

Women into Engineering

Amelia Rout and Dipa Patel

Staffordshire, Stoke on Trent, Shropshire, Telford and Wrekin LLN

The Women into Engineering study was funded by the Staffordshire, Stoke on Trent, Shropshire, Telford and Wrekin LLN in 2009-10. It focused on exploring the reasons for the low numbers of female learners in engineering on foundation degrees and undergraduate courses in Higher Education Institutes (HEI). Within our study we included the full breadth of sub-sectors including civil, chemical, bioengineering, environmental, manufacturing, mechanical, engineering design.

In spite of an overall increase in HE applications, engineering remains largely a male dominated career in the UK. Statistics from the Engineering and Technology Board highlight that in 2007 only thirteen percent of new chartered engineer registrants were women in the UK. In 2008 the figure had increased to seventeen percent but the proportion is still low in comparison to male engineers. Data collected from the HE institutions in our area who run engineering courses confirm that enrolment figures for 2008/09 show a low percentage of female learners as set out in figure one, and that these figures are lower than national average of seventeen percent.

Figure one: Summary of 2008/09 enrolment numbers

UNIVERSITY	COURSE	MALE	FEMALE	TOTAL	MALE %	FEMALE %
Wolverhampton	Degree	199	15	214	93 %	7%
	Foundation	19	2	21	90.5%	9.5%
	HNC	48	2	50	96%	4%
Staffordshire	Degree	234	26	260	90%	10%
	Foundation	220	12	232	94.8%	5.2%
Harper Adams	Degree	162	5	167	97%	3%
	Foundation	20	1	21	95.2%	4.8%

This project aimed to investigate how engineering courses in higher education can be promoted amongst female learners in UK. The data have been used to make recommendations to HEIs about curriculum development.

The study encompassed several stages:

1. To carry out a literature review regarding gender issues in engineering.
2. To collect enrolment figures (females) in engineering courses for academic year 2008 in Higher Education Institutes in Staffordshire, Shropshire and Open University (UK).
3. To scope existing programmes/government policies promoting engineering to female learners.
4. To gather and analyse data on HE engineering courses from learners aged 16+.
5. To gather and analyse data from relevant teachers in schools, colleges and universities in Staffordshire and Shropshire.
6. To gather and analyse data from female engineering graduates based in UK and internationally to help gain an insight into different practices and suggestions.

In addition, prior to data collection the project received ethical approval, and appropriate access measures were put in place to allow participants to be involved in the project. The findings of each project were shared with appropriate stakeholders which has facilitated the recommendations being taken forward.

This chapter focuses on a discussion of the results from stage four of the study. This stage was carried out using a questionnaire which included both closed and open ended questions. The questionnaires were completed out by AS/A-level learners taking maths alongside a variety of other subjects (n=76), FE engineering learners (n=45) and HE engineering learners (n=27). The quantitative data were analysed using descriptive statistics and the qualitative data were summarized by theme, representative quotes are provided below.

AS/A-Level Learners

The response rate among the AS/A-level group was ninety-eight percent (n=76). The results indicate that seventy-five participants were aged between sixteen to twenty-five and one participant was aged between twenty-six to thirty-five years. Forty-four participants were male and thirty-two were female.

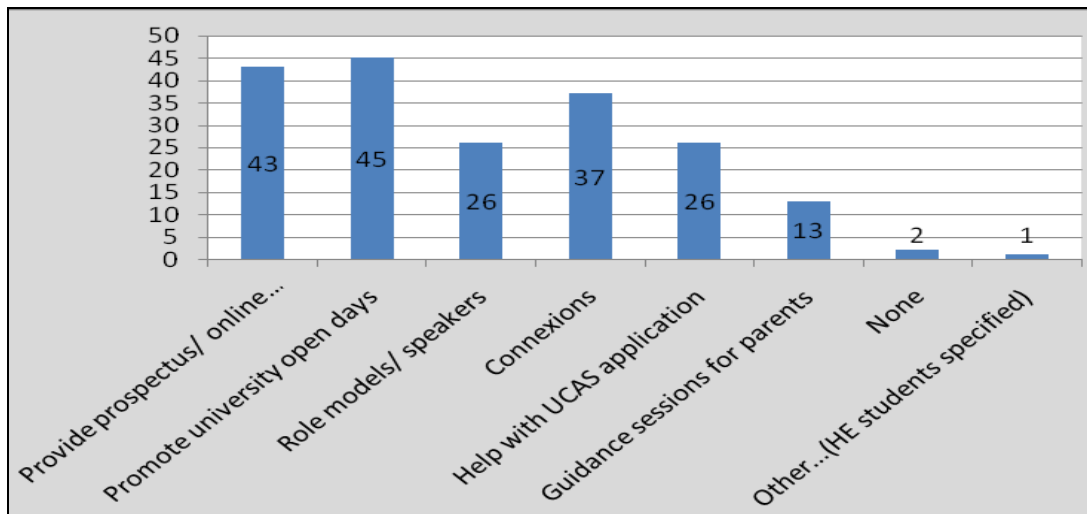
The majority of the participants were taking two to four subjects. All participants surveyed were enrolled onto either AS or A-Level mathematics, twenty-two participants were studying chemistry, nineteen participants were studying physics, fourteen participants were studying psychology and other courses taken included biology, physical education, computing, business studies, law, English, French, Spanish, German and accounting.

