.

DISCUSSION

These findings resonate well with the career choice literature, as most of the themes that have been identified as influencing career choice can be related to the categories in other career models. For example, career values (Dick and Rallis, 1991) and career rewards (Jawitz and Case, 1998) may be likened to career prospects, whereby engineering is perceived as a good degree to have whatever career path the individual may decide to follow later. Previous research had suggested that career or job prospects may be too narrow a reason for making a career decision, as both Dick and Rallis (1991) and Jawitz and Case (1998) had used a wider definition (e.g. career rewards also included consideration of extrinsic factors). However, the research here

did not suggest that students considered extrinsic factors, such as salary, in their decision making process. This could, however, be a result of the limited number of interviews, and is worth further exploration in the full study.

Future research should also consider the impact of gender on career choice. In the example above, it may be, for instance, that men are more influenced by extrinsic factors than women, as indicated in the literature by Dick and Rallis (1991). While it is likely that men's and women's career decisions are influenced by similar factors at a high level, such as an interest in the subjects involved, educational experiences, family influences and information, *how* these factors influence men and women generally, is likely to differ. For example, childhood experiences and socialisation processes may bias individuals to particular careers, as Arnold, Cooper and Robertson (1998) maintained. If men and women's career decisions are influenced by different factors, this could have important implications for promoting the construction industry to young people, as it suggests that a 'one-size fits all' approach to increasing the number of professionals in the industry is not appropriate. It will therefore be important in future research to interview both men and women about career choice in order to discover the best ways to increase the numbers of both sexes entering the profession.

The research has also highlighted the importance of information about the engineering industry. As the 'Universe of Engineering' report explains, *'for the role of engineering to be properly understood and recognised it is necessary to know what it is'* (Malpas, 2000, p.6). If more women are to be attracted into the construction industry, then awareness of the industry needs to be raised, as does access to good information about the sector. The research also shows that it is important to do this at an early stage in education. At the very least, it needs to occur before students choose their 'A' levels, as often there is a natural progression from what is being studied at 'A' level, to what is studied at University. Prior to this stage even, it will be important to get girls interested in traditionally male areas. Improving access to information and opportunities suggests the importance of educating key socialisers, such as parents, teachers and careers advice, in order that girls and boys are not socialised into 'feminine' or 'masculine' roles, respectively, and that information and opportunities are provided to all children regardless of sex.

That the informants considered career prospects a significant influence in choosing what to study at university is important, because it may imply that although women students have an interest in engineering, they have not yet decided whether to pursue it as a career. This suggests that career decisions are still being made when students are at university. This is further confirmed by the fact that the informants hoped the experience of the industrial placement would help them make decisions about their future careers. This may go some way to explain the low translation of women engineering students into women engineering professionals. Kirkup and Keller (1992), for example, found that only about half of women students go on to work as engineers, indicating that the engineering industry may not meet the expectations of some female students. However, it also suggests, as Jawitz and Case (1998) have argued, the importance of maintaining women's interest in construction once they are at university, and even in the workplace. This indicates that the next stage in the research may be to investigate why women choose to study engineering (in terms of what they hope to get from it) in comparison to their actual experiences of engineering

education. One possibility for future research would be to examine whether there are aspects of in the higher education experience, such as the organisational culture generally in construction disciplines, or the curriculum specifically, that appeal more to men than women.

CONCLUSION

One way to tackle the predicted skills shortages in the construction industry is to tackle the gender imbalance by increasing the number of women in the industry. This paper has therefore analysed women engineering students' career choices in order to find ways of encouraging or enabling more women to enter the construction industry. This study has shown that central to this, is the need to raise awareness of the industry from an early age, as well as, more generally, breaking down gendered socialisation processes in order that girls and boys are not biased towards particular career paths.

Although this study has only considered a limited number of women engineering students' experiences, it has indicated that career choice is a salient issue, worthy of further investigation. It particularly highlights the need for future research to explore gender differences in career choice, including the possibility that men and women are attracted to the construction industry for different reasons. This suggests that a 'one-size fits all' approach to promoting the industry is not adequate. Furthermore, if the construction industry is to encourage women to enter and remain in the industry, it must ensure that the higher education curriculum maintains the interest of women as well as men, and that the organisational culture in construction education and the workplace is welcoming to, and inclusive of, women.

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