Those participants who taken physics, electronics and product design courses in combination with their other subjects would have an opportunity progress onto HE engineering courses.

Seventy-five (out of seventy-six) participants were considering progressing onto HE courses. Fifty-three participants stated which HE course they were interested in taking including accounting engineering, medicine, mathematics and biology. However there was a clear distinction between genders with none of the female learners suggesting they would progress to engineering courses, while six male students stated their intentions to progress to an HE course.

Figure two shows the supporting tools that participant's institute provided to help decide what HE course to undertake:

Figure two: Bar Chart showing the tool(s) provided to help decide on what course to study at HE level



Participants were asked if they had considered engineering at HE level; fourteen participants had considered it, fifty participants had not considered it and eleven participants selected the do not know option.

Also participants were asked if anyone had spoken to them about courses available in HE engineering, the majority of the participants stated that they were not informed. Those participants who were informed of courses in HE engineering specified that the information came from teachers, parents and Connexions advisors.

Participants were asked what they thought studying engineering at HE level involved. Fifty-four participants responded to this question of which twenty-three were female learners. Results showed that ten female participants stated do not know or not sure when answering while the other thirteen female

participants mentioned the following; designing and fixing mechanical things, cars, physics and hands on work. On the other hand, the male participants had a better perception of engineering where most mentioned involvements of mathematics, physics, problem solving and practical work.

Additionally participants were asked to express their views on whether they believed females were capable of becoming successful engineers. The results show that sixty-four participants believe that females can become successful engineers, four participants disagreed and eight participants selected the do not know option. The participants that disagreed (all male) gave the following reasons; 'they are not strong' and 'many of the tasks will involve heavy lifting or grafting'.

The participants were questioned about whether they were aware of there being a high demand for female learners to study engineering at HE level. The results indicated that fifty-nine participants did not know, twelve participants selected no and five participants were aware of the high demand.

Finally, the following suggestions were made by the participants to help promote HE engineering courses to female learners in FE:

- Role models/guest speakers
- Course marketing
- Open days
- Introduce at an earlier age

FE Engineering Learners

The response rate for this survey was hundred percent (n=45). Forty-one participants were aged between sixteen and twenty-five, three participants were aged between twenty-six to thirty-five and one participant was aged between thirty-six to forty-five years. There were forty-three male learners and two female learners surveyed.

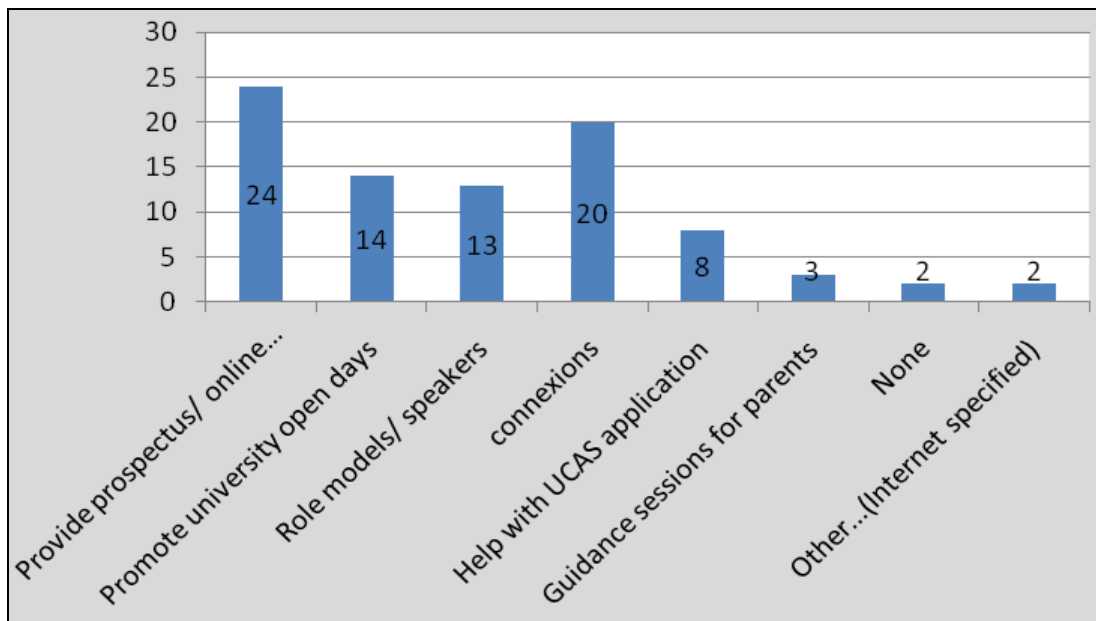
The participants were enrolled on an FE engineering related course such as mechanical engineering, electrical engineering, automotive engineering, motor vehicle engineering and general engineering. The results indicate that participants chose to study engineering because of subject interest, job prospects and the practical skills involved.

Of those who responded, twenty-nine were considering progression onto HE, three were not and thirteen selected do not know. Participants who were considering HE stated they were interested in undertaking electrical engineering, electronic engineering and applied technology. However a few participants were unsure of what course they may consider at HE level. Also participants who mentioned they were not thinking about progressing into HE stated:

“I don’t want to because I’d rather get a job” and “Want an apprenticeship when finishing college”.

Participants were asked to select the supporting tools that their institution provided to help decide what course to undertake at HE level. Figure three outlines the responses:

Figure three: Bar Chart showing the tool(s) provided to help decide on what course to study at HE level



The participants were asked if anyone had spoken to them about HE engineering courses. Twenty-seven participants selected yes, eleven participants selected no and six participants selected ‘do not know’. Participants stated that mostly teachers, Connexions advisors, guest speakers and friends informed them about HE engineering courses.

Thirty participants believed that engineering is a well paid career, five participants selected that it is not a well paid career and eight participants selected the do not know option. Most of the participants agreed that if they were to consider engineering at HE level they would be supported by their parents/partner/spouse.

The majority of the participants believed that females are capable of becoming successful engineers. When questioned about knowing whether there is a high demand for women learners to study engineering at HE level, the majority of the participants selected the do not know option, ten participants agreed to there being a demand and ten participants disagreed.

Finally, the following suggestions were made by the participants to promote HE engineering course to female learners in FE.

- Address stereotypes
- Introduce at an earlier age
- Role models/guest speakers
- Course marketing

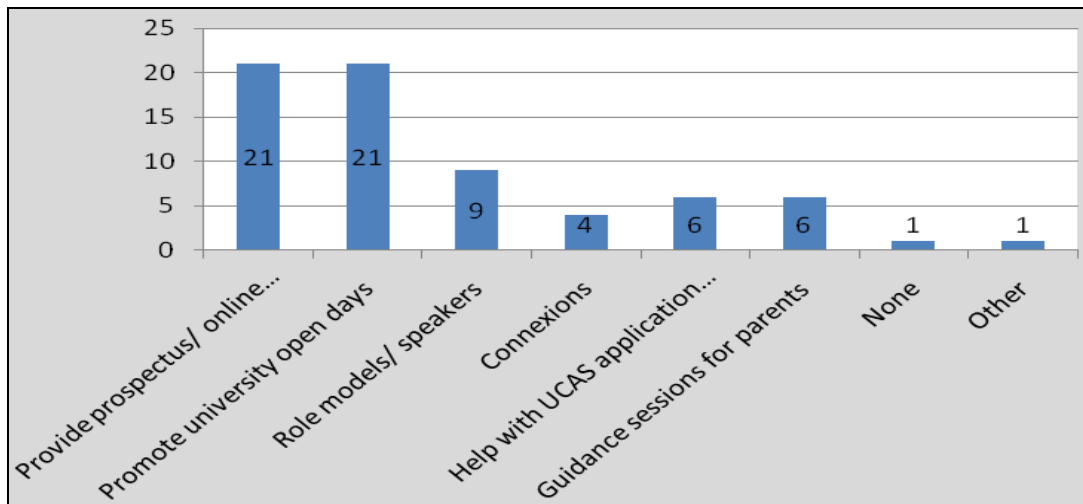
HE Engineering Learners

Thirty questionnaires were given out to HE engineering learners across the Network area. A total of twenty-seven participants completed the survey (90% response rate, twenty-four male, three female). Twenty-five participants were aged between sixteen and twenty-five and two were aged between twenty-six and thirty-five. Fifteen participants were undertaking Agricultural Engineering degrees, eight participants were on the Off Road Vehicle Design degree and four participants were on the Engineering Design & Development degree.

Participants were asked their reasons for studying engineering, twenty six participants responded. Thirteen participants outlined that they had an interest in the subject area, seven participants expressed job prospects and six participants chose to study engineering due to the practicality and useful skills involved.

Participants were asked what supporting tools their prior institution used to help decide on what courses to study at HE level. Participants had the option to select more than one from the list given. The results have been outlined in figure four.

Figure four: Bar Chart showing the tool(s) provided to help decide on what course to study at HE level



Participants were asked if anyone had spoken to them about what courses were available in HE. The results show that thirteen participants answered yes, twelve selected no and two selected do not know. Participants were asked to identify the individuals that had aided their selection to study engineering. Results show that seven participants stated teachers, three participants mentioned parent/s, one participant answered career advisor and one participant said HE institute.

Participants were asked if they believed engineering is a well paid career. The results show that thirty-one believe that engineering is a well paid career, four participants expressed that they did not believe it was and ten selected the do not know option. All participants stated that family members such as parents, partner and spouse supported the participant in choosing engineering.

The majority of participants stated that that females are capable of becoming successful engineers, one did not know and no participants said no. Participants were asked if they knew there whether there is a high demand for women learners to study engineering at HE level. Eight participants answered yes, four participants answered no and thirteen participants selected do not know.

Finally, the following suggestions were made by the participants to promote HE engineering course to female learners in FE:

- Address stereotypes
- Role models/guest speakers
- Marketing courses
- Open days
- Introduce at an earlier age

Discussion and Recommendations

Many colleges and universities are working towards attracting more female learners into engineering. For example, Swansea College (UK Resource Centre for Women in Science, Engineering and Technology, 2006) worked with JIVE to introduce girls only taster day in 2005 focusing on encouraging girls to consider engineering as a career option before selecting their school curriculum courses. The latest engineering taster day for girls held at Swansea College successfully helped to recruit twelve girls into a Design and Technology course at Dylan Thomas School.

Organisations are also working towards increasing the number of women in engineering. For example, HP sponsor women's leadership and development conferences and have developed material to help attract more female employees. Chevron Texaco Oil Refinery in Wales adopted an equal opportunities policy which includes working with schools and colleges to attract female apprentices and believe women have a definite place in the industry (UK Resource Centre for Women in Science, Engineering and Technology, 2006).

Additionally JCB Academy in September 2010 is set to introduce their first intake of learners aged fourteen to nineteen years across Staffordshire, Stoke-On-Trent, Derby and Derbyshire. Currently teenagers and parents are being invited to a recruitment road show where hundred and twenty learners will be given the opportunity to join the academy.

The findings from the survey provide some useful suggestions around how engineering courses can be promoted to female learners in schools/colleges including addressing stereotypes, providing role models and marketing courses.

The survey results indicate that there is a need to inform learners about engineering from an earlier age. Many female participants surveyed did not know what engineering involved and those that did answer

associated engineering with mechanics. The survey suggests that many learners are not aware of the vast field of engineering and career choices available. These implications of findings echo the assertion made by Jamieson that:

“Engineering educators have a role to play; for example, by fostering innovation and connecting engineering to the world, as opposed to a sole focus on the more classic nuts-and-bolts, classroom-only, fundamentals-based curriculum” (Jamieson, 2009).

The research carried out shows that regardless of all the government policies and supporting organisations, gender inequality still exists in engineering.

“Despite sex equality legislation having been around for over thirty years, discrimination and inequality still exists” (Mason in UK Resource Centre for Women in Science, Engineering and Technology, 2006, p2).

Even though there are many initiatives in place to help young learners, especially women into pursuing an engineering career, the Higher Education Institutes enrolment numbers are not promising for female learners.

The following recommendations have been suggested as an outcome from this project:

- The LLN to deliver staff development programme possibly across schools, colleges and private training providers.
- Information, advice and guidance training for teachers to encourage young learners towards engineering careers.
- To introduce engineering to female learners from a younger age potentially in secondary school aged between eleven to fourteen years old.
- Secondary school teachers and learners to attend HE engineering open days.
- To provide support to learners on HE engineering courses using social network tools such as Facebook, Twitter and MySpace.
- Information for learners, parents and general public on the ranges of engineering careers available.
- Employers should continue to engage with young female learners.

Work has begun in taking these recommendations forward, and we have decided that rather than creating more information, advice and guidance, the route that the LLN will take will be to bring existing resources together and make them more accessible to teaching staff so they can be well equipped to provide

female learners the information they need in order to consider progressing into an HE engineering course.

References

Jamieson, L. (2009). Changing the View Of Engineering. *The Engineer*. <<http://www.theengineer.co.uk/Articles/311364/Course+hook.htm>> [accessed 27th April 2010].

UK Resource Centre for Women in Science, Engineering and Technology. (2006). *The Gender Equality Duty In SET.... And How to Implement it*. Bradford: UK Resource Centre for Women in Science, Engineering & Technology.